

**TRACTEBEL ENGINEERING S.A.**  
Cerro Colorado 5240, Of. 1601, Ed. Torre del Parque II,  
Las Condes, Zip Code 7560995 - Santiago – CHILE  
tel. +56 2 2715 8000 - fax +56 2 2715 8001  
engineering-cl@tractebel.engie.com  
tractebel-engie.com

INFORME TÉCNICO

Código de Documento: P012330-2-GE-INF-00004

RESTRINGIDO

**Cliente:** Coordinador Eléctrico Nacional

**Proyecto:** Prueba de Consumo Específico en Central Quellón II

**Asunto:** Informe de Prueba

**Comentarios:** Revisión B sin comentarios. Se incorpora consumo auxiliar de la central y certificados de calibración pendientes.

|      |            |                         |                  |                      |                 |                      |
|------|------------|-------------------------|------------------|----------------------|-----------------|----------------------|
| 0    | 14/05/2019 | Revisión Final          | Ismael Rodríguez | Eduardo Andrzejewski | Christian López | Eduardo Andrzejewski |
| B    | 28/02/2019 | Comentarios del Cliente | Ismael Rodríguez | Eduardo Andrzejewski | Christian López | Eduardo Andrzejewski |
| A    | 22/02/2019 | Revisión Interna        | Ismael Rodríguez | Eduardo Andrzejewski | Christian López | Eduardo Andrzejewski |
| REV. | DD/MM/AA   | ESTATUS                 | ESCRITO          | VERIFICADO           | APROBADO        | VALIDADO             |

Informe de Prueba

TABLA DE CONTENIDO

RESUMEN EJECUTIVO ..... 3

1. OBJETIVO Y ALCANCE DE LA PRUEBA..... 4

2. DEFINICIONES Y ABREVIACIONES..... 4

3. DESCRIPCIÓN DE LA CENTRAL Y SUS UNIDADES ..... 5

4. DOCUMENTOS Y NORMAS APLICADAS..... 6

5. PARTICIPANTES DEL ENSAYO..... 6

6. DESCRIPCIÓN DEL ENSAYO ..... 7

7. MEDICIONES..... 8

    7.1. Mediciones Eléctricas ..... 8

    7.2. Mediciones de Consumo de Combustible ..... 9

8. CÁLCULOS ..... 11

    8.1. Consumo Específico Neto Medido ..... 11

    8.2. Consumo Específico Neto Corregido..... 11

9. CONSUMO ESPECÍFICO NETO..... 14

10. ANEXOS ..... 14

    ANEXO A – DATOS DE REFERENCIA..... 15

    ANEXO B – ACTA DE PRUEBA..... 16

    ANEXO C – LAYOUT DE LA CENTRAL ..... 17

    ANEXO D – CERTIFICADOS DE CALIBRACIÓN DE LOS INSTRUMENTOS ..... 18

    ANEXO E – ANÁLISIS DE COMBUSTIBLE..... 19

    ANEXO F – MEDICIONES, CÁLCULOS Y GRÁFICOS ..... 20

## RESUMEN EJECUTIVO

El propósito de este informe es reportar los resultados de las Pruebas de Consumo Específico Neto realizadas en 10 unidades de la central Quellón II en febrero de 2019. La central se sitúa en la comuna de Quellón, Región de Los Lagos, Chile.

La metodología utilizada se rige por el Anexo Técnico Determinación de Consumos Específicos de Unidades Generadoras y el correspondiente Protocolo de Pruebas.

**El Consumo Específico Neto Corregido aplicable a las 10 unidades Cummins C2250 D5 es de 2.209 kcal/kWh.**



Figura 1: Central Quellón II, a la izquierda Nave 1 y derecha Nave 2.

## 1. OBJETIVO Y ALCANCE DE LA PRUEBA

Conforme resolución de la Comisión Nacional de Energía, las empresas generadoras deberán validar el valor de consumo específico de sus unidades en conformidad a las disposiciones del Anexo Técnico: “Determinación de Consumos Específicos de Unidades Generadoras” de la Norma Técnica de Seguridad y Calidad De Servicio - Resolución Exenta N°375.

El presente documento tiene como objetivo reportar los resultados obtenidos durante los ensayos en la **Central Quellón II**, ubicada en la comuna de Quellón, Región de los Lagos, Chile.

## 2. DEFINICIONES Y ABREVIACIONES

### Definiciones

|                          |                                                                                                                                                                                                                                                        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unidad                   | Unidad Generadora, motor de combustión interna acoplado a su respectivo generador eléctrico.                                                                                                                                                           |
| Unidades Representativas | Unidades seleccionadas para ser instrumentadas y ensayadas. Los resultados obtenidos de estas unidades serán representativos para otras unidades idénticas de la central, previo acuerdo entre el Coordinador Eléctrico Nacional y el Experto Técnico. |
| Variables Primarias      | Son datos utilizados para los cálculos y correcciones de Potencia Máxima.                                                                                                                                                                              |
| Variables Secundarias    | Son datos utilizados para verificar, diagnosticar o demostrar que la planta opera normalmente.                                                                                                                                                         |

### Abreviaciones

|          |                                                 |
|----------|-------------------------------------------------|
| CEN      | Consumo Específico Neto                         |
| FP       | Factor de Potencia                              |
| HR       | Humedad Relativa [%]                            |
| PCI      | Poder Calorífico Inferior                       |
| PCS      | Poder Calorífico Superior                       |
| SCADA    | <i>Supervisory Control and Data Acquisition</i> |
| U1 a U10 | Unidad 01 a Unidad 10                           |

### 3. DESCRIPCIÓN DE LA CENTRAL Y SUS UNIDADES

La Central Quellón II es una central térmica compuesta por motores de combustión interna acoplados a su respectivo generador eléctrico. En la Tabla 1 se indican las características principales de las unidades de la Nave 2.

| Nave y Unidades  | Fabricante<br>Modelo<br>Rating | Potencia<br>[kW] | Consumo de<br>Combustible <sup>1</sup><br>[litros/hora] | Velocidad<br>[rpm] |
|------------------|--------------------------------|------------------|---------------------------------------------------------|--------------------|
| Nave 1: U8 a U10 | Cummins                        | 1.800            | 437                                                     | 1.500              |
| Nave 2: U1 a U7  | C2250 D5                       |                  |                                                         |                    |
|                  | Standby                        |                  |                                                         |                    |

Tabla 1: Características de las unidades de Central Quellón II

Todos los motores utilizan combustible Diésel Grado B, ver certificado en Anexo E. El presente informe considera la Prueba de Consumo Específico aplicable a las 10 unidades de la Central Quellón.



Figura 2: Interior de la Nave 1, Unidad 10.

<sup>1</sup> Valor referencial extraído del Manual del Operador - Cummins C2250 D5.

## 4. DOCUMENTOS Y NORMAS APLICADAS

Los documentos, que son aplicables para la realización de las pruebas, son los siguientes:

- Anexo Técnico: Determinación de Consumos Específicos de Unidades Generadoras.
- Protocolo de Prueba de Consumo Específico Central Quellón 2: P012330-2-GE-PRG-00004
- Norma ISO 3046, ISO 15550, ASME PTC 17 e ISO 8528.

## 5. PARTICIPANTES DEL ENSAYO

| Participante                 | Cargo                        | Nombre               |
|------------------------------|------------------------------|----------------------|
| <b>Tractebel</b>             | Experto Técnico              | Eduardo Andrzejewski |
|                              | Ingeniero de Pruebas         | Ismael Rodríguez     |
| <b>Central Quellón II</b>    | Gerente de Proyecto – Imelsa | Oscar Díaz           |
|                              | Administración – Imelsa      | Pablo Hormazábal     |
|                              | Ingeniero – Energía 7        | Guillermo Alcaíno    |
| <b>Mediciones y Muestras</b> | Muestras de Combustible      | Intertek             |
|                              | Mediciones Eléctricas        | Tecnet               |

Tabla 2: Participantes del ensayo.

Los involucrados y sus respectivos cargos, se evidencian en el Acta de Prueba, ver Anexo B.

## 6. DESCRIPCIÓN DEL ENSAYO

La prueba de Consumo Específico se realizó por separado en 6 unidades representativas para un total de 10 unidades. El Experto Técnico seleccionó las **Unidades 03 / 04 / 05 / 06 / 09 / 10**.

Para efectos de cálculos y correcciones, se registró la Potencia Neta con el medidor de tarificación. Además, se registró la Potencia Bruta de cada unidad en los bornes del generador con instrumentación temporal. Ambas mediciones eléctricas con clase de precisión 0.2.

Los certificados de calibración de todos los instrumentos utilizados se encuentran en el Anexo D.

La fecha y horarios de la prueba fueron los siguientes:

|                                       | U3       | U4       | U5       | U6       | U9       | U10      |
|---------------------------------------|----------|----------|----------|----------|----------|----------|
| <b>Fecha</b>                          | 07/02/19 | 07/02/19 | 07/02/19 | 07/02/19 | 08/02/19 | 08/02/19 |
| <b>Hora de inicio de prueba</b>       | 12:00    | 15:40    | 10:30    | 14:30    | 17:00    | 18:00    |
| <b>Hora de finalización de prueba</b> | 12:30    | 16:10    | 11:00    | 15:00    | 17:30    | 18:30    |

Tabla 3: Fecha y horarios de la Prueba de Consumo Específico.

El periodo de estabilización fue de 10 minutos para todas las unidades, momento en que la temperatura del refrigerante alcanzaba los 90°C. El ensayo fue ejecutado durante un periodo de 30 minutos.

## 7. MEDICIONES

Para efecto de cálculos, se consideran la totalidad de las mediciones registradas durante la prueba.

### 7.1. Mediciones Eléctricas

#### Mediciones Potencia Bruta y Potencia Neta

Las mediciones de potencia activa bruta y factor de potencia se registraron cada 5 segundos por el medidor externo clase 0.2 instalado en las unidades representativas.

|                            | U3    | U4    | U5    | U6    | U9    | U10   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| <b>Potencia Bruta [kW]</b> | 1.812 | 1.796 | 1.797 | 1.808 | 1.803 | 1.809 |
| <b>Potencia Neta [kW]</b>  | 1.772 | 1.754 | 1.756 | 1.765 | 1.763 | 1.766 |
| <b>Factor de Potencia</b>  | 0,94  | 0,95  | 0,96  | 0,95  | 0,95  | 0,95  |

Tabla 4: Mediciones primarias registradas.

En la Figura 3 se muestra una captura del medidor de potencia neta.



Figura 3: Medidor de potencia neta de la central

#### Consumos Auxiliares

Los consumos auxiliares de la central promedian un valor de 2,8 kW con todos los calefactores de las unidades apagados.



## 7.2. Mediciones de Consumo de Combustible

Las mediciones de consumo de combustible se realizaron por masa, a través de un estanque auxiliar suspendido desde una viga mediante un dinamómetro, ver instalación en Figura 4.



Figura 4: Instalación auxiliar para medición de consumo de combustible por masa.

Durante la prueba, se registró la masa del estanque cada 5 minutos, luego la diferencia entre las mediciones de cada intervalo corresponden al consumo de combustible en masa, ver Tabla 5.

|                                       | U3    | U4    | U5    | U6    | U9    | U10   | Promedio |
|---------------------------------------|-------|-------|-------|-------|-------|-------|----------|
| Consumo<br>Neto<br>Promedio<br>[kg/h] | 362,0 | 356,0 | 354,0 | 360,0 | 360,0 | 364,0 | 359,3    |

Tabla 5. Consumo Neto Promedio registrado en cada unidad representativa.

### 7.3. Mediciones Ambientales

Las mediciones ambientales de temperatura ambiente y humedad relativa se registraron manualmente cada 5 minutos utilizando un medidor portátil calibrado, próximo a la admisión de aire de cada unidad representativa.

En la Tabla 6 se indican los valores promedios registrados durante el periodo de prueba de cada unidad representativa, ajustados según la corrección indicada por el certificado de calibración del instrumento.

|                                  | U3   | U4   | U5   | U6   | U9   | U10  |
|----------------------------------|------|------|------|------|------|------|
| <b>Temperatura Ambiente [°C]</b> | 20,8 | 24,6 | 18,3 | 23,3 | 27,8 | 29,1 |
| <b>Humedad Relativa [%]</b>      | 43,7 | 24,3 | 51,6 | 36,1 | 36,0 | 32,7 |

Tabla 6: Mediciones ambientales promedio registradas durante la prueba

En el Anexo D se adjunta el certificado de calibración del instrumento.

### 7.4. Muestreo de Combustible

Para cada prueba, se tomó 1 muestra de combustible desde el estanque auxiliar. El procedimiento y análisis fue ejecutado por Laboratorio Intertek, ver informe en Anexo E.

|                                              | U3     | U4     | U5     | U6     | U9     | U10    | Unidad   |
|----------------------------------------------|--------|--------|--------|--------|--------|--------|----------|
| <b>Densidad a 15°C</b>                       | 0,832  | 0,8321 | 0,8325 | 0,8324 | 0,8321 | 0,8324 | kg/litro |
| <b>Poder Calorífico Inferior</b>             | 10.263 | 10.263 | 10.262 | 10.262 | 10.263 | 10.262 | kcal/kg  |
| <b>Poder Calorífico Superior<sup>2</sup></b> | 10.945 | 10.945 | 10.943 | 10.944 | 10.945 | 10.944 | kcal/kg  |

Tabla 7: Resumen de resultados del análisis de combustible, ver certificado en Anexo G.

Conforme al Artículo 20 del Anexo Técnico, para el cálculo del Consumo Específico Neto se aplicará el Poder Calorífico Superior.

<sup>2</sup> Unidades de Poder Calorífico fueron transformadas de MJ a kcal utilizando el conversor de unidades de Microsoft Excel.

## 8. CÁLCULOS

### 8.1. Consumo Específico Neto Medido

Durante los 30 minutos de prueba, las unidades representativas registraron los siguientes valores promedio.

|                                      | U3    | U4    | U5    | U6    | U9    | U10   |
|--------------------------------------|-------|-------|-------|-------|-------|-------|
| <b>Consumo de Combustible</b> [kg/h] | 362,0 | 356,0 | 354,0 | 360,0 | 360,0 | 364,0 |
| <b>Potencia Neta Promedio</b> [kW]   | 1.772 | 1.754 | 1.756 | 1.765 | 1.763 | 1.766 |

Tabla 8: Consumo de combustible y Potencia Neta de cada unidad representativa

Luego, es posible calcular el Consumo Específico Neto según la expresión:

$$\text{CEN} : \frac{\text{Consumo de Combustible} * \text{Poder Calorífico Superior}}{\text{Potencia Neta}}$$

En la Tabla 9 se indica este valor y además se incluyen los resultados CEN en unidades alternativas.

| <b>Consumo Neto Medido</b> | U3      | U4      | U5      | U6      | U9      | U10     |
|----------------------------|---------|---------|---------|---------|---------|---------|
| CEN [kg/MWh]               | 204,3   | 203,0   | 201,6   | 204,0   | 204,2   | 206,1   |
| CEN [litros/MWh]           | 245,5   | 243,9   | 242,2   | 241,8   | 245,4   | 247,6   |
| <b>CEN [kcal/kWh]</b>      | 2.235,9 | 2.221,3 | 2.206,2 | 2.232,3 | 2.235,3 | 2.255,2 |

Tabla 9: Resultados de Consumo Específico Neto

### 8.2. Consumo Específico Neto Corregido

#### Condiciones de Referencia

El consumo específico neto determinado en el capítulo anterior debe ser corregido a fin de homologarlo a las condiciones de referencia de la central.

Las condiciones de referencia para las unidades de la Central Quellón II son las siguientes:

| Parámetro                    | Valor | Observación                                      |
|------------------------------|-------|--------------------------------------------------|
| Temperatura Ambiente [°C]    | 10,7  | Condición de Sitio – Promedio Anual <sup>3</sup> |
| Humedad Relativa [%]         | 30,0  | Condición Referencia ISO                         |
| Altitud [msnm]               | 149   | Condición de Sitio <sup>4</sup>                  |
| Factor de Potencia Generador | 0,95  | Condición Anexo Técnico                          |

Tabla 10: Condiciones de referencia para motores de combustión interna según norma ISO 15550

Debido a que el fabricante Cummins no especifica un método de corrección para el consumo específico, se aplican las correcciones indicadas en la norma ISO 3046-1, capítulos 10.3 y 10.4.

Considerando las características del motor: diésel turbo-cargado con enfriamiento del aire de carga a través del sistema de refrigeración líquido del motor, corresponde aplicar la fórmula referencia "D", ver coeficientes y factores en Tabla 11.

| Variable            | Valor | Comentario                                                     |
|---------------------|-------|----------------------------------------------------------------|
| Factor "a"          | 0     | Motores Diésel con enfriamiento de aire de carga               |
| Coeficiente "m"     | 0,7   | Motores Diésel con enfriamiento de aire de carga               |
| Coeficiente "n"     | 1,2   | Motores Diésel con enfriamiento de aire de carga               |
| Coeficiente "s"     | 0     | Aire de carga enfriado por circuito de refrigeración del motor |
| Eficiencia Mecánica | 0,8   | Se asume 0,8 si el fabricante no especifica                    |

Tabla 11: Coeficientes y factores utilizados para la corrección de Consumo Específico, extraídos de la norma ISO 3046-1, Tabla 2.

### Corrección por Factor de Potencia

Durante la prueba, sólo las unidades U3 y U5 operaron con FP distinto de 0,95 por lo cual se aplica corrección, ver detalles en Anexo F.

### Consumo Específico Neto Corregido

A partir de los valores de CEN calculados en el Capítulo 8.1, se aplican las correcciones de la norma ISO 3046-1, según las condiciones ambiente dadas para cada unidad, y se obtiene el CEN corregido según la siguiente expresión.

<sup>3</sup> Temperatura promedio anual del sitio. Fuente: Explorador Solar de la Universidad de Chile.

<sup>4</sup> Altitud del sitio. Fuente: Explorador Solar de la Universidad de Chile.

$$CEN_{\text{corregido}} : \frac{\text{Consumo Combustible}_{\text{corregido}} * PCS}{\text{Potencia Neta}}$$

En la Tabla 12 se indican los resultados y en el Anexo F se detallan las mediciones y cálculos.

| <b>Consumo Corregido</b>             | <b>U3</b> | <b>U4</b> | <b>U5</b> | <b>U6</b> | <b>U9</b> | <b>U10</b> | <b>Promedio</b> |
|--------------------------------------|-----------|-----------|-----------|-----------|-----------|------------|-----------------|
| Consumo Combustible Corregido [kg/h] | 359,3     | 352,3     | 352,0     | 356,6     | 355,3     | 359,0      | 355,8           |
| CEN_corregido [kg/MWh]               | 202,7     | 200,9     | 200,5     | 202,1     | 201,6     | 203,2      | 201,8           |
| CEN_corregido [litros/MWh]           | 243,6     | 241,4     | 240,9     | 239,6     | 242,2     | 244,2      | 242,0           |
| Corrección con respecto a CEN medido | -0,79%    | -1,03%    | -0,53%    | -0,94%    | -1,30%    | -1,37%     | -0,99%          |
| <b>CEN_corregido [kcal/kWh]</b>      | 2.218,2   | 2.198,3   | 2.194,6   | 2.211,3   | 2.206,2   | 2.224,3    | <b>2.208,8</b>  |

Tabla 12: Resultados de CEN corregido

## 9. CONSUMO ESPECÍFICO NETO

Los resultados de Consumo Específico Neto medido y corregido para las unidades representativas de la central Quellón II se indican en la Tabla 13.

|                                          | U3    | U4    | U5    | U6    | U9    | U10   | Unidad     |
|------------------------------------------|-------|-------|-------|-------|-------|-------|------------|
| Consumo Específico Neto Medido           | 362,0 | 356,0 | 354,0 | 360,0 | 360,0 | 364,0 | [kg/h]     |
| <b>Consumo Específico Neto Corregido</b> | 2.218 | 2.198 | 2.195 | 2.211 | 2.206 | 2.224 | [kcal/kWh] |

Tabla 13: Resultados de Consumo Específico Neto en unidades representativas de la Central Quellón II.

Finalmente, el valor de Consumo Específico Neto para la Central Quellón II se puede obtener del promedio de las unidades representativas, este valor se indica en la Tabla 13.

|                                          | Central Quellón II      |
|------------------------------------------|-------------------------|
| <b>Consumo Específico Neto Corregido</b> | <b>2.209 [kcal/kWh]</b> |

Figura 5: Consumo Específico Neto Corregido – Central Quellón II

En el Anexo F se adjuntan las mediciones, cálculos y gráficos.

## 10. ANEXOS

ANEXO A – DATOS DE REFERENCIA

ANEXO B – ACTA DE PRUEBA

ANEXO C – LAYOUT DE LA CENTRAL

ANEXO D – CERTIFICADOS DE CALIBRACIÓN DE LOS INSTRUMENTOS

ANEXO E – ANÁLISIS DE COMBUSTIBLE

ANEXO F – MEDICIONES, CÁLCULOS Y GRÁFICOS

## ANEXO A – DATOS DE REFERENCIA

» Generator set data sheet



**Model:** C2250 D5  
**Frequency:** 50  
**Fuel Type:** Diesel

|                                    |                       |
|------------------------------------|-----------------------|
| Spec sheet:                        | SS17-CPGK             |
| Noise data sheet (Open/enclosed):  | ND50-OSHHP/ND50-CSHHP |
| Airflow data sheet:                | AF50-HHP              |
| Derate data sheet (Open/enclosed): | DD50-OSHHP/DD50-CSHHP |
| Transient data sheet:              | RTF                   |

| Fuel consumption | Standby     |        |        |        | Data Center Continuous |        |        |        |
|------------------|-------------|--------|--------|--------|------------------------|--------|--------|--------|
|                  | kVA (kW)    |        |        |        | kVA (kW)               |        |        |        |
| Ratings          | 2250 (1800) |        |        |        | 2000 (1600)            |        |        |        |
| Load             | 1/4         | 1/2    | 3/4    | Full   | 1/4                    | 1/2    | 3/4    | Full   |
| gph              | 30.3        | 50.4   | 72.0   | 96.0   | 25.1                   | 44.0   | 64.0   | 86.6   |
| L/hr             | 137.70      | 229.40 | 327.80 | 437.00 | 114.00                 | 200.00 | 291.00 | 394.00 |

| Engine                         | Standby rating                                 | Data Center Continuous |
|--------------------------------|------------------------------------------------|------------------------|
| Engine manufacturer            | Cummins                                        |                        |
| Engine model                   | QSK60-G4                                       |                        |
| Configuration                  | Cast Iron, 60° V16 Cylinder                    |                        |
| Aspiration                     | Turbo Charged and Low Temperature After-Cooled |                        |
| Gross engine power output, kWm | 1915                                           | 1730                   |
| BMEP at set rated load, kPa    | 2544                                           | 2296                   |
| Bore, mm                       | 159                                            |                        |
| Stroke, mm                     | 190                                            |                        |
| Rated speed, rpm               | 1500                                           |                        |
| Piston speed, m/s              | 9.5                                            |                        |
| Compression ratio              | 14.5:1                                         |                        |
| Lube oil capacity, L           | Stby - 280 Prime - 397                         |                        |
| Overspeed limit, rpm           | 1850 ±50                                       |                        |
| Regenerative power, kW         | 146                                            |                        |
| Governor type                  | Electronic                                     |                        |
| Starting voltage               | 24V Volts DC                                   |                        |

| Fuel flow                             |      |
|---------------------------------------|------|
| Maximum fuel flow, L/hr               | 1893 |
| Maximum fuel inlet restriction, mm Hg | 120  |
| Maximum fuel inlet temperature (°C)   | 70   |



| Air                                  | Standby rating | Data Center Continuous |
|--------------------------------------|----------------|------------------------|
| Combustion air, m <sup>3</sup> /min  | 144.00         | 136.00                 |
| Maximum air cleaner restriction, kPa | 6.2            |                        |

| Exhaust                                                 |     |     |
|---------------------------------------------------------|-----|-----|
| Exhaust gas flow at set rated load, m <sup>3</sup> /min | 336 | 311 |
| Exhaust gas temperature, °C                             | 450 | 430 |
| Maximum exhaust back pressure, kPa                      | 6.7 |     |

| Standard set-mounted radiator cooling                                 |       |       |
|-----------------------------------------------------------------------|-------|-------|
| Ambient design, °C                                                    | 40    |       |
| Fan load, KW <sub>m</sub>                                             | 33    |       |
| Coolant capacity (with radiator), L                                   | 454   |       |
| Cooling system air flow, m <sup>3</sup> /sec @ 12.7mmH <sub>2</sub> O | 26.4  |       |
| Total heat rejection, BTU/min                                         | 54030 | 48080 |
| Maximum cooling air flow static restriction mmH <sub>2</sub> O        | 0.12  |       |

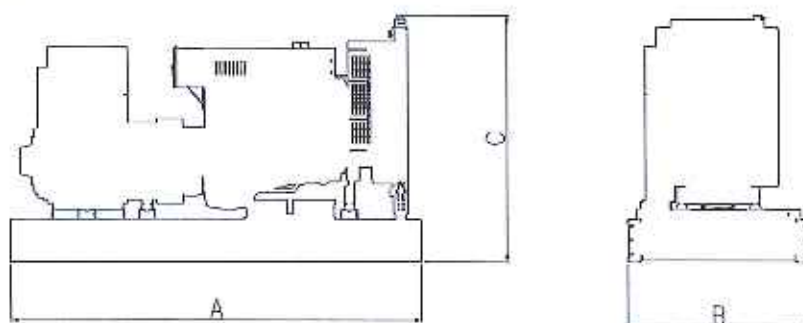
| Weights <sup>A</sup> | Open  | Enclosed |
|----------------------|-------|----------|
| Unit dry weight kgs  | 14863 | N/A      |
| Unit wet weight kgs  | 15510 | N/A      |

<sup>A</sup> Weights represent a set with standard features. See outline drawing for weights of other configurations

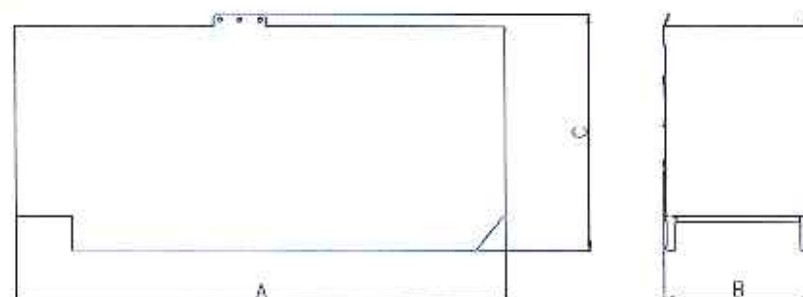
| Dimensions                       | Length | Width | Height |
|----------------------------------|--------|-------|--------|
| Standard open set dimensions     | 6175.1 | 2286  | 2537.2 |
| Enclosed set standard dimensions | N/A    | N/A   | N/A    |

## Genset outline

### Open set



### Enclosed set



Outlines are for illustrative purposes only. Please refer to the genset outline drawing for an exact representation of this model.

### Alternator data

| Connection <sup>1</sup> | Temp rise °C | Duty <sup>2</sup> | Alternator | Voltage  |
|-------------------------|--------------|-------------------|------------|----------|
| Wye, 3 Phase            | 150/125C     | S/P               | LVP7G      | 400-440V |
| Wye, 3 Phase            | 105C         | P                 | HVSI804R1  | 480V     |
|                         |              |                   |            |          |
|                         |              |                   |            |          |
|                         |              |                   |            |          |

### Ratings definitions

| Emergency Standby Power (ESP)                                                                                                                                                                                                                                            | Limited-Time running Power (LTP)                                                                                                                 | Prime Power (PRP)                                                                                                                                                                                                                         | Data Center Continuous Power (COP)                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2769, DIN 6271 and BS 5514. | Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528. | Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2769, DIN 6271 and BS 5514. | Applicable for supplying back-up power for data center applications evaluated at specific site conditions. This rating is based on load profiles and performance requirements consistent with the data center industry. This rating is site specific and changes in application type or location would require further consideration. |

### Formulas for calculating full load currents:

Three phase output

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

Single phase output

$$\frac{\text{kW} \times \text{Single Phase Factor} \times 1000}{\text{Voltage}}$$

See your distributor for more information.

Cummins Power Generation  
 Manston Park, Columbus Avenue  
 Manston, Ramsgate  
 Kent CT12 5BF, UK  
 Telephone: +44 (0) 1843 255000  
 Fax: +44 (0) 1843 255902  
 E-Mail: [cpg.uk@cummins.com](mailto:cpg.uk@cummins.com)  
 Web: [www.cumminspower.com](http://www.cumminspower.com)

### 1.1.3 Información acústica

#### 1.1.3.1 Información acústica (1500 rpm)

TABLE 1. DATOS ACÚSTICOS (1500 RPM)

| Modelo                                                                                                       | C1760 D5      | C2000 D5      | C2000 D5e     | C2200 D5e     | C2250 D5      | C2500 D5A     |
|--------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Motor                                                                                                        | QSK60GS3      | QSK60G3       | QSK60GS3      | QSK60GS3      | QSK60G4       | QSK60G8       |
| Datos acústicos del grupo cerrado – LWA*                                                                     | NO DISPONIBLE | NO DISPONIBLE | NO DISPONIBLE | NO DISPONIBLE | NO DISPONIBLE | NO DISPONIBLE |
| Datos acústicos del grupo abierto – dB(A) a 1m <sup>3</sup> – SPL (o grupo cerrado con las puertas abiertas) | 103,7         | 103,7         | 103,7         | 103,7         | 103,7         | 103,7         |

1. Las cifras con las puertas cerradas se miden a partir de niveles de potencia sonora garantizados por 2000/14/EC  
 2. En base a una carga del 75%  
 3. En base a una carga del 110%  
 De acuerdo con la política de Cummins Power Generation de mejora continua, estas cifras están sujetas a cambios.  
 Para ver las cifras del espectro sonoro, consultar también con un distribuidor autorizado.  
 \*(En base al uso de una cubierta estándar de Cummins y el funcionamiento con las puertas cerradas de un grupo de 50 Hz) <sup>1,2</sup>

#### 1.1.3.2 Información acústica (1800 rpm)

TABLE 2. DATOS ACÚSTICOS (1800 RPM)

| Modelo                                                                                                                                                                          | C2000 D6      | C2250 D6A     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
| Motor                                                                                                                                                                           | QSK60G6       | QSK60G9       |
| Datos acústicos del grupo cerrado – LWA<br>(En base al uso de la cubierta estándar de Cummins y el funcionamiento con las puertas cerradas de un grupo de 60 Hz) <sup>1,2</sup> | NO DISPONIBLE | NO DISPONIBLE |
| Datos acústicos del grupo abierto – dB(A) a 1m <sup>3</sup> – SPL (o grupo cerrado con las puertas abiertas)                                                                    | 105,7         | 105,7         |

1. Las cifras con las puertas cerradas se miden a partir de niveles de potencia sonora garantizados por 2000/14/EC  
 2. En base a una carga del 75%  
 3. En base a una carga del 110%  
 Para ver las cifras del espectro sonoro, consultar también con un distribuidor autorizado.  
 De acuerdo con la política de Cummins Power Generation de mejora continua, estas cifras están sujetas a cambios.

#### 1.1.4 Consumo de combustible del motor (L/hr)

| Modelo | C1760 D5e | C2000 D5 | C2000 D5e | C2200 D5e | C2250 D5 | C2500 D5A |
|--------|-----------|----------|-----------|-----------|----------|-----------|
| Motor  | QSK60GS3  | QSK60G3  | QSK60GS3  | QSK60GS3  | QSK60G4  | QSK60G8   |



|                                                                                                                                                                             |              |     |              |              |     |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----|--------------|--------------|-----|-----|
| Datos de rendimiento del motor a 50 Hz <sup>1</sup>                                                                                                                         | A determinar | 393 | A determinar | A determinar | 437 | 500 |
| 1. Reserva/Carga Total<br>Consultar las hojas de datos para otras aplicaciones. De acuerdo con la política de CPGK de mejora continua, estas cifras están sujetas a cambio. |              |     |              |              |     |     |

|                                                                                                                                                                             |          |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|
| Modelo                                                                                                                                                                      | C2000 D6 | C2250 D6A |
| Motor                                                                                                                                                                       | QSK60G6  | QSK60G9   |
| Datos de rendimiento del motor a 60 Hz <sup>1</sup>                                                                                                                         | 518      | 569       |
| 1. Reserva/Carga Total<br>Consultar las hojas de datos para otras aplicaciones. De acuerdo con la política de CPGK de mejora continua, estas cifras están sujetas a cambio. |          |           |

## ANEXO B – ACTA DE PRUEBA

## TRACTEBEL ENGINEERING S.A.

Cerro Colorado 5240, Of. 1601, Ed. Torre del Parque II,  
Las Condes, Zip Code 7560995 - Santiago - CHILE  
tel. +56 2 2715 8000 - fax +56 2 2715 8001  
engineering-cl@tractebel.engie.com  
tractebel-engie.com

## ACTA DE PRUEBA

Código P012330

RESTRINGIDO

Asunto: Determinación de Consumo Específico en unidad(es) generadora(s)  
Lugar: Central Quellón II, Chiloé  
Fecha: 07/02/19

|                             |                        |
|-----------------------------|------------------------|
| Naves N°                    | 2                      |
| Unidades N°                 | 3, 4, 5 y 6            |
| Equipo de generación        | Cummins C2250 D5       |
| Generador eléctrico         | Stamford               |
| Evento                      | Hora [HH:MM]           |
| Inicio de las actividades   | 10:00 / Fin: 22:45 hrs |
| Inicio de la estabilización | ver tablas unidades    |
| Inicio de la prueba         | ver tablas unidades    |
| Finalización de la prueba   | ver tablas unidades    |
| Lista de asistentes         | Anexo 01               |

### PRINCIPALES EVENTOS OCURRIDOS

- |                                      |                                          |                         |
|--------------------------------------|------------------------------------------|-------------------------|
| 1. Cambio de filtros de succión:     | Sí / <input checked="" type="radio"/> No | Fecha: Unidades nuevas. |
| 2. Cambio de filtros de combustible: | Sí / <input checked="" type="radio"/> No | Fecha:                  |

### OBSERVACIONES

- 1) Medición de potencia bruta efectuada por Tecnet con teclados.
- 2) Pruebas realizadas individualmente, medición de consumo mediante estanque auxiliar y dinamómetro.
- 3) Muestras de combustible tomadas por Intertek desde estanques auxiliares.
- 4) Antes del inicio de las actividades la unidad tuvo que poner por punto en servicio.



1/5

| Hora<br>[HH:MM] | Peso Total<br>[N] Kg | Potencia<br>[kW] | FP   | T <sub>amb</sub><br>[°C] | HR<br>[%] |
|-----------------|----------------------|------------------|------|--------------------------|-----------|
| 12:00           | 610                  | 1.828            | 0,95 | 20,6                     | 45,9      |
| 12:05           | 580                  | 1.826            | 0,95 | 20,1                     | 48,5      |
| 12:10           | 550                  | 1.830            | 0,94 | 20,3                     | 48,4      |
| 12:15           | 519                  | 1.819            | 0,94 | 20,0                     | 45,9      |
| 12:20           | 489                  | 1.814            | 0,94 | <del>20,0</del> 21,1     | 44,6      |
| 12:25           | 459                  | 1.796            | 0,94 | 20,0                     | 44,8      |
| 12:30           | 429                  | 1.784            | 0,95 | 20,6                     | 44,8      |
|                 |                      |                  |      |                          |           |
|                 |                      |                  |      |                          |           |
|                 |                      |                  |      |                          |           |
|                 |                      |                  |      |                          |           |
|                 |                      |                  |      |                          |           |
|                 |                      |                  |      |                          |           |
|                 |                      |                  |      |                          |           |
|                 |                      |                  |      |                          |           |

Nave: 2  
Unidad: 3  
Fecha: 07/02/19

La totalidad de las mediciones registradas durante la prueba serán tabuladas y enviadas en formato digital a más tardar el día: 13/02/19



| Hora<br>[HH:MM] | Peso Total<br>[Kg] | Potencia<br>[KW] | FP   | T <sub>amb</sub><br>[°C] | HR<br>[%] |
|-----------------|--------------------|------------------|------|--------------------------|-----------|
| 10:30           | 637                | 1.824            | 0,96 | 18,5                     | 52,5      |
| 10:35           | 608                | 1.784            | 0,95 | 18,4                     | 54,8      |
| 10:40           | 578                | 1.797            | 0,96 | 17,4                     | 55,9      |
| 10:45           | 549                | 1.792            | 0,95 | 17,7                     | 53,4      |
| 10:50           | 519                | 1.806            | 0,95 | 18,6                     | 52,4      |
| 10:55           | 490                | 1.783            | 0,95 | 18,6                     | 52,4      |
| 11:00           | 460                | 1.784            | 0,96 | 18,2                     | 52,8      |
|                 |                    |                  |      |                          |           |
|                 |                    |                  |      |                          |           |
|                 |                    |                  |      |                          |           |
|                 |                    |                  |      |                          |           |
|                 |                    |                  |      |                          |           |
|                 |                    |                  |      |                          |           |
|                 |                    |                  |      |                          |           |
|                 |                    |                  |      |                          |           |
|                 |                    |                  |      |                          |           |

Nave: 2  
Unidad: 5  
Fecha: 07/02/19

La totalidad de las mediciones registradas durante la prueba serán tabuladas y enviadas en formato digital a más tardar el día: 13/02/19



| Hora<br>[HH:MM] | Peso Total<br>[N] <sup>kg</sup> | Potencia<br>[kW] | FP   | T <sub>amb</sub><br>[°C] | HR<br>[%] |
|-----------------|---------------------------------|------------------|------|--------------------------|-----------|
| 14:30           | 866                             |                  |      | 22,8                     | 38,3      |
| 14:35           | 836                             | 1.801            | 0,95 | 23,0                     | 37,7      |
| 14:40           | 806                             | 1.826            | 0,95 | 23,6                     | 37,1      |
| 14:45           | 776                             | 1.819            | 0,95 | 23,4                     | 37,9      |
| 14:50           | 746                             | 1.826            | 0,95 | 23,3                     | 38,3      |
| 14:55           | 715                             | 1.806            | 0,95 | 22,6                     | 36,5      |
| 15:00           | 686                             | 1.836            | 0,95 | 23,3                     | 33,8      |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |

Nave: 2  
Unidad: 6  
Fecha: 07/02/19

La totalidad de las mediciones registradas durante la prueba serán tabuladas y enviadas en formato digital a más tardar el día: 13/02/19

| Hora<br>[HH:MM] | Peso Total<br>[N] <sup>Kg</sup> | Potencia<br>[kW] | FP   | T <sub>amb</sub><br>[°C] | HR<br>[%] |
|-----------------|---------------------------------|------------------|------|--------------------------|-----------|
| 15:40           | 895                             | 1.775            | 0,95 | 24,7                     | 27,3      |
| 15:45           | 856                             | 1.703            | 0,95 | 23,4                     | 26,8      |
| 15:50           | 826                             | 1.802            | 0,95 | 24,5                     | 25,5      |
| 15:55           | 796                             | 1.792            | 0,95 | 23,4                     | 24,3      |
| 16:00           | 767                             | 1.785            | 0,95 | 24,1                     | 24,8      |
| 16:05           | 737                             | 1.786            | 0,95 | 23,8                     | 24,6      |
| 16:10           | 707                             | 1.797            | 0,95 | 25,1                     | 23,8      |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |
|                 |                                 |                  |      |                          |           |

Nave: 2  
Unidad: 4  
Fecha: 07/02/19

La totalidad de las mediciones registradas durante la prueba serán tabuladas y enviadas en formato digital a más tardar el día: 13/02/19

80

## TRACTEBEL ENGINEERING S.A.

Cerro Colorado 5240, Of. 1601, Ed. Torre del Parque II,  
Las Condes, Zip Code 7560995 - Santiago - CHILE  
tel. +56 2 2715 8000 - fax +56 2 2715 8001  
engineering-cl@tractebel.engie.com  
tractebel-engie.com

## ACTA DE PRUEBA

Código P012330

RESTRINGIDO

Asunto: Determinación de Consumo Específico en unidad(es) generadora(s)  
Lugar: Central Quellón II, Chiloé  
Fecha: 08/02/19

|                             |                      |
|-----------------------------|----------------------|
| Naves N°                    | 1                    |
| Unidades N°                 | 9 y 10               |
| Equipo de generación        | Cummins C2250 D5     |
| Generador eléctrico         | Stamford             |
| Evento                      | Hora [HH:MM]         |
| Inicio de las actividades   | 09:25 / Fin: 19:30   |
| Inicio de la estabilización | ver tablas unidades. |
| Inicio de la prueba         |                      |
| Finalización de la prueba   |                      |
| Lista de asistentes         | Anexo 01             |

### PRINCIPALES EVENTOS OCURRIDOS

1. Cambio de filtros de succión: SI / No
  2. Cambio de filtros de combustible: SI / No
- Fecha: Unidades nuevas.

### OBSERVACIONES

- 1) Medición de potencia bruta efectuada por TECNIT con TCC clase 0.5.
- 2) Pruebas realizadas individualmente, medición de consumo mediante estanque auxiliar y dinamómetro.
- 3) Muestras de combustible tomadas por Interbelle desde estanques auxiliares.





[illegible]

Nave: 1  
Unidad: 9  
Fecha: 08/02/19

Unidad: 9

Fecha: 08/02/19

La totalidad de las mediciones registradas durante la prueba serán tabuladas y enviadas en formato digital a más tardar el día: 13/02/19

| Hora<br>[HH:MM] | Peso Total<br>[N] <i>Kg</i> | Potencia<br>[kW] | FP   | T <sub>amb</sub><br>[°C] | HR<br>[%] |
|-----------------|-----------------------------|------------------|------|--------------------------|-----------|
| 18:00           | 514                         | 1.822            | 0,94 | 28,3                     | 36,5      |
| 18:05           | 484                         | 1.800            | 0,95 | 28,8                     | 33,9      |
| 18:10           | 454                         | 1.814            | 0,95 | 28,5                     | 34,9      |
| 18:15           | 423                         | 1.814            | 0,95 | 28,6                     | 32,2      |
| 18:20           | 393                         | 1.799            | 0,95 | 29,0                     | 36,7      |
| 18:25           | 363                         | 1.804            | 0,94 | 30,0                     | 31,9      |
| 18:30           | 332                         | 1.799            | 0,94 | 30,8                     | 30,5      |
|                 |                             |                  |      |                          |           |
|                 |                             |                  |      |                          |           |
|                 |                             |                  |      |                          |           |
|                 |                             |                  |      |                          |           |
|                 |                             |                  |      |                          |           |
|                 |                             |                  |      |                          |           |
|                 |                             |                  |      |                          |           |
|                 |                             |                  |      |                          |           |

Nave: 1  
Unidad: 10  
Fecha: 08/02/19

La totalidad de las mediciones registradas durante la prueba serán tabuladas y enviadas en formato digital a más tardar el día: 13/02/19

## Anexo 01: Lista de Asistentes

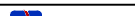
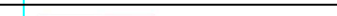


## ANEXO C – LAYOUT DE LA CENTRAL



| LISTADO DE COORDENADAS VERTICES |            |             |
|---------------------------------|------------|-------------|
| VERTICE                         | ESTE       | SUR         |
| V1                              | 612796,798 | 5228077,086 |
| V2                              | 612771,730 | 5228046,431 |
| V3                              | 612758,571 | 5228057,192 |
| V4                              | 612783,639 | 5228087,850 |
| V5                              | 612756,357 | 5228102,665 |
| V6                              | 612769,516 | 5228091,904 |
| V7                              | 612751,538 | 5228069,918 |
| V8                              | 612738,378 | 5228080,679 |

| SIMBOLOGÍA                                                                            |                      |
|---------------------------------------------------------------------------------------|----------------------|
|  | GENERADOR PROYECTADA |
|  | SPLITER              |
|  | SALIDA AIRE          |

|    |        |                                             |  |  |        |                                                                                                                                                                 |        |                                       |                    |                                                                                                  |                  |                   |                 |               |          |
|----|--------|---------------------------------------------|--|--|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------------------------------|--------------------|--------------------------------------------------------------------------------------------------|------------------|-------------------|-----------------|---------------|----------|
|    |        |                                             |  |  |        | <div><div></div><div>PROYECTO<br/>CENTRAL TERMICA QUELLON 18MW</div></div> |        |                                       |                    | <div></div> |                  |                   |                 |               |          |
|    |        |                                             |  |  |        | OBRA                                                                                                                                                            |        | DETALLE                               |                    |                                                                                                  |                  |                   |                 |               |          |
|    |        |                                             |  |  |        | CENTRAL QUELLON                                                                                                                                                 |        | DISPOSICIÓN GENERAL EQUIPOS DE PLANTA |                    |                                                                                                  |                  |                   |                 |               |          |
| 0  | MAR-18 | APROBADO PARA CONSTRUCCIÓN                  |  |  | M.Q.N. | R.A.L.                                                                                                                                                          | H.B.F. |                                       |                    |                                                                                                  |                  |                   |                 |               |          |
| A  | DIC-17 | EMITIDO PARA REVISIÓN Y COMENTARIOS INTERNO |  |  | IMELSA | R.A.L.                                                                                                                                                          | H.B.F. |                                       |                    |                                                                                                  |                  |                   |                 |               |          |
| N° | FECHA  | MODIFICACIONES                              |  |  | EJEC   | REV                                                                                                                                                             | APR    | DIBUJO<br>L.P.C.                      | PROYECTO<br>L.P.C. | CONTROLO<br>R.A.L.                                                                               | APROBO<br>H.B.F. | FECHA<br>DIC-2017 | ESCALA<br>1/500 | LAMINA<br>1/1 | REV<br>0 |

## ANEXO D – CERTIFICADOS DE CALIBRACIÓN DE LOS INSTRUMENTOS

**INFORME DE ENSAYO**

**CERTIFICADO DE COMPROBACIÓN DE EXACTITUD DE MEDIDOR.**

Tecnet S. A., Organismo de Comprobación de Exactitud de Medidores de Energía Eléctrica, según resoluciones exentas SEC N° 219 del 19 de Febrero de 2001.

**Certificado N° CVM-TD02078-18-10**

**1. ANTECEDENTES DEL CLIENTE.**

|                      |                    |
|----------------------|--------------------|
| Razón Social         | IMELSA S.A.        |
| Dirección            | Avda España N° 795 |
| Ciudad               | Santiago           |
| N° Orden             | 12908              |
| N° / Fecha Solicitud | 11.06.2018         |

**2. CARACTERÍSTICAS MEDIDOR DE ENERGÍA.**

|                          |                                |
|--------------------------|--------------------------------|
| Marca                    | Schneider Electric             |
| Modelo                   | ION7650                        |
| N° de Serie              | MJ-1701A878-05                 |
| Tensión Nominal          | 3 x 57 - 347 [V] L-N           |
| Corriente                | 3 x 5 (20) [A]                 |
| Frecuencia               | 50 Hz.                         |
| Constante                | 1.8 Wh/Imp                     |
| Año Fabricación          | 2017                           |
| Clase Exactitud Activo   | ± 0,2 S                        |
| Clase Exactitud Reactivo | ± 2.0                          |
| Constante Lectura        | 1                              |
| Lectura Dejada Activo    | 000000,000 [Kwh]               |
| Lectura Dejada Reactivo  | 000000,000 [Kvarh]             |
| Estado                   | Medidor instalado y alambrado. |

**3. OBSERVACIONES.**

El equipo patrón utilizado cuenta con su Certificado de Calibración vigente y ha sido calibrado y trazado al Sistema Internacional de Unidades (SI).

Este certificado sólo puede ser difundido íntegro y sin modificaciones ni enmiendas.

Este certificado es válido sólo con firma y timbre.

Medidor se entrega con logo y sello TECNET.

Responsables de las pruebas de comprobación:

Av. Las Parcelas 5490  
Estación Central  
Santiago, Chile  
Tel.: (56-2) 770 2801  
Tel.: (56-2) 770 2815  
www.tecnet.cl



Adolfo Rojas Cabrera  
9.742.703-8

30.05.2018  
Fecha



Timbre  
Página 1 de 3

#### 4. CONDICIONES DE LA COMPROBACIÓN DE EXACTITUD.

##### 4.1. LUGAR DE ENSAYO.

|                        |                            |
|------------------------|----------------------------|
| Lugar                  | Central Termica Quellon II |
| Fecha ejecución        | 30.05.2018                 |
| Realizó                | Adolfo Rojas C.            |
| Procedimiento aplicado | PR-GM-17, IN-GM-04         |

##### 4.2. CARACTERÍSTICAS PATRÓN.

|          |               |
|----------|---------------|
| Marca    | MTE           |
| Modelo   | PTS 3,3C      |
| Clase    | $\pm 0,05 \%$ |
| N° serie | 35115         |

##### 4.3. CONDICIÓN DE MEDIDA.

|                        |          |
|------------------------|----------|
| Tipo de Medida         | Directa  |
| Temperatura            | Ambiente |
| Humedad                | Ambiente |
| Voltaje Nominal (Vn)   | 220 [V]  |
| Corriente Nominal (In) | 5 (A)    |
| Frecuencia             | 50 Hz    |

##### 4.4. TRATAMIENTO SELLOS MEDIDOR.

|          | Encontrados.         | Dejados.                     |
|----------|----------------------|------------------------------|
| Cubierta | 81708<br>(Hermetico) | Tecnet 164606<br>(Hermetico) |

##### 4.5. PRUEBAS DE COMPROBACIÓN EXACTITUD.

La interpretación de los resultados de las pruebas se realizaron tomando como referencia los requisitos establecidos en las normas técnicas de medidores vigentes.

El error relativo calculado está referido a la energía activa o reactiva, según corresponda.

A continuación se presentan los resultados de las pruebas realizadas para comprobar la exactitud del medidor de energía indentificado en punto 2.

Av. Las Parcelas 5490  
Estación Central  
Santiago, Chile  
Tel.: (56-2) 770 2801  
Tel.: (56-2) 770 2815  
www.tecnet.cl



Timbre  
Página 2 de 3



#### 4.5.1. TABLA ERRORES MODO ENERGÍA ACTIVA.

| PRUEBAS TRIFÁSICAS A VOLTAJE NOMINAL |         |     |              |       |              |        |                |
|--------------------------------------|---------|-----|--------------|-------|--------------|--------|----------------|
| Elemento                             | Carga % | FP  | Error %      |       |              |        | Límite Norma % |
|                                      |         |     | Modo Directo |       | Modo Inverso |        |                |
|                                      |         |     | Inicial      | Final | Inicial      | Final  |                |
| 1-2-3                                | 100     | 1   | 0,022        | 0,022 | 0,023        | 0,023  | ± 0,2          |
| 1-2-3                                | 100     | 0,5 | 0,056        | 0,056 | -0,008       | -0,008 | ± 0,3          |
| 1-2-3                                | 10      | 1   | 0,018        | 0,018 | 0,017        | 0,017  | ± 0,2          |
| 1-2-3                                | 10      | 0,5 | 0,065        | 0,065 | 0,067        | 0,067  | ± 0,3          |

| PRUEBAS POR ELEMENTO A VOLTAJE NOMINAL |         |     |              |       |              |        |                |
|----------------------------------------|---------|-----|--------------|-------|--------------|--------|----------------|
| Elemento                               | Carga % | FP  | Error %      |       |              |        | Límite Norma % |
|                                        |         |     | Modo Directo |       | Modo Inverso |        |                |
|                                        |         |     | Inicial      | Final | Inicial      | Final  |                |
| 1                                      | 100     | 1   | 0,006        | 0,006 | 0,008        | 0,008  | ± 0,3          |
| 2                                      | 100     | 1   | 0,023        | 0,023 | 0,026        | 0,026  | ± 0,3          |
| 3                                      | 100     | 1   | 0,043        | 0,043 | 0,044        | 0,044  | ± 0,3          |
| 1                                      | 100     | 0,5 | 0,035        | 0,035 | -0,011       | -0,011 | ± 0,4          |
| 2                                      | 100     | 0,5 | 0,053        | 0,053 | 0,004        | 0,004  | ± 0,4          |
| 3                                      | 100     | 0,5 | 0,093        | 0,093 | -0,015       | -0,015 | ± 0,4          |

#### 4.5.2. TABLA ERRORES CON ENERGÍA REACTIVA.

| PRUEBAS TRIFÁSICAS Y POR ELEMENTOS A VOLTAJE NOMINAL |         |     |              |        |              |        |                |
|------------------------------------------------------|---------|-----|--------------|--------|--------------|--------|----------------|
| Elemento                                             | Carga % | FP  | Error %      |        |              |        | Límite Norma % |
|                                                      |         |     | Modo Directo |        | Modo Inverso |        |                |
|                                                      |         |     | Inicial      | Final  | Inicial      | Final  |                |
| 1-2-3                                                | 100     | 1   | 0,016        | 0,016  | 0,016        | 0,016  | ± 2,0          |
| 1-2-3                                                | 100     | 0,5 | 0,012        | 0,012  | -0,016       | -0,016 | ± 2,0          |
| 1-2-3                                                | 10      | 1   | -0,022       | -0,022 | 0,013        | 0,013  | ± 2,0          |
| 1-2-3                                                | 10      | 0,5 | -0,038       | -0,038 | -0,034       | -0,034 | ± 2,0          |
| 1                                                    | 100     | 1   | 0,017        | 0,017  | 0,022        | 0,022  | ± 3,0          |
| 2                                                    | 100     | 1   | 0,000        | 0,000  | 0,003        | 0,003  | ± 3,0          |
| 3                                                    | 100     | 1   | 0,026        | 0,026  | 0,031        | 0,031  | ± 3,0          |
| 1                                                    | 100     | 0,5 | 0,010        | 0,010  | -0,011       | -0,011 | ± 3,0          |
| 2                                                    | 100     | 0,5 | -0,049       | -0,049 | -0,044       | -0,044 | ± 3,0          |
| 3                                                    | 100     | 0,5 | 0,009        | 0,009  | 0,015        | 0,015  | ± 3,0          |

#### 4.6. PRUEBA DE ARRANQUE.

No efectuada.

#### 4.7. PRUEBA DE MARCHA EN VACÍO.

No efectuada.

#### 5. CONCLUSIONES.

Tecnet S.A. certifica la exactitud de la medida del medidor de energía sujeto a pruebas, según los errores indicados en este Informe de Ensayo.

El medidor en su módulo Activo, Cumple con los límites de exactitud especificados para su clase, según lo establecido en la norma IEC 62053-22 :2003.

El medidor en su módulo Reactivo, Cumple con los límites de exactitud especificados para su clase, según lo establecido en la norma IEC 62053-23 :2003.

Av. Las Parcelas 5490  
Estación Central  
Santiago, Chile  
Tel.: (56-2) 770 2801  
Tel.: (56-2) 770 2815  
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Timbre  
Página 3 de 3

**INFORME DE ENSAYO****CERTIFICADO DE COMPROBACIÓN DE EXACTITUD DE MEDIDOR.**

Tecnet S. A., Organismo de Comprobación de Exactitud de Medidores de Energía Eléctrica, según resoluciones exentas SEC N° 219 del 19 de Febrero de 2001.

**Certificado N° CVM-TD02004-16-05**

**1. ANTECEDENTES DEL CLIENTE.**

|                      |                                        |
|----------------------|----------------------------------------|
| Razón Social         | Tecnet S.A.                            |
| Dirección            | Av Las Parcelas #5490 Estacion Central |
| Ciudad               | Santiago                               |
| N° Orden             | Sin Datos                              |
| N° / Fecha Solicitud | Sin Datos                              |

**2. CARACTERÍSTICAS MEDIDOR DE ENERGÍA.**

|                          |                      |
|--------------------------|----------------------|
| Marca                    | Schneider Electric   |
| Modelo                   | ION 8650             |
| N° de Serie              | MW-1404A042-01       |
| Tensión Nominal          | 3 x 57 - 277 [V] L-N |
| Corriente                | 3 x 5 (20) [A]       |
| Frecuencia               | 50 Hz.               |
| Constante                | 1.8 Wh/Imp           |
| Año Fabricación          | 2014                 |
| Clase Exactitud Activo   | $\pm 0,2$ S          |
| Clase Exactitud Reactivo | $\pm 2.0$            |
| Constante Lectura        | 1                    |
| Lectura Dejada Activo    | 0.000 [Kwh]          |
| Lectura Dejada Reactivo  | 0.000 [Kvarh]        |
| Estado                   | Medidor en servicio. |

**3. OBSERVACIONES.**

El equipo patrón utilizado cuenta con su Certificado de Calibración vigente y ha sido calibrado y trazado al Sistema Internacional de Unidades (SI).

Este certificado sólo puede ser difundido íntegro y sin modificaciones ni enmiendas.

Este certificado es válido sólo con firma y timbre.

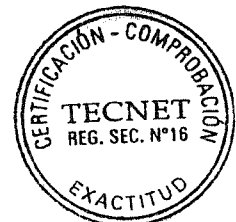
Medidor se entrega con logo y sello TECNET.

Responsables de las pruebas de comprobación:

Av. Las Parcelas 5490  
Estación Central  
Santiago, Chile  
Tel.: (56-2) 770 2801  
Tel.: (56-2) 770 2815  
www.tecnet.cl

Jaime Cisternas R  
15.172.328-4

18/10/2018  
Fecha



Timbre  
Página 1 de 3

#### 4. CONDICIONES DE LA COMPROBACIÓN DE EXACTITUD.

##### 4.1. LUGAR DE ENSAYO.

|                        |                            |
|------------------------|----------------------------|
| Lugar                  | Laboratorio TYD Concepcion |
| Fecha ejecución        | 18.10.2017                 |
| Realizó                | Jaime Cisternas R          |
| Procedimiento aplicado | PR-GM-17, IN-GM-04         |

##### 4.2. CARACTERÍSTICAS PATRÓN.

|          |               |
|----------|---------------|
| Marca    | MTE           |
| Modelo   | PTS 3,3       |
| Clase    | $\pm 0,05 \%$ |
| N° serie | 28680         |

##### 4.3. CONDICIÓN DE MEDIDA.

|                        |          |
|------------------------|----------|
| Tipo de Medida         | Directa  |
| Temperatura            | Ambiente |
| Humedad                | Ambiente |
| Voltaje Nominal (Vn)   | 69 [V]   |
| Corriente Nominal (In) | 5 (A)    |
| Frecuencia             | 50 Hz    |

##### 4.4. TRATAMIENTO SELLOS MEDIDOR.

|          |              |           |
|----------|--------------|-----------|
|          | Encontrados. | Dejados.  |
| Cubierta | Sin Sello    | Sin Sello |

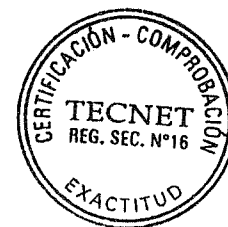
##### 4.5. PRUEBAS DE COMPROBACIÓN EXACTITUD.

La interpretación de los resultados de las pruebas se realizaron tomando como referencia los requisitos establecidos en las normas técnicas de medidores vigentes.

El error relativo calculado está referido a la energía activa o reactiva, según corresponda.

A continuación se presentan los resultados de las pruebas realizadas para comprobar la exactitud del medidor de energía indentificado en punto 2.

Av. Las Parcelas 5490  
Estación Central  
Santiago, Chile  
Tel.: (56-2) 770 2801  
Tel.: (56-2) 770 2815  
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Timbre  
Página 2 de 3

#### 4.5.1. TABLA ERRORES MODO ENERGÍA ACTIVA.

| PRUEBAS TRIFÁSICAS A VOLTAJE NOMINAL |         |     |              |       |              |        |                |
|--------------------------------------|---------|-----|--------------|-------|--------------|--------|----------------|
| Elemento                             | Carga % | FP  | Error %      |       |              |        | Limite Norma % |
|                                      |         |     | Modo Directo |       | Modo Inverso |        |                |
|                                      |         |     | Inicial      | Final | Inicial      | Final  |                |
| 1-2-3                                | 100     | 1   | 0.053        | 0.053 | 0.038        | 0.038  | ± 0.2          |
| 1-2-3                                | 100     | 0.5 | 0.072        | 0.072 | -0.004       | -0.004 | ± 0.3          |
| 1-2-3                                | 10      | 1   | 0.074        | 0.074 | 0.047        | 0.047  | ± 0.2          |
| 1-2-3                                | 10      | 0.5 | 0.062        | 0.062 | 0.009        | 0.009  | ± 0.3          |

| PRUEBAS POR ELEMENTO A VOLTAJE NOMINAL |         |     |              |       |              |        |                |
|----------------------------------------|---------|-----|--------------|-------|--------------|--------|----------------|
| Elemento                               | Carga % | FP  | Error %      |       |              |        | Limite Norma % |
|                                        |         |     | Modo Directo |       | Modo Inverso |        |                |
|                                        |         |     | Inicial      | Final | Inicial      | Final  |                |
| 1                                      | 100     | 1   | 0.072        | 0.072 | 0.028        | 0.028  | ± 0.3          |
| 2                                      | 100     | 1   | 0.098        | 0.098 | 0.074        | 0.074  | ± 0.3          |
| 3                                      | 100     | 1   | 0.012        | 0.012 | -0.042       | -0.042 | ± 0.3          |
| 1                                      | 100     | 0.5 | 0.094        | 0.094 | 0.050        | 0.050  | ± 0.4          |
| 2                                      | 100     | 0.5 | 0.088        | 0.088 | 0.064        | 0.064  | ± 0.4          |
| 3                                      | 100     | 0.5 | 0.008        | 0.008 | 0.082        | 0.082  | ± 0.4          |

#### 4.5.2. TABLA ERRORES CON ENERGÍA REACTIVA.

| PRUEBAS TRIFÁSICAS Y POR ELEMENTOS A VOLTAJE NOMINAL |         |     |              |        |              |        |                |
|------------------------------------------------------|---------|-----|--------------|--------|--------------|--------|----------------|
| Elemento                                             | Carga % | FP  | Error %      |        |              |        | Límite Norma % |
|                                                      |         |     | Modo Directo |        | Modo Inverso |        |                |
|                                                      |         |     | Inicial      | Final  | Inicial      | Final  |                |
| 1-2-3                                                | 100     | 1   | 0.066        | 0.066  | 0.000        | 0.000  | ± 2,0          |
| 1-2-3                                                | 100     | 0.5 | 0.022        | 0.022  | 0.040        | 0.040  | ± 2,0          |
| 1-2-3                                                | 10      | 1   | 0.037        | 0.037  | 0.018        | 0.018  | ± 2,0          |
| 1-2-3                                                | 10      | 0.5 | 0.023        | 0.023  | 0.029        | 0.029  | ± 2,5          |
| 1                                                    | 100     | 1   | 0.032        | 0.032  | 0.052        | 0.052  | ± 3,0          |
| 2                                                    | 100     | 1   | 0.048        | 0.048  | 0.062        | 0.062  | ± 3,0          |
| 3                                                    | 100     | 1   | -0.040       | -0.040 | 0.068        | 0.068  | ± 3,0          |
| 1                                                    | 100     | 0.5 | -0.026       | -0.026 | -0.002       | -0.002 | ± 3,0          |
| 2                                                    | 100     | 0.5 | 0.056        | 0.056  | 0.038        | 0.038  | ± 3,0          |
| 3                                                    | 100     | 0.5 | -0.018       | -0.018 | -0.034       | -0.034 | ± 3,0          |

#### 4.6. PRUEBA DE ARRANQUE.

No efectuada.

#### 4.7. PRUEBA DE MARCHA EN VACÍO.

No efectuada.

#### 5. CONCLUSIONES.

Tecnet S.A. certifica la exactitud de la medida del medidor de energía sujeto a pruebas, según los errores indicados en este Informe de Ensayo.

El medidor en su módulo Activo, Cumple con los límites de exactitud especificados para su clase, según lo establecido en la norma IEC 62053-22 :2003.

El medidor en su módulo Reactivo, Cumple con los límites de exactitud especificados para su clase, según lo establecido en la norma IEC 62053-23 :2003.



## INFORME DE ENSAYO

### CERTIFICADO DE COMPROBACIÓN DE EXACTITUD DE MEDIDOR.

Tecnet S. A., Organismo de Comprobación de Exactitud de Medidores de Energía Eléctrica, según resoluciones exentas SEC N° 219 del 19 de Febrero de 2001.

Certificado N° CVM-TD02005-16-05

#### 1. ANTECEDENTES DEL CLIENTE.

|                      |                                        |
|----------------------|----------------------------------------|
| Razón Social         | Tecnet S.A.                            |
| Dirección            | Av Las Parcelas #5490 Estacion Central |
| Ciudad               | Santiago                               |
| N° Orden             | Sin Datos                              |
| N° / Fecha Solicitud | Sin Datos                              |

#### 2. CARACTERÍSTICAS MEDIDOR DE ENERGÍA.

|                          |                      |
|--------------------------|----------------------|
| Marca                    | Schneider Electric   |
| Modelo                   | ION 8600             |
| N° de Serie              | PT-0901A368-01       |
| Tensión Nominal          | 3 x 57 - 277 [V] L-N |
| Corriente                | 3 x 5 (20) [A]       |
| Frecuencia               | 50 Hz.               |
| Constante                | 1.8 Wh/Imp           |
| Año Fabricación          | 2009                 |
| Clase Exactitud Activo   | ± 0,2 S              |
| Clase Exactitud Reactivo | ± 2.0                |
| Constante Lectura        | 1                    |
| Lectura Dejada Activo    | 0.000 [Kwh]          |
| Lectura Dejada Reactivo  | 0.000 [Kvarh]        |
| Estado                   | Medidor en servicio. |

#### 3. OBSERVACIONES.

El equipo patrón utilizado cuenta con su Certificado de Calibración vigente y ha sido calibrado y trazado al Sistema Internacional de Unidades (SI).

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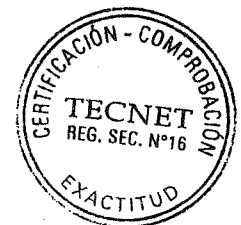
Medidor se entrega con logo y sello TECNET.

Responsables de las pruebas de comprobación:

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Jaime Cisternas R  
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18/10/2018  
Fecha



Timbre  
Página 1 de 3

#### 4. CONDICIONES DE LA COMPROBACIÓN DE EXACTITUD.

##### 4.1. LUGAR DE ENSAYO.

|                        |                            |
|------------------------|----------------------------|
| Lugar                  | Laboratorio TYD Concepcion |
| Fecha ejecución        | 18.10.2017                 |
| Realizó                | Jaime Cisternas R          |
| Procedimiento aplicado | PR-GM-17, IN-GM-04         |

##### 4.2. CARACTERÍSTICAS PATRÓN.

|          |               |
|----------|---------------|
| Marca    | MTE           |
| Modelo   | PTS 3,3       |
| Clase    | $\pm 0,05 \%$ |
| N° serie | 28680         |

##### 4.3. CONDICIÓN DE MEDIDA.

|                        |          |
|------------------------|----------|
| Tipo de Medida         | Directa  |
| Temperatura            | Ambiente |
| Humedad                | Ambiente |
| Voltaje Nominal (Vn)   | 69 [V]   |
| Corriente Nominal (In) | 5 (A)    |
| Frecuencia             | 50 Hz    |

##### 4.4. TRATAMIENTO SELLOS MEDIDOR.

|          | Encontrados. | Dejados.  |
|----------|--------------|-----------|
| Cubierta | Sin Sello    | Sin Sello |

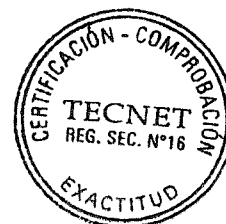
##### 4.5. PRUEBAS DE COMPROBACIÓN EXACTITUD.

La interpretación de los resultados de las pruebas se realizaron tomando como referencia los requisitos establecidos en las normas técnicas de medidores vigentes.

El error relativo calculado está referido a la energía activa o reactiva, según corresponda.

A continuación se presentan los resultados de las pruebas realizadas para comprobar la exactitud del medidor de energía indentificado en punto 2.

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Timbre  
Página 2 de 3



#### 4.5.1. TABLA ERRORES MODO ENERGÍA ACTIVA.

| PRUEBAS TRIFÁSICAS A VOLTAJE NOMINAL |         |     |              |        |              |        |                |
|--------------------------------------|---------|-----|--------------|--------|--------------|--------|----------------|
| Elemento                             | Carga % | FP  | Error %      |        |              |        | Limite Norma % |
|                                      |         |     | Modo Directo |        | Modo Inverso |        |                |
|                                      |         |     | Inicial      | Final  | Inicial      | Final  |                |
| 1-2-3                                | 100     | 1   | -0.064       | -0.064 | -0.078       | -0.078 | ± 0.2          |
| 1-2-3                                | 100     | 0.5 | -0.054       | -0.054 | -0.090       | -0.090 | ± 0.3          |
| 1-2-3                                | 10      | 1   | -0.088       | -0.088 | -0.083       | -0.083 | ± 0.2          |
| 1-2-3                                | 10      | 0.5 | -0.083       | -0.083 | -0.082       | -0.082 | ± 0.3          |

| PRUEBAS POR ELEMENTO A VOLTAJE NOMINAL |         |     |              |        |              |        |                |
|----------------------------------------|---------|-----|--------------|--------|--------------|--------|----------------|
| Elemento                               | Carga % | FP  | Error %      |        |              |        | Límite Norma % |
|                                        |         |     | Modo Directo |        | Modo Inverso |        |                |
|                                        |         |     | Inicial      | Final  | Inicial      | Final  |                |
| 1                                      | 100     | 1   | -0.064       | -0.064 | -0.052       | -0.052 | ± 0.3          |
| 2                                      | 100     | 1   | -0.052       | -0.052 | -0.076       | -0.076 | ± 0.3          |
| 3                                      | 100     | 1   | -0.086       | -0.086 | -0.072       | -0.072 | ± 0.3          |
| 1                                      | 100     | 0.5 | -0.066       | -0.066 | -0.084       | -0.084 | ± 0.4          |
| 2                                      | 100     | 0.5 | -0.016       | -0.016 | 0.002        | 0.002  | ± 0.4          |
| 3                                      | 100     | 0.5 | -0.022       | -0.022 | 0.008        | 0.008  | ± 0.4          |

#### 4.5.2. TABLA ERRORES CON ENERGÍA REACTIVA.

| PRUEBAS TRIFASICAS Y POR ELEMENTOS A VOLTAJE NOMINAL |         |     |              |        |              |        |                |
|------------------------------------------------------|---------|-----|--------------|--------|--------------|--------|----------------|
| Elemento                                             | Carga % | FP  | Error %      |        |              |        | Límite Norma % |
|                                                      |         |     | Modo Directo |        | Modo Inverso |        |                |
|                                                      |         |     | Inicial      | Final  | Inicial      | Final  |                |
| 1-2-3                                                | 100     | 1   | -0.080       | -0.080 | -0.054       | -0.054 | ± 2,0          |
| 1-2-3                                                | 100     | 0.5 | -0.052       | -0.052 | -0.074       | -0.074 | ± 2,0          |
| 1-2-3                                                | 10      | 1   | -0.094       | -0.094 | -0.091       | -0.091 | ± 2,0          |
| 1-2-3                                                | 10      | 0.5 | -0.081       | -0.081 | -0.072       | -0.072 | ± 2,5          |
| 1                                                    | 100     | 1   | -0.068       | -0.068 | -0.090       | -0.090 | ± 3,0          |
| 2                                                    | 100     | 1   | -0.044       | -0.044 | -0.054       | -0.054 | ± 3,0          |
| 3                                                    | 100     | 1   | -0.076       | -0.076 | -0.024       | -0.024 | ± 3,0          |
| 1                                                    | 100     | 0.5 | -0.002       | -0.002 | -0.076       | -0.076 | ± 3,0          |
| 2                                                    | 100     | 0.5 | 0.010        | 0.010  | -0.026       | -0.026 | ± 3,0          |
| 3                                                    | 100     | 0.5 | -0.090       | -0.090 | -0.026       | -0.026 | ± 3,0          |

#### 4.6. PRUEBA DE ARRANQUE.

No efectuada.

#### 4.7. PRUEBA DE MARCHA EN VACÍO.

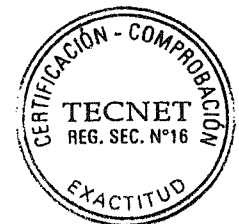
No efectuada.

#### 5. CONCLUSIONES.

Tecnet S.A. certifica la exactitud de la medida del medidor de energía sujeto a pruebas, según los errores indicados en este Informe de Ensayo.

El medidor en su módulo Activo, Cumple con los límites de exactitud especificados para su clase, según lo establecido en la norma IEC 62053-22 :2003.

El medidor en su módulo Reactivo, Cumple con los límites de exactitud especificados para su clase, según lo establecido en la norma IEC 62053-23 :2003.



## Medidor Temperatura y Humedad Ambiente



### CERTIFICADO DE CALIBRACION LABC-TE-977

Laboratorio de calibración - Magnitud Temperatura



SISTEMA NACIONAL  
DE ACREDITACION

Acreditación LC 105

Guía de Laboratorio: 26239

F-LABC-25 (Rev. 01)

Fecha de Emisión: 09-05-2018

#### IDENTIFICACION DEL CLIENTE

Nombre : IMELSA S.A.  
Dirección : Av. España # 795 - Santiago Centro, Santiago

#### IDENTIFICACION DEL ÍTEM

Descripción : Termohigrómetro  
Marca o fabricante : FLUKE  
Modelo : 971  
N° de serie : Sin información  
Id. del cliente : Sin información  
Rango : -20 a 60 °C  
Mínima División de escala : 0,1 °C

#### CONDICIONES DE CALIBRACION

Fecha de calibración : 04-05-2018  
Etiqueta de calibración : 12148  
Procedimiento de referencia : P-LABC-13  
Lugar de calibración : Laboratorio de calibración Veto y Cía. Ltda.

#### CONDICIONES AMBIENTALES

Temperatura : (22 ± 2) °C  
Humedad relativa : (54 ± 9) %HR

#### PATRON UTILIZADO

Descripción : Indicador digital / Sensor  
Marca : Vaisala  
Modelo : MI70 / HMP77B  
N° de serie : N1940016 / N2130593  
Código interno : HU-PR-04 / HU-PR-05

#### TRAZABILIDAD DE LA CALIBRACION

Laboratorio emisor : Veto y Cía. Ltda.  
N° de certificado : LABC-TE-579  
Fecha de vencimiento : Octubre 2018

  
Nicol Ortiz Acevedo  
Técnico

Sello del Laboratorio

  
Hernán Ramírez Villegas  
Jefe de Laboratorio

**RESULTADOS**

| Indicación Patrón | Indicación Ítem | Error de medición | Incertidumbre expandida |
|-------------------|-----------------|-------------------|-------------------------|
| °C                | °C              | °C                | °C                      |
| 10,3              | 9,8             | -0,5              | 0,9                     |
| 25,1              | 24,8            | -0,3              | 0,9                     |
| 40,2              | 40,1            | -0,1              | 0,9                     |

El factor de cobertura utilizado en la estimación de la Incertidumbre es de  $k=2$  correspondiente a un nivel de confianza del 95%.

Los patrones utilizados en la calibración cuentan con trazabilidad a patrones nacionales, los que a su vez están referidos a patrones primarios los cuales materializan las unidades del Sistema Internacional de Unidades (SI).

Los resultados de la calibración están referidos al momento y condiciones en las cuales fueron efectuadas las mediciones, y están relacionados solo con el ítem calibrado.

El cliente es responsable de calibrar el instrumento a intervalos que estime apropiados.

Este certificado no puede ser reproducido en forma parcial o total sin la autorización del laboratorio.

**FIN DEL CERTIFICADO DE CALIBRACIÓN**



**IDENTIFICACION DEL CLIENTE**

Nombre : IMELSA S.A.  
Dirección : Av. España # 795 - Santiago Centro, Santiago

**IDENTIFICACION DEL ÍTEM**

Descripción : Termohigrómetro  
Marca o fabricante : FLUKE  
Modelo : 971  
N° de serie : Sin información  
Id. del cliente : Sin información  
Rango : 5 a 95 %HR  
Mínima División de escala : 0,1 %HR

**CONDICIONES DE CALIBRACION**

Fecha de calibración : 08-05-2018  
Etiqueta de calibración : 12149  
Procedimiento de referencia : P-LABC-15  
Lugar de calibración : Laboratorio de calibración Veto y Cía. Ltda.

**CONDICIONES AMBIENTALES**

Temperatura :  $(22 \pm 1) ^\circ\text{C}$   
Humedad relativa :  $(53 \pm 5) \% \text{HR}$

**PATRON UTILIZADO**

Descripción : Indicador digital / Sensor  
Marca : Vaisala  
Modelo : MI70 / HMP77B  
N° de serie : N1940016 / N2130593  
Código Interno : HU-PR-04 / HU-PR-05

**TRAZABILIDAD DE LA CALIBRACION**

Laboratorio emisor : Veto y Cía. Ltda.  
N° de certificado : H33-17210107  
Fecha de vencimiento : Mayo 2019

  
Nicol Ortiz Acevedo  
Técnico

Sello del Laboratorio

  
Hernán Ramírez Villegas  
Jefe de Laboratorio

**RESULTADOS**

| Indicación Patrón | Indicación Ítem | Error de medición | Incertidumbre expandida |
|-------------------|-----------------|-------------------|-------------------------|
| %HR               | %HR             | %HR               | %HR                     |
| 30,7              | 31,6            | 0,9               | 3,5                     |
| 51,7              | 53,7            | 2,0               | 3,5                     |
| 70,4              | 72,8            | 2,4               | 3,5                     |

El factor de cobertura utilizado en la estimación de la incertidumbre es de  $k=2$  correspondiente a un nivel de confianza del 95%.

Los patrones utilizados en la calibración cuentan con trazabilidad a patrones nacionales, los que a su vez están referidos a patrones primarios los cuales materializan las unidades del Sistema Internacional de Unidades (SI).

Los resultados de la calibración están referidos al momento y condiciones en las cuales fueron efectuadas las mediciones, y están relacionados solo con el ítem calibrado.

El cliente es responsable de calibrar el instrumento a intervalos que estime apropiados.

Este certificado no puede ser reproducido en forma parcial o total sin la autorización del laboratorio.

**FIN DEL CERTIFICADO DE CALIBRACIÓN**

## ANEXO E – ANÁLISIS DE COMBUSTIBLE



## INFORME DE ANALISIS

Nº: LAQ19 - 0337

Pág 1/1

Fecha de Reporte: 20-feb-19  
Ref. Laboratorio: LAQ19 - 0337  
Ref. Caleb Brett: N/A  
Ref. Cliente: N/A

|                                           |   |                                                      |
|-------------------------------------------|---|------------------------------------------------------|
| Cliente:                                  | : | ENERGIA SIETE SPA                                    |
| Dirección:                                | : | Av. Presidente Riesco 5711, Oficina 401, Las Condes  |
| Descripción Producto (según Cliente):     | : | DIESEL OIL                                           |
| Lugar de Muestreo (Nave, Terminal, Otro): | : | Central Quellón                                      |
| Punto de Muestreo:                        | : | Gen #3                                               |
| Tipo de Muestreo:                         | : | Puntual                                              |
| Identificación de Muestra o Sello:        | : | Sello #69620                                         |
| Muestreado por:                           | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Norma Aplicable al Muestreo               | : | API MPMS CAPITULO 8 / ASTM D 4057 (**)               |
| Muestra entregada por:                    | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Analizada por                             | : | INTERTEK CALEB BRETT CHILE S.A. LABORATORIO QUINTERO |
| Fecha de Muestreo                         | : | 06-feb-19                                            |
| Fecha / Hora de Recepción en Lab.         | : | 14-feb-19 09:00 Hrs                                  |
| Fecha de Análisis                         | : | 18 - 20 feb / 2019                                   |

| DESCRIPCION DEL ANALISIS          | Unidad  | Método           | Especificación (*)    | Resultados        |
|-----------------------------------|---------|------------------|-----------------------|-------------------|
| GRAVEDAD API                      | °API    | ASTM D 4052-16   | informar              | 38.4              |
| DENSIDAD A 15°C                   | kg/L    | ASTM D 4052-16   | min 0.820 - max 0.850 | 0.8320            |
| APARIENCIA ( Temp. Muestra 22°C)  | --      | ASTM D 4176-14   | Claro & Brillante     | Claro & Brillante |
| AZUFRE                            | mg/kg   | ASTM D 5453-16e1 | max 15                | 5.1               |
| DESTILACIÓN, 50% RECUPERADO       | °C      | ASTM D 86-17     | informar              | 268.0             |
| DESTILACIÓN, 90% RECUPERADO       | °C      | ASTM D 86-17     | min 282 - max 350     | 329.7             |
| INDICE DE CETANO                  | Nº      | ASTM D 976-16    | informar              | 53.2              |
| PUNTO DE INFLAMACIÓN              | °C      | ASTM D 93A-16a   | min 52                | 62                |
| CENIZAS                           | % p/p   | ASTM D 482-13    | max 0.01              | <0.001            |
| AGUA Y SEDIMENTOS                 | % vol   | ASTM D 2709-16   | max 0.05              | <0.01             |
| CALOR DE COMBUSTION SUPERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10945             |
| CALOR DE COMBUSTION INFERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10263             |
|                                   |         |                  |                       |                   |
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Rev.#08, 19/May/2017

FCL-Q-008/1 A

### Observaciones

|                                                   |
|---------------------------------------------------|
| (*) Especificación Petroleo Diesel DS 60 REGIONES |
| (**) Ensayo y Muestreo No acreditado              |

- Este reporte de análisis no puede reproducirse parcialmente sin la aprobación por escrito de Intertek Caleb Brett (Chile) S.A.
- El(los) resultado(s) de ensayo(s) emitido(s) en este Reporte es(son) válido(s) únicamente para la muestra descrita



Acreditado por INN, Acreditación LE 103


Carmen G. Rosales B.  
Jefe Laboratorio Combustibles  
Intertek Caleb Brett Chile S.A.

Intertek Caleb Brett Chile S.A.

Oficina Punta Arenas: Avenida España N°142, Punta Arenas

Laboratorio de Combustibles : Ruta F 170 s/n, Las Ventanas V Región - Fono: (56-32) 279 4371 - Fax: (56-32) 279 4372

Laboratorio Petroquímico : Sanfuentes N° 2318 - San Antonio, Fono: (56-35) 28 0143, Fax: (56-35) 28 4255

Casa Matriz: Av Las Condes 11287, Torre A Of-301, Las Condes, Santiago - Chile Fono: (56-2) 24819100 - Fax: (56-2) 24819191 - E-mail: chile.santiago@intertek.com

## INFORME DE ANALISIS

N°: LAQ19 - 0338

Pág 1/1

Fecha de Reporte: 20-feb-19  
Ref. Laboratorio: LAQ19 - 0338  
Ref. Caleb Brett: N/A  
Ref. Cliente: N/A

|                                           |   |                                                      |
|-------------------------------------------|---|------------------------------------------------------|
| Cliente:                                  | : | ENERGIA SIETE SPA                                    |
| Dirección:                                | : | Av. Presidente Riesco 5711, Oficina 401, Las Condes  |
| Descripción Producto (según Cliente):     | : | DIESEL OIL                                           |
| Lugar de Muestreo (Nave, Terminal, Otro): | : | Central Quellón                                      |
| Punto de Muestreo:                        | : | Gen # 5                                              |
| Tipo de Muestreo:                         | : | Puntual                                              |
| Identificación de Muestra o Sello:        | : | Sello #69621                                         |
| Muestreado por:                           | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Norma Aplicable al Muestreo:              | : | API MPMS CAPITULO 8 / ASTM D 4057 (**)               |
| Muestra entregada por:                    | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Analizada por:                            | : | INTERTEK CALEB BRETT CHILE S.A. LABORATORIO QUINTERO |
| Fecha de Muestreo:                        | : | 06-feb-19                                            |
| Fecha / Hora de Recepción en Lab.         | : | 14-feb-19 09:00 Hrs                                  |
| Fecha de Análisis:                        | : | 18 - 20 feb / 2019                                   |

| DESCRIPCION DEL ANALISIS          | Unidad  | Método           | Especificación (*)    | Resultados        |
|-----------------------------------|---------|------------------|-----------------------|-------------------|
| GRAVEDAD API                      | °API    | ASTM D 4052-16   | informar              | 38.3              |
| DENSIDAD A 15°C                   | kg/L    | ASTM D 4052-16   | min 0.820 - max 0.850 | 0.8325            |
| APARIENCIA (Temp. Muestra 22°C)   | --      | ASTM D 4176-14   | Claro & Brillante     | Claro & Brillante |
| AZUFRE                            | mg/kg   | ASTM D 5453-16e1 | max 15                | 5.9               |
| DESTILACIÓN, 50% RECUPERADO       | °C      | ASTM D 86-17     | informar              | 268.8             |
| DESTILACIÓN, 90% RECUPERADO       | °C      | ASTM D 86-17     | min 282 - max 350     | 331.2             |
| INDICE DE CETANO                  | N°      | ASTM D 976-16    | informar              | 53.3              |
| PUNTO DE INFLAMACIÓN              | °C      | ASTM D 93A-16a   | min 52                | 62                |
| CENIZAS                           | % p/p   | ASTM D 482-13    | max 0.01              | <0.001            |
| AGUA Y SEDIMENTOS                 | % vol   | ASTM D 2709-16   | max 0.05              | <0.01             |
| CALOR DE COMBUSTION SUPERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10943             |
| CALOR DE COMBUSTION INFERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10262             |
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Rev.#08, 19/May/2017

FCL-Q-008/1 A

### Observaciones

- (\*) Especificación Petroleo Diesel DS 60 REGIONES  
(\*\*) Ensayo y Muestreo No acreditado

- Este reporte de análisis no puede reproducirse parcialmente sin la aprobación por escrito de Intertek Caleb Brett (Chile) S.A.
- El(los) resultado(s) de ensayo(s) emitido(s) en este Reporte es(son) válido(s) únicamente para la muestra descrita



Acreditado por INN, Acreditación LE 103

Carmen G. Rosales B.  
Jefe Laboratorio Combustibles  
Intertek Caleb Brett Chile S.A.

Intertek Caleb Brett Chile S.A.

Oficina Punta Arenas: Avenida España N°142, Punta Arenas

Laboratorio de Combustibles : Ruta F 170 s/n, Las Ventanas V Región - Fono: (56-32) 279 4371 - Fax: (56-32) 279 4372

Laboratorio Petroquímico : Sanfuentes N° 2318 - San Antonio, Fono: (56-35) 28 0143, Fax: (56-35) 28 4255

Casa Matriz: Av Las Condes 11287, Torre A Of-301, Las Condes, Santiago - Chile Fono: (56-2) 24819100 - Fax: (56-2) 24819191 - E-mail: chile.santiago@intertek.com

## INFORME DE ANALISIS

Nº: LAQ19 - 0339

Pág 1/1

Fecha de Reporte: 20-feb-19  
Ref. Laboratorio: LAQ19 - 0339  
Ref. Caleb Brett: N/A  
Ref. Cliente: N/A

|                                           |   |                                                      |
|-------------------------------------------|---|------------------------------------------------------|
| Cliente:                                  | : | ENERGIA SIETE SPA                                    |
| Dirección:                                | : | Av. Presidente Riesco 5711, Oficina 401, Las Condes  |
| Descripción Producto (según Cliente):     | : | DIESEL OIL                                           |
| Lugar de Muestreo (Nave, Terminal, Otro): | : | Central Quellón                                      |
| Punto de Muestreo:                        | : | Gen # 6/10                                           |
| Tipo de Muestreo:                         | : | Puntual                                              |
| Identificación de Muestra o Sello:        | : | Sello #69622                                         |
| Muestreado por:                           | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Norma Aplicable al Muestreo:              | : | API MPMS CAPITULO 8 / ASTM D 4057 (**)               |
| Muestra entregada por:                    | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Analizada por:                            | : | INTERTEK CALEB BRETT CHILE S.A. LABORATORIO QUINTERO |
| Fecha de Muestreo:                        | : | 07-feb-19                                            |
| Fecha / Hora de Recepción en Lab.         | : | 14-feb-19 09:00 Hrs                                  |
| Fecha de Análisis:                        | : | 18 - 20 feb / 2019                                   |

| DESCRIPCION DEL ANALISIS          | Unidad  | Método           | Especificación (*)    | Resultados        |
|-----------------------------------|---------|------------------|-----------------------|-------------------|
| GRAVEDAD API                      | °API    | ASTM D 4052-16   | informar              | 38.3              |
| DENSIDAD A 15°C                   | kg/L    | ASTM D 4052-16   | min 0.820 - max 0.850 | 0.8324            |
| APARIENCIA (Temp. Muestra 22°C)   | --      | ASTM D 4176-14   | Claro & Brillante     | Claro & Brillante |
| AZUFRE                            | mg/kg   | ASTM D 5453-16e1 | max 15                | 6.8               |
| DESTILACIÓN, 50% RECUPERADO       | °C      | ASTM D 86-17     | informar              | 269.0             |
| DESTILACIÓN, 90% RECUPERADO       | °C      | ASTM D 86-17     | min 282 - max 350     | 331.2             |
| INDICE DE CETANO                  | Nº      | ASTM D 976-16    | informar              | 53.3              |
| PUNTO DE INFLAMACIÓN              | °C      | ASTM D 93A-16a   | min 52                | 63                |
| CENIZAS                           | % p/p   | ASTM D 482-13    | max 0.01              | <0.001            |
| AGUA Y SEDIMENTOS                 | % vol   | ASTM D 2709-16   | max 0.05              | <0.01             |
| CALOR DE COMBUSTION SUPERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10944             |
| CALOR DE COMBUSTION INFERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10262             |
|                                   |         |                  |                       |                   |
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Rev.#08, 19/May/2017

FCL-Q-008/1 A

### Observaciones

- (\*) Especificación Petroleo Diesel DS 60 REGIONES  
(\*\*) Ensayo y Muestreo No acreditado

- Este reporte de análisis no puede reproducirse parcialmente sin la aprobación por escrito de Intertek Caleb Brett (Chile) S.A.
- El(los) resultado(s) de ensayo(s) emitido(s) en este Reporte es(son) válido(s) únicamente para la muestra descrita



Acreditado por INN, Acreditación LE 103


Carmen G. Rosales B.  
Jefe Laboratorio Combustibles  
Intertek Caleb Brett Chile S.A.

Intertek Caleb Brett Chile S.A.

Oficina Punta Arenas: Avenida España N°142, Punta Arenas

Laboratorio de Combustibles : Ruta F 170 s/n, Las Ventanas V Región - Fono: (56-32) 279 4371 - Fax: (56-32) 279 4372

Laboratorio Petroquímico : Sanfuentes N° 2318 - San Antonio, Fono: (56-35) 28 0143, Fax: (56-35) 28 4255

Casa Matriz: Av Las Condes 11287, Torre A Of-301, Las Condes, Santiago - Chile Fono: (56-2) 24819100 - Fax: (56-2) 24819191 - E-mail: chile.santiago@intertek.com

## INFORME DE ANALISIS

Nº: LAQ19 - 0340

Pág 1/1

Fecha de Reporte: 20-feb-19  
Ref. Laboratorio: LAQ19 - 0340  
Ref. Caleb Brett: N/A  
Ref. Cliente: N/A

|                                           |   |                                                      |
|-------------------------------------------|---|------------------------------------------------------|
| Cliente:                                  | : | ENERGIA SIETE SPA                                    |
| Dirección:                                | : | Av. Presidente Riesco 5711, Oficina 401, Las Condes  |
| Descripción Producto (según Cliente):     | : | DIESEL OIL                                           |
| Lugar de Muestreo (Nave, Terminal, Otro): | : | Central Quellón                                      |
| Punto de Muestreo:                        | : | Gen # 4/9                                            |
| Tipo de Muestreo:                         | : | Puntual                                              |
| Identificación de Muestra o Sello:        | : | Sello #69623                                         |
| Muestreado por:                           | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Norma Aplicable al Muestreo:              | : | API MPMS CAPITULO 8 / ASTM D 4057 (**)               |
| Muestra entregada por:                    | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Analizada por:                            | : | INTERTEK CALEB BRETT CHILE S.A. LABORATORIO QUINTERO |
| Fecha de Muestreo:                        | : | 07-feb-19                                            |
| Fecha / Hora de Recepción en Lab.         | : | 14-feb-19 09:00 Hrs                                  |
| Fecha de Análisis:                        | : | 18 - 20 feb / 2019                                   |

| DESCRIPCION DEL ANALISIS          | Unidad  | Método           | Especificación (*)    | Resultados        |
|-----------------------------------|---------|------------------|-----------------------|-------------------|
| GRAVEDAD API                      | °API    | ASTM D 4052-16   | informar              | 38.4              |
| DENSIDAD A 15°C                   | kg/L    | ASTM D 4052-16   | min 0.820 - max 0.850 | 0.8321            |
| APARIENCIA ( Temp. Muestra 22°C)  | --      | ASTM D 4176-14   | Claro & Brillante     | Claro & Brillante |
| AZUFRE                            | mg/kg   | ASTM D 5453-16e1 | max 15                | 7.5               |
| DESTILACIÓN, 50% RECUPERADO       | °C      | ASTM D 86-17     | informar              | 268.6             |
| DESTILACIÓN, 90% RECUPERADO       | °C      | ASTM D 86-17     | min 282 - max 350     | 331.1             |
| INDICE DE CETANO                  | Nº      | ASTM D 976-16    | informar              | 53.3              |
| PUNTO DE INFLAMACIÓN              | °C      | ASTM D 93A-16a   | min 52                | 62                |
| CENIZAS                           | % p/p   | ASTM D 482-13    | max 0.01              | <0.001            |
| AGUA Y SEDIMENTOS                 | % vol   | ASTM D 2709-16   | max 0.05              | <0.01             |
| CALOR DE COMBUSTION SUPERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10945             |
| CALOR DE COMBUSTION INFERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10263             |
|                                   |         |                  |                       |                   |
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Rev.#08, 19/May/2017

FCL-Q-008/1 A

### Observaciones

- (\*) Especificación Petroleo Diesel DS 60 REGIONES  
(\*\*) Ensayo y Muestreo No acreditado

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- El(los) resultado(s) de ensayo(s) emitido(s) en este Reporte es(son) válido(s) únicamente para la muestra descrita



Acreditado por INN, Acreditación LE 103


Carmen G. Rosales B.  
Jefe Laboratorio Combustibles  
Intertek Caleb Brett Chile S.A.

Intertek Caleb Brett Chile S.A.

Oficina Punta Arenas: Avenida España N°142, Punta Arenas

Laboratorio de Combustibles : Ruta F 170 s/n, Las Ventanas V Región - Fono: (56-32) 279 4371 - Fax: (56-32) 279 4372

Laboratorio Petroquímico : Sanfuentes N° 2318 - San Antonio, Fono: (56-35) 28 0143, Fax: (56-35) 28 4255

Casa Matriz: Av Las Condes 11287, Torre A Of-301, Las Condes, Santiago - Chile Fono: (56-2) 24819100 - Fax: (56-2) 24819191 - E-mail: chile.santiago@intertek.com

## INFORME DE ANALISIS

N°: LAQ19 - 0341

Pág 1/1

Fecha de Reporte: 20-feb-19  
Ref. Laboratorio: LAQ19 - 0341  
Ref. Caleb Brett: N/A  
Ref. Cliente: N/A

|                                           |   |                                                      |
|-------------------------------------------|---|------------------------------------------------------|
| Cliente:                                  | : | ENERGIA SIETE SPA                                    |
| Dirección:                                | : | Av. Presidente Riesco 5711, Oficina 401, Las Condes  |
| Descripción Producto (según Cliente):     | : | DIESEL OIL                                           |
| Lugar de Muestreo (Nave, Terminal, Otro): | : | Central Quellón                                      |
| Punto de Muestreo:                        | : | TK # 5                                               |
| Tipo de Muestreo:                         | : | Puntual                                              |
| Identificación de Muestra o Sello:        | : | Sello #69624                                         |
| Muestreado por:                           | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Norma Aplicable al Muestreo:              | : | API MPMS CAPITULO 8 / ASTM D 4057 (**)               |
| Muestra entregada por:                    | : | INTERTEK CALEB BRETT CHILE S.A. SAN ANTONIO          |
| Analizada por:                            | : | INTERTEK CALEB BRETT CHILE S.A. LABORATORIO QUINTERO |
| Fecha de Muestreo:                        | : | 07-feb-19                                            |
| Fecha / Hora de Recepción en Lab.         | : | 14-feb-19 09:00 Hrs                                  |
| Fecha de Análisis:                        | : | 18 - 20 feb / 2019                                   |

| DESCRIPCION DEL ANALISIS          | Unidad  | Método           | Especificación (*)    | Resultados        |
|-----------------------------------|---------|------------------|-----------------------|-------------------|
| GRAVEDAD API                      | °API    | ASTM D 4052-16   | informar              | 38.6              |
| DENSIDAD A 15°C                   | kg/L    | ASTM D 4052-16   | min 0.820 - max 0.850 | 0.8311            |
| APARIENCIA ( Temp. Muestra 23°C)  | --      | ASTM D 4176-14   | Claro & Brillante     | Claro & Brillante |
| AZUFRE                            | mg/kg   | ASTM D 5453-16e1 | max 15                | 5.5               |
| DESTILACIÓN, 50% RECUPERADO       | °C      | ASTM D 86-17     | informar              | 267.1             |
| DESTILACIÓN, 90% RECUPERADO       | °C      | ASTM D 86-17     | min 282 - max 350     | 329.9             |
| INDICE DE CETANO                  | N°      | ASTM D 976-16    | informar              | 53.5              |
| PUNTO DE INFLAMACIÓN              | °C      | ASTM D 93A-16a   | min 52                | 62                |
| CENIZAS                           | % p/p   | ASTM D 482-13    | max 0.01              | <0.001            |
| AGUA Y SEDIMENTOS                 | % vol   | ASTM D 2709-16   | max 0.05              | <0.01             |
| CALOR DE COMBUSTION SUPERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10948             |
| CALOR DE COMBUSTION INFERIOR (**) | Kcal/Kg | ASTM D 4868-17   | --                    | 10265             |
|                                   |         |                  |                       |                   |
|                                   |         |                  |                       |                   |
|                                   |         |                  |                       |                   |
|                                   |         |                  |                       |                   |
|                                   |         |                  |                       |                   |
|                                   |         |                  |                       |                   |
|                                   |         |                  |                       |                   |
|                                   |         |                  |                       |                   |

Rev.#08, 19/May/2017

FCL-Q-008/1 A

### Observaciones

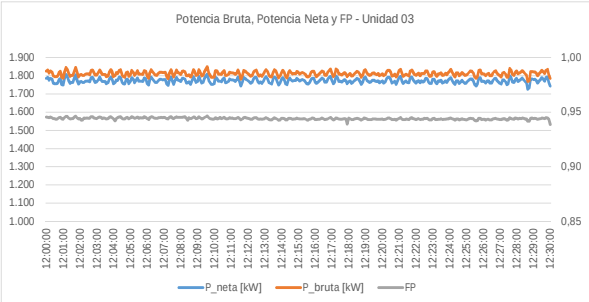
|                                                   |
|---------------------------------------------------|
| (*) Especificación Petroleo Diesel DS 60 REGIONES |
| (**) Ensayo y Muestreo No acreditado              |

- Este reporte de análisis no puede reproducirse parcialmente sin la aprobación por escrito de Intertek Caleb Brett (Chile) S.A.
- El(los) resultado(s) de ensayo(s) emitido(s) en este Reporte es(son) válido(s) únicamente para la muestra descrita

## ANEXO F – MEDICIONES, CÁLCULOS Y GRÁFICOS



|           |             |              |       |
|-----------|-------------|--------------|-------|
| Promedio  | 1.772       | 1.812        | 0.94  |
| Unidad 03 |             |              |       |
| Hora      | P_neta [kW] | P_bruta [kW] | FP    |
| 12:00:00  | 1.786       | 1.824        | 0.945 |
| 12:00:05  | 1.790       | 1.831        | 0.945 |
| 12:00:10  | 1.775       | 1.813        | 0.945 |
| 12:00:15  | 1.785       | 1.825        | 0.945 |
| 12:00:20  | 1.782       | 1.821        | 0.945 |
| 12:00:25  | 1.759       | 1.799        | 0.944 |
| 12:00:30  | 1.756       | 1.795        | 0.944 |
| 12:00:35  | 1.755       | 1.794        | 0.944 |
| 12:00:40  | 1.758       | 1.795        | 0.944 |
| 12:00:45  | 1.778       | 1.817        | 0.945 |
| 12:00:50  | 1.784       | 1.824        | 0.945 |
| 12:00:55  | 1.751       | 1.792        | 0.944 |
| 12:01:00  | 1.748       | 1.785        | 0.943 |
| 12:01:05  | 1.782       | 1.817        | 0.945 |
| 12:01:10  | 1.806       | 1.846        | 0.946 |
| 12:01:15  | 1.794       | 1.835        | 0.946 |
| 12:01:20  | 1.773       | 1.814        | 0.945 |
| 12:01:25  | 1.757       | 1.796        | 0.944 |
| 12:01:30  | 1.762       | 1.801        | 0.944 |
| 12:01:35  | 1.764       | 1.802        | 0.944 |
| 12:01:40  | 1.788       | 1.825        | 0.945 |
| 12:01:45  | 1.805       | 1.845        | 0.946 |
| 12:01:50  | 1.773       | 1.816        | 0.945 |
| 12:01:55  | 1.754       | 1.793        | 0.944 |
| 12:02:00  | 1.766       | 1.803        | 0.944 |
| 12:02:05  | 1.767       | 1.807        | 0.943 |
| 12:02:10  | 1.762       | 1.802        | 0.943 |
| 12:02:15  | 1.762       | 1.801        | 0.945 |
| 12:02:20  | 1.770       | 1.808        | 0.944 |
| 12:02:25  | 1.771       | 1.810        | 0.945 |
| 12:02:30  | 1.771       | 1.810        | 0.944 |
| 12:02:35  | 1.767       | 1.805        | 0.944 |
| 12:02:40  | 1.790       | 1.828        | 0.946 |
| 12:02:45  | 1.791       | 1.832        | 0.946 |
| 12:02:50  | 1.778       | 1.818        | 0.945 |
| 12:02:55  | 1.763       | 1.802        | 0.944 |
| 12:03:00  | 1.766       | 1.804        | 0.944 |
| 12:03:05  | 1.775       | 1.814        | 0.945 |
| 12:03:10  | 1.792       | 1.832        | 0.945 |
| 12:03:15  | 1.779       | 1.820        | 0.945 |
| 12:03:20  | 1.768       | 1.807        | 0.944 |
| 12:03:25  | 1.768       | 1.806        | 0.945 |
| 12:03:30  | 1.768       | 1.807        | 0.944 |
| 12:03:35  | 1.755       | 1.795        | 0.944 |
| 12:03:40  | 1.761       | 1.799        | 0.944 |
| 12:03:45  | 1.781       | 1.819        | 0.945 |
| 12:03:50  | 1.793       | 1.832        | 0.946 |
| 12:03:55  | 1.779       | 1.820        | 0.945 |
| 12:04:00  | 1.755       | 1.794        | 0.944 |
| 12:04:05  | 1.763       | 1.800        | 0.942 |
| 12:04:10  | 1.777       | 1.817        | 0.944 |
| 12:04:15  | 1.772       | 1.811        | 0.945 |
| 12:04:20  | 1.792       | 1.830        | 0.946 |
| 12:04:25  | 1.791       | 1.833        | 0.946 |
| 12:04:30  | 1.765       | 1.805        | 0.944 |
| 12:04:35  | 1.755       | 1.795        | 0.944 |
| 12:04:40  | 1.753       | 1.792        | 0.944 |
| 12:04:45  | 1.781       | 1.818        | 0.945 |
| 12:04:50  | 1.780       | 1.821        | 0.945 |
| 12:04:55  | 1.756       | 1.797        | 0.944 |
| 12:05:00  | 1.768       | 1.804        | 0.945 |
| 12:05:05  | 1.789       | 1.830        | 0.946 |
| 12:05:10  | 1.781       | 1.820        | 0.945 |
| 12:05:15  | 1.762       | 1.802        | 0.944 |
| 12:05:20  | 1.772       | 1.809        | 0.945 |
| 12:05:25  | 1.788       | 1.828        | 0.945 |
| 12:05:30  | 1.769       | 1.809        | 0.944 |
| 12:05:35  | 1.771       | 1.809        | 0.945 |
| 12:05:40  | 1.769       | 1.809        | 0.945 |
| 12:05:45  | 1.769       | 1.807        | 0.945 |
| 12:05:50  | 1.788       | 1.827        | 0.946 |
| 12:05:55  | 1.784       | 1.824        | 0.945 |
| 12:06:00  | 1.758       | 1.799        | 0.944 |
| 12:06:05  | 1.748       | 1.785        | 0.943 |
| 12:06:10  | 1.780       | 1.817        | 0.945 |
| 12:06:15  | 1.793       | 1.834        | 0.946 |
| 12:06:20  | 1.781       | 1.820        | 0.945 |
| 12:06:25  | 1.771       | 1.811        | 0.945 |
| 12:06:30  | 1.763       | 1.803        | 0.944 |
| 12:06:35  | 1.764       | 1.801        | 0.944 |
| 12:06:40  | 1.772       | 1.812        | 0.945 |
| 12:06:45  | 1.780       | 1.819        | 0.945 |
| 12:06:50  | 1.780       | 1.819        | 0.945 |
| 12:06:55  | 1.776       | 1.816        | 0.945 |
| 12:07:00  | 1.778       | 1.817        | 0.945 |
| 12:07:05  | 1.779       | 1.818        | 0.945 |
| 12:07:10  | 1.756       | 1.797        | 0.944 |
| 12:07:15  | 1.748       | 1.785        | 0.944 |
| 12:07:20  | 1.777       | 1.815        | 0.945 |
| 12:07:25  | 1.793       | 1.833        | 0.946 |
| 12:07:30  | 1.769       | 1.810        | 0.945 |
| 12:07:35  | 1.753       | 1.792        | 0.944 |
| 12:07:40  | 1.777       | 1.814        | 0.945 |
| 12:07:45  | 1.791       | 1.831        | 0.946 |
| 12:07:50  | 1.777       | 1.817        | 0.945 |
| 12:07:55  | 1.774       | 1.814        | 0.945 |
| 12:08:00  | 1.768       | 1.807        | 0.945 |
| 12:08:05  | 1.786       | 1.824        | 0.945 |
| 12:08:10  | 1.785       | 1.826        | 0.946 |
| 12:08:15  | 1.782       | 1.822        | 0.946 |
| 12:08:20  | 1.759       | 1.799        | 0.944 |
| 12:08:25  | 1.761       | 1.800        | 0.942 |
| 12:08:30  | 1.766       | 1.804        | 0.945 |
| 12:08:35  | 1.753       | 1.793        | 0.944 |
| 12:08:40  | 1.771       | 1.807        | 0.945 |
| 12:08:45  | 1.794       | 1.833        | 0.946 |
| 12:08:50  | 1.780       | 1.821        | 0.945 |
| 12:08:55  | 1.762       | 1.802        | 0.944 |
| 12:09:00  | 1.768       | 1.805        | 0.944 |
| 12:09:05  | 1.795       | 1.834        | 0.946 |
| 12:09:10  | 1.777       | 1.818        | 0.945 |
| 12:09:15  | 1.759       | 1.798        | 0.944 |
| 12:09:20  | 1.764       | 1.801        | 0.944 |
| 12:09:25  | 1.784       | 1.820        | 0.945 |
| 12:09:30  | 1.799       | 1.837        | 0.946 |
| 12:09:35  | 1.809       | 1.850        | 0.947 |
| 12:09:40  | 1.774       | 1.814        | 0.945 |
| 12:09:45  | 1.762       | 1.801        | 0.944 |
| 12:09:50  | 1.753       | 1.792        | 0.944 |
| 12:09:55  | 1.752       | 1.790        | 0.943 |
| 12:10:00  | 1.756       | 1.793        | 0.944 |
| 12:10:05  | 1.791       | 1.827        | 0.945 |
| 12:10:10  | 1.784       | 1.826        | 0.944 |
| 12:10:15  | 1.771       | 1.809        | 0.944 |
| 12:10:20  | 1.770       | 1.809        | 0.945 |
| 12:10:25  | 1.767       | 1.806        | 0.944 |
| 12:10:30  | 1.781       | 1.818        | 0.945 |
| 12:10:35  | 1.788       | 1.827        | 0.945 |
| 12:10:40  | 1.762       | 1.802        | 0.944 |
| 12:10:45  | 1.763       | 1.801        | 0.944 |
| 12:10:50  | 1.768       | 1.807        | 0.944 |
| 12:10:55  | 1.781       | 1.819        | 0.945 |
| 12:11:00  | 1.777       | 1.816        | 0.944 |
| 12:11:05  | 1.776       | 1.815        | 0.945 |
| 12:11:10  | 1.775       | 1.814        | 0.944 |
| 12:11:15  | 1.768       | 1.807        | 0.944 |
| 12:11:20  | 1.776       | 1.814        | 0.944 |
| 12:11:25  | 1.793       | 1.832        | 0.945 |
| 12:11:30  | 1.765       | 1.808        | 0.944 |
| 12:11:35  | 1.743       | 1.780        | 0.943 |
| 12:11:40  | 1.766       | 1.802        | 0.944 |
| 12:11:45  | 1.792       | 1.830        | 0.945 |
| 12:11:50  | 1.786       | 1.825        | 0.945 |
| 12:11:55  | 1.777       | 1.817        | 0.945 |
| 12:12:00  | 1.773       | 1.812        | 0.944 |
| 12:12:05  | 1.767       | 1.806        | 0.944 |
| 12:12:10  | 1.757       | 1.796        | 0.943 |
| 12:12:15  | 1.763       | 1.800        | 0.943 |
| 12:12:20  | 1.784       | 1.821        | 0.945 |
| 12:12:25  | 1.790       | 1.829        | 0.945 |



|             |            |        |    |
|-------------|------------|--------|----|
| Corrección  |            | 0,3    | -2 |
| Ambientales |            |        |    |
| Tiempo      | T_amb [°C] | HR [%] |    |
| 12:00       | 21         | 46     |    |
| 12:01       | 20         | 49     |    |
| 12:02       | 21         | 48     |    |
| 12:03       | 21         | 47     |    |
| 12:04       | 20         | 48     |    |
| 12:05       | 20         | 49     |    |
| 12:06       | 20         | 48     |    |
| 12:07       | 20         | 48     |    |
| 12:08       | 20         | 48     |    |
| 12:09       | 20         | 48     |    |
| 12:10       | 20         | 48     |    |
| 12:11       | 21         | 45     |    |
| 12:12       | 21         | 45     |    |
| 12:13       | 21         | 45     |    |
| 12:14       | 20         | 46     |    |
| 12:15       | 20         | 46     |    |
| 12:16       | 20         | 45     |    |
| 12:17       | 21         | 44     |    |
| 12:18       | 21         | 44     |    |
| 12:19       | 21         | 44     |    |
| 12:20       | 21         | 45     |    |
| 12:21       | 21         | 44     |    |
| 12:22       | 20         | 46     |    |
| 12:23       | 20         | 43     |    |
| 12:24       | 20         | 44     |    |
| 12:25       | 20         | 45     |    |
| 12:26       | 21         | 45     |    |
| 12:27       | 21         | 45     |    |
| 12:28       | 22         | 43     |    |
| 12:29       | 21         | 45     |    |
| 12:30       | 21         | 45     |    |
| Promedio    | 20         | 46     |    |
| Corregidos  | 21         | 44     |    |

|                 |  |           |               |
|-----------------|--|-----------|---------------|
| Celda de Carga  |  | Masa [kg] | Cons [kg/min] |
| Tiempo          |  |           |               |
| 12:00           |  | 610       | -             |
| 12:01           |  | 604       | 6             |
| 12:02           |  | 598       | 6             |
| 12:03           |  | 592       | 6             |
| 12:04           |  | 586       | 6             |
| 12:05           |  | 580       | 6             |
| 12:06           |  | 574       | 6             |
| 12:07           |  | 568       | 6             |
| 12:08           |  | 562       | 6             |
| 12:09           |  | 556       | 6             |
| 12:10           |  | 550       | 6             |
| 12:11           |  | 544       | 6             |
| 12:12           |  | 537       | 7             |
| 12:13           |  | 531       | 6             |
| 12:14           |  | 525       | 6             |
| 12:15           |  | 519       | 6             |
| 12:16           |  | 513       | 6             |
| 12:17           |  | 507       | 6             |
| 12:18           |  | 501       | 6             |
| 12:19           |  | 495       | 6             |
| 12:20           |  | 489       | 6             |
| 12:21           |  | 483       | 6             |
| 12:22           |  | 477       | 6             |
| 12:23           |  | 470       | 7             |
| 12:24           |  | 465       | 5             |
| 12:25           |  | 459       | 6             |
| 12:26           |  | 453       | 6             |
| 12:27           |  | 447       | 6             |
| 12:28           |  | 441       | 6             |
| 12:29           |  | 434       | 7             |
| 12:30           |  | 429       | 5             |
| Promedio kg/h   |  | 362       |               |
| Consumo [lts/h] |  | 435,1     |               |

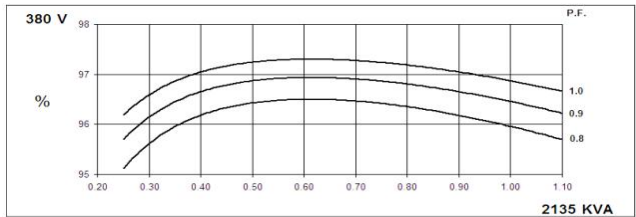
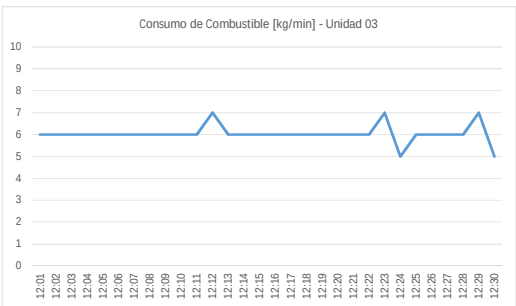
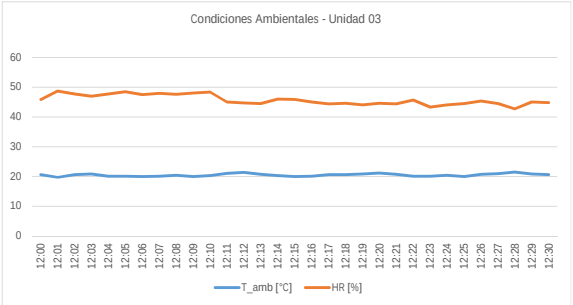
|                                        |       |            |
|----------------------------------------|-------|------------|
| Consumo Especifico Neto sin corrección |       |            |
| C_esp_volumen                          | 245,5 | [lts/MWh]  |
| C_esp_masa                             | 204,3 | [kg/MWh]   |
| C_esp_calorias                         | 2.236 | [kcal/MWh] |

|                       |        |         |
|-----------------------|--------|---------|
| Combustible Diesel B2 |        |         |
| Densidad              | 0,8320 | kg/lts  |
| PCI                   | --     | kcal/kg |
| PCS                   | 10.945 | kcal/kg |

|                       |                  |                                   |               |
|-----------------------|------------------|-----------------------------------|---------------|
| Correcciones ISO 3046 |                  |                                   |               |
| coef a                | 0                | Tabla B.1 ISO 3046-1 motor tipo D |               |
| coef m                | 0,7              |                                   |               |
| coef n                | 1,2              |                                   |               |
| coef s                | 0                | no aplica                         |               |
| eficiencia mec        | 0,8              | ISO 3046                          |               |
| alfa                  | 0,9518           | ISO 3046                          |               |
| k                     | 0,9590           | ISO 3046                          |               |
| px                    | no aplica correc | Presión Atm Test                  | kPa           |
| pr                    | no aplica correc | Presión Atm Ref                   | kPa           |
| Tx [°K]               | 293,8            | Temp Test                         | grados Kelvin |
| Tr [°K]               | 283,7            | Temp Ref                          | grados Kelvin |
| Bx                    | 362,0            | C_esp medido                      | kg/h          |
| Br                    | 359,3            | C_esp ISO                         | kg/h          |
| Corrección ISO        | -0,75%           |                                   |               |

|                                 |          |                   |
|---------------------------------|----------|-------------------|
| Corrección Factor de Potencia   |          |                   |
| FP promedio                     | 0,94     | Aplica Correccion |
| Eficiencia @0,94                | 96,81    | %                 |
| Eficiencia @0,95                | 96,85    | %                 |
| Potencia bruta Medida           | 1.811,57 | kW                |
| Potencia bruta Corregida @ 0,95 | 1.812,32 | kW                |
| delta_loss                      | 0,743    | kW                |
| Pnetra medida                   | 1.772    | kW                |
| Pnetra Corregida @0,95          | 1.773    | kW                |
| Corrección FP                   | 0,04%    |                   |

|                 |        |              |
|-----------------|--------|--------------|
| C_esp Corregido | 0,2027 | kg / kWh     |
| C_esp Corregido | 244    | litros / MWh |
| C_esp Corregido | 2.218  | kcal / kWh   |
| Corrección      | -0,79% |              |



|                    |  |                |    |        |
|--------------------|--|----------------|----|--------|
| Factor de Potencia |  | Eficiencia [%] |    |        |
| X0                 |  | 0,9            | Y0 | 96,652 |

|          |       |       |       |
|----------|-------|-------|-------|
| 12:12:30 | 1.790 | 1.830 | 0.945 |
| 12:12:35 | 1.768 | 1.808 | 0.944 |
| 12:12:40 | 1.759 | 1.798 | 0.944 |
| 12:12:45 | 1.765 | 1.804 | 0.944 |
| 12:12:50 | 1.758 | 1.796 | 0.943 |
| 12:12:55 | 1.769 | 1.807 | 0.944 |
| 12:13:00 | 1.783 | 1.821 | 0.944 |
| 12:13:05 | 1.795 | 1.833 | 0.945 |
| 12:13:10 | 1.784 | 1.824 | 0.944 |
| 12:13:15 | 1.761 | 1.801 | 0.943 |
| 12:13:20 | 1.757 | 1.794 | 0.943 |
| 12:13:25 | 1.755 | 1.792 | 0.943 |
| 12:13:30 | 1.783 | 1.820 | 0.944 |
| 12:13:35 | 1.793 | 1.833 | 0.945 |
| 12:13:40 | 1.789 | 1.828 | 0.944 |
| 12:13:45 | 1.764 | 1.805 | 0.944 |
| 12:13:50 | 1.749 | 1.787 | 0.943 |
| 12:13:55 | 1.762 | 1.800 | 0.943 |
| 12:14:00 | 1.780 | 1.817 | 0.944 |
| 12:14:05 | 1.789 | 1.829 | 0.944 |
| 12:14:10 | 1.776 | 1.815 | 0.944 |
| 12:14:15 | 1.755 | 1.794 | 0.943 |
| 12:14:20 | 1.750 | 1.787 | 0.943 |
| 12:14:25 | 1.780 | 1.818 | 0.944 |
| 12:14:30 | 1.787 | 1.827 | 0.944 |
| 12:14:35 | 1.776 | 1.815 | 0.944 |
| 12:14:40 | 1.771 | 1.808 | 0.943 |
| 12:14:45 | 1.773 | 1.811 | 0.944 |
| 12:14:50 | 1.773 | 1.811 | 0.944 |
| 12:14:55 | 1.786 | 1.825 | 0.944 |
| 12:15:00 | 1.781 | 1.820 | 0.944 |
| 12:15:05 | 1.770 | 1.809 | 0.944 |
| 12:15:10 | 1.775 | 1.813 | 0.944 |
| 12:15:15 | 1.778 | 1.817 | 0.944 |
| 12:15:20 | 1.774 | 1.814 | 0.944 |
| 12:15:25 | 1.768 | 1.808 | 0.944 |
| 12:15:30 | 1.755 | 1.794 | 0.943 |
| 12:15:35 | 1.753 | 1.792 | 0.943 |
| 12:15:40 | 1.761 | 1.797 | 0.943 |
| 12:15:45 | 1.778 | 1.817 | 0.944 |
| 12:15:50 | 1.786 | 1.824 | 0.945 |
| 12:15:55 | 1.786 | 1.825 | 0.944 |
| 12:16:00 | 1.765 | 1.806 | 0.943 |
| 12:16:05 | 1.757 | 1.794 | 0.943 |
| 12:16:10 | 1.765 | 1.803 | 0.943 |
| 12:16:15 | 1.772 | 1.810 | 0.944 |
| 12:16:20 | 1.779 | 1.817 | 0.944 |
| 12:16:25 | 1.787 | 1.825 | 0.945 |
| 12:16:30 | 1.782 | 1.822 | 0.944 |
| 12:16:35 | 1.764 | 1.804 | 0.943 |
| 12:16:40 | 1.765 | 1.802 | 0.944 |
| 12:16:45 | 1.779 | 1.817 | 0.944 |
| 12:16:50 | 1.790 | 1.828 | 0.945 |
| 12:16:55 | 1.797 | 1.836 | 0.945 |
| 12:17:00 | 1.776 | 1.816 | 0.944 |
| 12:17:05 | 1.755 | 1.795 | 0.943 |
| 12:17:10 | 1.766 | 1.802 | 0.943 |
| 12:17:15 | 1.798 | 1.836 | 0.945 |
| 12:17:20 | 1.789 | 1.830 | 0.944 |
| 12:17:25 | 1.768 | 1.808 | 0.944 |
| 12:17:30 | 1.770 | 1.808 | 0.943 |
| 12:17:35 | 1.764 | 1.803 | 0.943 |
| 12:17:40 | 1.772 | 1.811 | 0.944 |
| 12:17:45 | 1.779 | 1.817 | 0.944 |
| 12:17:50 | 1.772 | 1.811 | 0.944 |
| 12:17:55 | 1.755 | 1.794 | 0.939 |
| 12:18:00 | 1.769 | 1.805 | 0.945 |
| 12:18:05 | 1.772 | 1.812 | 0.944 |
| 12:18:10 | 1.758 | 1.797 | 0.943 |
| 12:18:15 | 1.763 | 1.800 | 0.943 |
| 12:18:20 | 1.771 | 1.809 | 0.944 |
| 12:18:25 | 1.779 | 1.817 | 0.944 |
| 12:18:30 | 1.785 | 1.824 | 0.944 |
| 12:18:35 | 1.782 | 1.821 | 0.944 |
| 12:18:40 | 1.768 | 1.808 | 0.943 |
| 12:18:45 | 1.753 | 1.791 | 0.943 |
| 12:18:50 | 1.767 | 1.804 | 0.943 |
| 12:18:55 | 1.790 | 1.828 | 0.945 |
| 12:19:00 | 1.793 | 1.833 | 0.944 |
| 12:19:05 | 1.773 | 1.814 | 0.944 |
| 12:19:10 | 1.769 | 1.807 | 0.943 |
| 12:19:15 | 1.763 | 1.802 | 0.943 |
| 12:19:20 | 1.767 | 1.804 | 0.943 |
| 12:19:25 | 1.775 | 1.813 | 0.944 |
| 12:19:30 | 1.776 | 1.815 | 0.944 |
| 12:19:35 | 1.769 | 1.808 | 0.944 |
| 12:19:40 | 1.768 | 1.805 | 0.943 |
| 12:19:45 | 1.772 | 1.811 | 0.944 |
| 12:19:50 | 1.761 | 1.800 | 0.943 |
| 12:19:55 | 1.766 | 1.804 | 0.943 |
| 12:20:00 | 1.772 | 1.810 | 0.944 |
| 12:20:05 | 1.760 | 1.799 | 0.943 |
| 12:20:10 | 1.767 | 1.804 | 0.943 |
| 12:20:15 | 1.782 | 1.820 | 0.944 |
| 12:20:20 | 1.791 | 1.829 | 0.945 |
| 12:20:25 | 1.790 | 1.829 | 0.945 |
| 12:20:30 | 1.778 | 1.819 | 0.944 |
| 12:20:35 | 1.759 | 1.798 | 0.943 |
| 12:20:40 | 1.765 | 1.802 | 0.943 |
| 12:20:45 | 1.769 | 1.809 | 0.943 |
| 12:20:50 | 1.753 | 1.792 | 0.943 |
| 12:20:55 | 1.773 | 1.809 | 0.944 |
| 12:21:00 | 1.790 | 1.829 | 0.944 |
| 12:21:05 | 1.795 | 1.834 | 0.945 |
| 12:21:10 | 1.772 | 1.813 | 0.944 |
| 12:21:15 | 1.758 | 1.796 | 0.943 |
| 12:21:20 | 1.766 | 1.804 | 0.943 |
| 12:21:25 | 1.771 | 1.809 | 0.944 |
| 12:21:30 | 1.763 | 1.803 | 0.943 |
| 12:21:35 | 1.761 | 1.798 | 0.943 |
| 12:21:40 | 1.789 | 1.826 | 0.944 |
| 12:21:45 | 1.792 | 1.831 | 0.945 |
| 12:21:50 | 1.779 | 1.819 | 0.944 |
| 12:21:55 | 1.769 | 1.808 | 0.944 |
| 12:22:00 | 1.760 | 1.801 | 0.943 |
| 12:22:05 | 1.770 | 1.808 | 0.944 |
| 12:22:10 | 1.773 | 1.814 | 0.944 |
| 12:22:15 | 1.760 | 1.800 | 0.943 |
| 12:22:20 | 1.772 | 1.812 | 0.943 |
| 12:22:25 | 1.765 | 1.812 | 0.944 |
| 12:22:30 | 1.770 | 1.811 | 0.944 |
| 12:22:35 | 1.786 | 1.827 | 0.944 |
| 12:22:40 | 1.784 | 1.825 | 0.944 |
| 12:22:45 | 1.766 | 1.808 | 0.944 |
| 12:22:50 | 1.757 | 1.797 | 0.943 |
| 12:22:55 | 1.758 | 1.798 | 0.943 |
| 12:23:00 | 1.780 | 1.820 | 0.944 |
| 12:23:05 | 1.781 | 1.822 | 0.944 |
| 12:23:10 | 1.765 | 1.807 | 0.943 |
| 12:23:15 | 1.755 | 1.796 | 0.943 |
| 12:23:20 | 1.772 | 1.811 | 0.943 |
| 12:23:25 | 1.769 | 1.809 | 0.943 |
| 12:23:30 | 1.775 | 1.816 | 0.944 |
| 12:23:35 | 1.759 | 1.801 | 0.943 |
| 12:23:40 | 1.763 | 1.804 | 0.943 |
| 12:23:45 | 1.771 | 1.814 | 0.943 |
| 12:23:50 | 1.763 | 1.804 | 0.944 |
| 12:23:55 | 1.775 | 1.816 | 0.944 |
| 12:24:00 | 1.783 | 1.825 | 0.944 |
| 12:24:05 | 1.789 | 1.834 | 0.944 |
| 12:24:10 | 1.773 | 1.818 | 0.944 |
| 12:24:15 | 1.759 | 1.803 | 0.943 |
| 12:24:20 | 1.751 | 1.793 | 0.943 |
| 12:24:25 | 1.772 | 1.815 | 0.944 |
| 12:24:30 | 1.771 | 1.815 | 0.944 |
| 12:24:35 | 1.757 | 1.800 | 0.943 |
| 12:24:40 | 1.767 | 1.809 | 0.943 |
| 12:24:45 | 1.774 | 1.818 | 0.944 |
| 12:24:50 | 1.767 | 1.810 | 0.944 |
| 12:24:55 | 1.758 | 1.802 | 0.943 |
| 12:25:00 | 1.760 | 1.802 | 0.943 |
| 12:25:05 | 1.768 | 1.809 | 0.943 |
| 12:25:10 | 1.777 | 1.818 | 0.944 |
| 12:25:15 | 1.782 | 1.825 | 0.944 |
| 12:25:20 | 1.782 | 1.824 | 0.944 |
| 12:25:25 | 1.772 | 1.816 | 0.944 |
| 12:25:30 | 1.753 | 1.795 | 0.942 |
| 12:25:35 | 1.743 | 1.785 | 0.942 |
| 12:25:40 | 1.756 | 1.796 | 0.942 |
| 12:25:45 | 1.787 | 1.827 | 0.944 |
| 12:25:50 | 1.789 | 1.831 | 0.944 |

10.3 Power adjustment for ambient conditions

10.3.1 When it is required that the engine be operated under conditions different from the standard reference conditions given in clause 5 of ISO 15550:2002, and if it is required that the power output be adjusted to or from the standard reference conditions, the following equations shall be used if other methods are not stated by the manufacturer (see note 2 in 10.3.2 and also 10.3.4):

$$P_x = \alpha \times P_t$$
 (1)

NOTE In equation (1), the mathematical approach is inverse of that of equations (1) and (2) of ISO 15550:—, clause 7.

where the power adjustment factor,  $\alpha$ , is given by:

$$\alpha = k - 0,7 \left( 1 - k \right) \left( \frac{1}{\eta_m} - 1 \right)$$
 (2)

where the ratio of indicated power is:

$$k = \left( \frac{p_x - a \phi_x p_{sx}}{p_t - a \phi_t p_{sr}} \right)^m \left( \frac{T_t}{T_x} \right)^n \left( \frac{T_{cr}}{T_{cx}} \right)^s$$
 (3)

10.4 Recalculation of fuel consumption at test or site ambient conditions for adjusted engines

When it is required that the engine be operated under test or site ambient conditions different from the standard reference conditions given in clause 5 of ISO 15550:2002 the specific fuel consumption will differ from that declared for the standard reference conditions and shall be recalculated for or from the standard reference conditions.

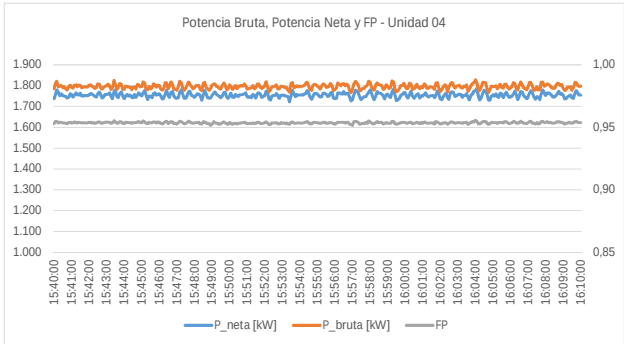
The following equations shall be used if other methods are not declared by the manufacturer:

$$b_x = \beta \ b_t$$
 (7)

where  $\beta = \frac{k}{\alpha}$  (8)

|          |       |       |       |
|----------|-------|-------|-------|
| 12:25:55 | 1.769 | 1.811 | 0.943 |
| 12:26:00 | 1.771 | 1.810 | 0.943 |
| 12:26:05 | 1.768 | 1.809 | 0.944 |
| 12:26:10 | 1.760 | 1.800 | 0.943 |
| 12:26:15 | 1.771 | 1.811 | 0.944 |
| 12:26:20 | 1.772 | 1.813 | 0.944 |
| 12:26:25 | 1.759 | 1.799 | 0.943 |
| 12:26:30 | 1.760 | 1.800 | 0.943 |
| 12:26:35 | 1.774 | 1.813 | 0.944 |
| 12:26:40 | 1.784 | 1.824 | 0.944 |
| 12:26:45 | 1.786 | 1.827 | 0.944 |
| 12:26:50 | 1.772 | 1.814 | 0.944 |
| 12:26:55 | 1.765 | 1.805 | 0.943 |
| 12:27:00 | 1.757 | 1.799 | 0.943 |
| 12:27:05 | 1.754 | 1.793 | 0.943 |
| 12:27:10 | 1.777 | 1.816 | 0.944 |
| 12:27:15 | 1.777 | 1.819 | 0.944 |
| 12:27:20 | 1.766 | 1.808 | 0.943 |
| 12:27:25 | 1.750 | 1.790 | 0.943 |
| 12:27:30 | 1.755 | 1.793 | 0.943 |
| 12:27:35 | 1.800 | 1.840 | 0.945 |
| 12:27:40 | 1.788 | 1.831 | 0.944 |
| 12:27:45 | 1.767 | 1.809 | 0.944 |
| 12:27:50 | 1.762 | 1.802 | 0.943 |
| 12:27:55 | 1.778 | 1.817 | 0.945 |
| 12:28:00 | 1.786 | 1.826 | 0.944 |
| 12:28:05 | 1.768 | 1.809 | 0.944 |
| 12:28:10 | 1.773 | 1.813 | 0.944 |
| 12:28:15 | 1.779 | 1.820 | 0.944 |
| 12:28:20 | 1.787 | 1.828 | 0.945 |
| 12:28:25 | 1.778 | 1.820 | 0.944 |
| 12:28:30 | 1.769 | 1.809 | 0.944 |
| 12:28:35 | 1.763 | 1.804 | 0.944 |
| 12:28:40 | 1.725 | 1.768 | 0.942 |
| 12:28:45 | 1.735 | 1.772 | 0.942 |
| 12:28:50 | 1.782 | 1.822 | 0.944 |
| 12:28:55 | 1.781 | 1.822 | 0.945 |
| 12:29:00 | 1.779 | 1.820 | 0.944 |
| 12:29:05 | 1.780 | 1.821 | 0.944 |
| 12:29:10 | 1.773 | 1.814 | 0.944 |
| 12:29:15 | 1.759 | 1.800 | 0.943 |
| 12:29:20 | 1.770 | 1.809 | 0.944 |
| 12:29:25 | 1.778 | 1.819 | 0.944 |
| 12:29:30 | 1.788 | 1.829 | 0.945 |
| 12:29:35 | 1.780 | 1.821 | 0.944 |
| 12:29:40 | 1.770 | 1.811 | 0.944 |
| 12:29:45 | 1.790 | 1.829 | 0.945 |
| 12:29:50 | 1.793 | 1.835 | 0.945 |
| 12:29:55 | 1.762 | 1.804 | 0.943 |
| 12:30:00 | 1.744 | 1.785 | 0.939 |

|           |             |              |       |
|-----------|-------------|--------------|-------|
| Promedio  | 1.754       | 1.796        | 0.95  |
| Unidad 04 |             |              |       |
| Hora      | P_neta [kW] | P_bruta [kW] | FP    |
| 15:40:00  | 1.737       | 1.785        | 0,953 |
| 15:40:05  | 1.756       | 1.810        | 0,955 |
| 15:40:10  | 1.779       | 1.820        | 0,955 |
| 15:40:15  | 1.766       | 1.795        | 0,954 |
| 15:40:20  | 1.751       | 1.797        | 0,954 |
| 15:40:25  | 1.761       | 1.800        | 0,954 |
| 15:40:30  | 1.753       | 1.791        | 0,954 |
| 15:40:35  | 1.751       | 1.795        | 0,954 |
| 15:40:40  | 1.749       | 1.785        | 0,953 |
| 15:40:45  | 1.741       | 1.779        | 0,953 |
| 15:40:50  | 1.743       | 1.795        | 0,954 |
| 15:40:55  | 1.760       | 1.802        | 0,954 |
| 15:41:00  | 1.757       | 1.793        | 0,954 |
| 15:41:05  | 1.745       | 1.788        | 0,953 |
| 15:41:10  | 1.754       | 1.803        | 0,954 |
| 15:41:15  | 1.765       | 1.803        | 0,954 |
| 15:41:20  | 1.756       | 1.794        | 0,954 |
| 15:41:25  | 1.755       | 1.802        | 0,954 |
| 15:41:30  | 1.764       | 1.801        | 0,954 |
| 15:41:35  | 1.750       | 1.790        | 0,953 |
| 15:41:40  | 1.751       | 1.793        | 0,954 |
| 15:41:45  | 1.754       | 1.795        | 0,953 |
| 15:41:50  | 1.753       | 1.794        | 0,954 |
| 15:41:55  | 1.751       | 1.792        | 0,953 |
| 15:42:00  | 1.756       | 1.802        | 0,954 |
| 15:42:05  | 1.763       | 1.804        | 0,954 |
| 15:42:10  | 1.759       | 1.797        | 0,953 |
| 15:42:15  | 1.753       | 1.793        | 0,954 |
| 15:42:20  | 1.749       | 1.787        | 0,953 |
| 15:42:25  | 1.746       | 1.792        | 0,954 |
| 15:42:30  | 1.760       | 1.808        | 0,954 |
| 15:42:35  | 1.769       | 1.807        | 0,954 |
| 15:42:40  | 1.755       | 1.786        | 0,953 |
| 15:42:45  | 1.741       | 1.783        | 0,953 |
| 15:42:50  | 1.746       | 1.793        | 0,954 |
| 15:42:55  | 1.757       | 1.798        | 0,954 |
| 15:43:00  | 1.757       | 1.799        | 0,954 |
| 15:43:05  | 1.759       | 1.807        | 0,954 |
| 15:43:10  | 1.765       | 1.799        | 0,954 |
| 15:43:15  | 1.748       | 1.782        | 0,953 |
| 15:43:20  | 1.738       | 1.789        | 0,954 |
| 15:43:25  | 1.771       | 1.825        | 0,955 |
| 15:43:30  | 1.780       | 1.807        | 0,954 |
| 15:43:35  | 1.748       | 1.781        | 0,953 |
| 15:43:40  | 1.742       | 1.791        | 0,953 |
| 15:43:45  | 1.762       | 1.810        | 0,955 |
| 15:43:50  | 1.769       | 1.806        | 0,954 |
| 15:43:55  | 1.752       | 1.782        | 0,953 |
| 15:44:00  | 1.737       | 1.783        | 0,953 |
| 15:44:05  | 1.751       | 1.798        | 0,954 |
| 15:44:10  | 1.758       | 1.796        | 0,954 |
| 15:44:15  | 1.751       | 1.793        | 0,954 |
| 15:44:20  | 1.755       | 1.793        | 0,954 |
| 15:44:25  | 1.744       | 1.781        | 0,953 |
| 15:44:30  | 1.742       | 1.793        | 0,954 |
| 15:44:35  | 1.757       | 1.794        | 0,954 |
| 15:44:40  | 1.744       | 1.784        | 0,954 |
| 15:44:45  | 1.754       | 1.805        | 0,954 |
| 15:44:50  | 1.765       | 1.803        | 0,955 |
| 15:44:55  | 1.757       | 1.795        | 0,954 |
| 15:45:00  | 1.751       | 1.796        | 0,954 |
| 15:45:05  | 1.766       | 1.818        | 0,955 |
| 15:45:10  | 1.778       | 1.812        | 0,954 |
| 15:45:15  | 1.755       | 1.782        | 0,953 |
| 15:45:20  | 1.732       | 1.781        | 0,953 |
| 15:45:25  | 1.750       | 1.796        | 0,954 |
| 15:45:30  | 1.751       | 1.786        | 0,953 |
| 15:45:35  | 1.743       | 1.790        | 0,954 |
| 15:45:40  | 1.760       | 1.808        | 0,954 |
| 15:45:45  | 1.765       | 1.803        | 0,954 |
| 15:45:50  | 1.754       | 1.794        | 0,954 |
| 15:45:55  | 1.758       | 1.802        | 0,954 |
| 15:46:00  | 1.761       | 1.802        | 0,954 |
| 15:46:05  | 1.752       | 1.783        | 0,953 |
| 15:46:10  | 1.736       | 1.779        | 0,953 |
| 15:46:15  | 1.739       | 1.786        | 0,953 |
| 15:46:20  | 1.760       | 1.815        | 0,955 |
| 15:46:25  | 1.778       | 1.813        | 0,955 |
| 15:46:30  | 1.754       | 1.785        | 0,953 |
| 15:46:35  | 1.744       | 1.797        | 0,954 |
| 15:46:40  | 1.769       | 1.818        | 0,954 |
| 15:46:45  | 1.772       | 1.803        | 0,954 |
| 15:46:50  | 1.749       | 1.783        | 0,953 |
| 15:46:55  | 1.740       | 1.782        | 0,953 |
| 15:47:00  | 1.739       | 1.778        | 0,953 |
| 15:47:05  | 1.742       | 1.796        | 0,954 |
| 15:47:10  | 1.768       | 1.820        | 0,955 |
| 15:47:15  | 1.780       | 1.815        | 0,954 |
| 15:47:20  | 1.757       | 1.787        | 0,953 |
| 15:47:25  | 1.739       | 1.778        | 0,953 |
| 15:47:30  | 1.740       | 1.787        | 0,953 |
| 15:47:35  | 1.752       | 1.801        | 0,954 |
| 15:47:40  | 1.771       | 1.818        | 0,955 |
| 15:47:45  | 1.774       | 1.805        | 0,954 |
| 15:47:50  | 1.753       | 1.795        | 0,954 |
| 15:47:55  | 1.750       | 1.786        | 0,953 |
| 15:48:00  | 1.744       | 1.790        | 0,953 |
| 15:48:05  | 1.753       | 1.801        | 0,954 |
| 15:48:10  | 1.760       | 1.801        | 0,954 |
| 15:48:15  | 1.759       | 1.801        | 0,954 |
| 15:48:20  | 1.753       | 1.783        | 0,953 |
| 15:48:25  | 1.731       | 1.776        | 0,953 |
| 15:48:30  | 1.755       | 1.812        | 0,954 |
| 15:48:35  | 1.778       | 1.817        | 0,954 |
| 15:48:40  | 1.760       | 1.789        | 0,953 |
| 15:48:45  | 1.743       | 1.785        | 0,953 |
| 15:48:50  | 1.740       | 1.778        | 0,953 |
| 15:48:55  | 1.740       | 1.787        | 0,952 |
| 15:49:00  | 1.753       | 1.802        | 0,953 |
| 15:49:05  | 1.764       | 1.809        | 0,954 |
| 15:49:10  | 1.769       | 1.808        | 0,954 |
| 15:49:15  | 1.758       | 1.796        | 0,953 |
| 15:49:20  | 1.754       | 1.794        | 0,953 |
| 15:49:25  | 1.749       | 1.786        | 0,952 |
| 15:49:30  | 1.742       | 1.784        | 0,953 |
| 15:49:35  | 1.750       | 1.800        | 0,954 |
| 15:49:40  | 1.767       | 1.812        | 0,954 |
| 15:49:45  | 1.768       | 1.802        | 0,953 |
| 15:49:50  | 1.746       | 1.781        | 0,953 |
| 15:49:55  | 1.739       | 1.784        | 0,952 |
| 15:50:00  | 1.752       | 1.804        | 0,954 |
| 15:50:05  | 1.764       | 1.797        | 0,953 |
| 15:50:10  | 1.744       | 1.783        | 0,952 |
| 15:50:15  | 1.743       | 1.791        | 0,953 |
| 15:50:20  | 1.757       | 1.801        | 0,953 |
| 15:50:25  | 1.750       | 1.785        | 0,953 |
| 15:50:30  | 1.748       | 1.797        | 0,953 |
| 15:50:35  | 1.757       | 1.797        | 0,953 |
| 15:50:40  | 1.757       | 1.801        | 0,953 |
| 15:50:45  | 1.757       | 1.797        | 0,954 |
| 15:50:50  | 1.760       | 1.808        | 0,954 |
| 15:50:55  | 1.765       | 1.800        | 0,953 |
| 15:51:00  | 1.747       | 1.784        | 0,953 |



|             |             |        |     |      |
|-------------|-------------|--------|-----|------|
| Corrección  |             |        | 0,3 | -0,9 |
| Ambientales |             |        |     |      |
| Tiempo      | T_amb [°C]  | HR [%] |     |      |
| 15:40:00    | 25          | 27     |     |      |
| 15:41:00    | 23          | 28     |     |      |
| 15:42:00    | 24          | 27     |     |      |
| 15:43:00    | 24          | 27     |     |      |
| 15:44:00    | 24          | 27     |     |      |
| 15:45:00    | 23          | 27     |     |      |
| 15:46:00    | 23          | 27     |     |      |
| 15:47:00    | 24          | 25     |     |      |
| 15:48:00    | 24          | 25     |     |      |
| 15:49:00    | 25          | 26     |     |      |
| 15:50:00    | 25          | 26     |     |      |
| 15:51:00    | 26          | 25     |     |      |
| 15:52:00    | 25          | 25     |     |      |
| 15:53:00    | 24          | 26     |     |      |
| 15:54:00    | 25          | 24     |     |      |
| 15:55:00    | 23          | 24     |     |      |
| 15:56:00    | 26          | 25     |     |      |
| 15:57:00    | 26          | 24     |     |      |
| 15:58:00    | 25          | 25     |     |      |
| 15:59:00    | 24          | 25     |     |      |
| 16:00:00    | 24          | 25     |     |      |
| 16:01:00    | 25          | 24     |     |      |
| 16:02:00    | 24          | 24     |     |      |
| 16:03:00    | 25          | 23     |     |      |
| 16:04:00    | 24          | 25     |     |      |
| 16:05:00    | 24          | 25     |     |      |
| 16:06:00    | 24          | 25     |     |      |
| 16:07:00    | 24          | 24     |     |      |
| 16:08:00    | 24          | 25     |     |      |
| 16:09:00    | 26          | 23     |     |      |
| 16:10:00    | 24          | 24     |     |      |
| Promedio    | 24,31       | 25,2   |     |      |
| Corregidos  | 24,60645161 | 24,3   |     |      |

|                 |           |               |
|-----------------|-----------|---------------|
| Celda de Carga  |           |               |
| Tiempo          | Masa [kg] | Cons [kg/min] |
| 15:40           | 885       | -             |
| 15:41           | 879       | 6             |
| 15:42           | 874       | 5             |
| 15:43           | 868       | 6             |
| 15:44           | 862       | 6             |
| 15:45           | 856       | 6             |
| 15:46           | 850       | 6             |
| 15:47           | 844       | 6             |
| 15:48           | 838       | 6             |
| 15:49           | 832       | 6             |
| 15:50           | 826       | 6             |
| 15:51           | 820       | 6             |
| 15:52           | 814       | 6             |
| 15:53           | 808       | 6             |
| 15:54           | 802       | 6             |
| 15:55           | 796       | 6             |
| 15:56           | 790       | 6             |
| 15:57           | 784       | 6             |
| 15:58           | 778       | 6             |
| 15:59           | 773       | 5             |
| 16:00           | 767       | 6             |
| 16:01           | 760       | 7             |
| 16:02           | 754       | 6             |
| 16:03           | 749       | 5             |
| 16:04           | 743       | 6             |
| 16:05           | 737       | 6             |
| 16:06           | 731       | 6             |
| 16:07           | 724       | 7             |
| 16:08           | 718       | 6             |
| 16:09           | 713       | 5             |
| 16:10           | 707       | 6             |
| Promedio [kg/h] | 356,0     |               |

|                 |       |
|-----------------|-------|
| Consumo [lts/h] | 427,8 |
|-----------------|-------|

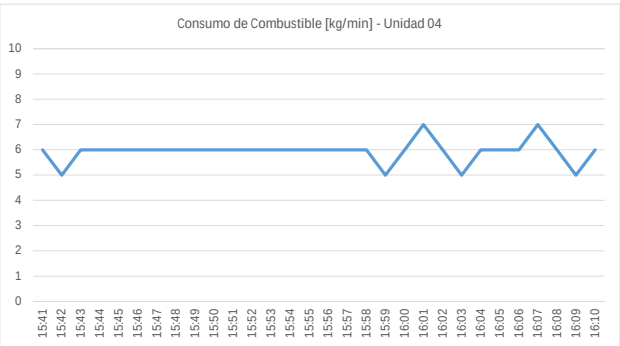
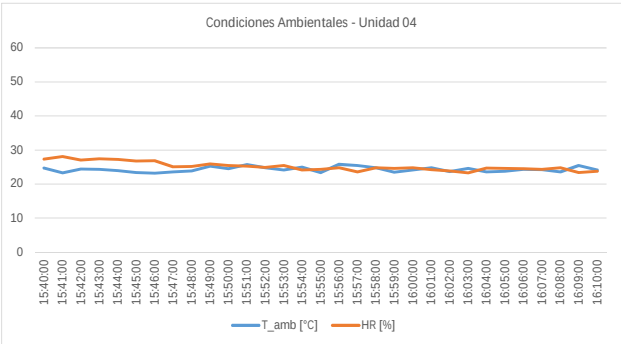
|                                        |       |            |
|----------------------------------------|-------|------------|
| Consumo Específico Neto sin corrección |       |            |
| C_esp_volumen                          | 243,9 | [lts/MWh]  |
| C_esp_masa                             | 203,0 | [kg/MWh]   |
| C_esp_calorias                         | 2.221 | [kcal/MWh] |

|                       |        |         |
|-----------------------|--------|---------|
| Combustible Diesel B2 |        |         |
| Densidad              | 0,8321 | kg/lts  |
| PCI                   | --     | kcal/kg |
| PCS                   | 10.945 | kcal/kg |

|                       |                  |                                   |               |
|-----------------------|------------------|-----------------------------------|---------------|
| Correcciones ISO 3046 |                  |                                   |               |
| coef a                | 0                | Tabla B.1 ISO 3046-1 motor tipo D |               |
| coef m                | 0,7              |                                   |               |
| coef n                | 1,2              |                                   |               |
| coef s                | 0                | no aplica                         |               |
| eficiencia mec        | 0,8              | ISO 3046                          |               |
| alfa                  | 0,9344           | ISO 3046                          |               |
| k                     | 0,9442           | ISO 3046                          |               |
| px                    | no aplica correc | Presión Atm Test                  | kPa           |
| pr                    | no aplica correc | Presión Atm Ref                   | kPa           |
| Tx [°K]               | 297,6            | Temp Test                         | grados Kelvin |
| Tr [°K]               | 283,7            | Temp Ref                          | grados Kelvin |
| Bx                    | 356,0            | C_esp medido                      | kg/h          |
| Br                    | 352,3            | C_esp ISO                         | kg/h          |
| Corrección ISO        | -1,03%           |                                   |               |

|                                   |       |    |
|-----------------------------------|-------|----|
| Corrección Factor de Potencia     |       |    |
| FP promedio                       | 0,95  |    |
| FP = 0,95 >> NO APLICA CORRECCIÓN |       |    |
| Pneta                             | 1.754 | kW |
| Pneta correg_FP                   | 1.754 | kW |
| Corrección FP                     | 0,00% |    |

|                 |        |              |
|-----------------|--------|--------------|
| C_esp Corregido | 0,2009 | kg / kWh     |
| C_esp Corregido | 241    | litros / MWh |



ISO 3046-1:2002(E)

Table 2 — Numerical values for power adjustment

| Engine type                                                                        | Fuel type        | Conditions                              | Formula reference                        | Factor | Exponents   |
|------------------------------------------------------------------------------------|------------------|-----------------------------------------|------------------------------------------|--------|-------------|
| Diesel engines and dual fuel compression-ignition engines operating on liquid fuel | Diesel fuel oils | Non-turbocharged                        | Power limited by air to fuel ratio       | A      | 1 1 0,75 0  |
|                                                                                    |                  |                                         | Power limited by thermal loading         | B      | 0 1 1 0     |
|                                                                                    |                  | Turbocharged without charge air cooling | Low and medium speed four-stroke engines | C      | 0 0,7 2 0   |
|                                                                                    |                  | Turbocharged with charge air cooling    |                                          | D      | 0 0,7 1,2 1 |

|       |                                                                                                                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NOTES |                                                                                                                                                                                                                                                                                                  |
| 1     | The formula references and exponents have been derived by CIMAC (International Council on Combustion Engines).                                                                                                                                                                                   |
| 2     | The factors and exponents have been established by tests on a number of engines to be representative of the types of engines specified. They may be considered as a guideline.<br>Engine manufacturers may alternatively declare their own values appropriate to their individual engine design. |
| 3     | The values of exponent <i>s</i> applies to power adjustment from a reference charge air coolant temperature.<br>Where the charge air is cooled by engine jacket water at nominally constant temperature the value of 's' could be taken as zero.                                                 |
| 4     | The formulae reference A and D are applied in the examples given in annexes C and D.                                                                                                                                                                                                             |
| 5     | High speed four-stroke engines subject to power adjustment are not covered in this table. The correction factors and exponents shall be specified by engine manufacturer.                                                                                                                        |
| 6     | nr = There are no values recommended. It is up to the engine manufacturers to use their own values appropriate to their individual engine design.                                                                                                                                                |

### 10.3 Power adjustment for ambient conditions

**10.3.1** When it is required that the engine be operated under conditions different from the standard reference conditions given in clause 5 of ISO 15550:2002, and if it is required that the power output be adjusted to or from the standard reference conditions, the following equations shall be used if other methods are not stated by the manufacturer (see note 2 in 10.3.2 and also 10.3.4):

$$P_x = \alpha \times P_r \tag{1}$$

NOTE In equation (1), the mathematical approach is inverse of that of equations (1) and (2) of ISO 15550:—, clause 7.

where the power adjustment factor,  $\alpha$ , is given by:

$$\alpha = k - 0,7 \left( 1 - k \right) \left( \frac{1}{\eta_m} - 1 \right) \tag{2}$$

where the ratio of indicated power is:

$$k = \left( \frac{p_x - a \phi_x p_{ax}}{p_r - a \phi_r p_{sr}} \right)^m \left( \frac{T_r}{T_x} \right)^n \left( \frac{T_{cr}}{T_{cx}} \right)^s \tag{3}$$

### 10.4 Recalculation of fuel consumption at test or site ambient conditions for adjusted engines

When it is required that the engine be operated under test or site ambient conditions different from the standard reference conditions given in clause 5 of ISO 15550:2002 the specific fuel consumption will differ from that declared for the standard reference conditions and shall be recalculated for or from the standard reference conditions.

The following equations shall be used if other methods are not declared by the manufacturer:



|          |       |       |       |
|----------|-------|-------|-------|
| 15:51:05 | 1.744 | 1.787 | 0,953 |
| 15:51:10 | 1.747 | 1.787 | 0,953 |
| 15:51:15 | 1.743 | 1.790 | 0,953 |
| 15:51:20 | 1.758 | 1.800 | 0,954 |
| 15:51:25 | 1.751 | 1.785 | 0,953 |
| 15:51:30 | 1.740 | 1.791 | 0,953 |
| 15:51:35 | 1.763 | 1.808 | 0,954 |
| 15:51:40 | 1.766 | 1.808 | 0,954 |
| 15:51:45 | 1.760 | 1.791 | 0,953 |
| 15:51:50 | 1.744 | 1.786 | 0,953 |
| 15:51:55 | 1.748 | 1.791 | 0,953 |
| 15:52:00 | 1.751 | 1.801 | 0,954 |
| 15:52:05 | 1.773 | 1.819 | 0,954 |
| 15:52:10 | 1.766 | 1.793 | 0,953 |
| 15:52:15 | 1.737 | 1.772 | 0,952 |
| 15:52:20 | 1.732 | 1.781 | 0,953 |
| 15:52:25 | 1.750 | 1.795 | 0,953 |
| 15:52:30 | 1.753 | 1.796 | 0,953 |
| 15:52:35 | 1.753 | 1.798 | 0,953 |
| 15:52:40 | 1.762 | 1.803 | 0,954 |
| 15:52:45 | 1.752 | 1.784 | 0,953 |
| 15:52:50 | 1.739 | 1.785 | 0,953 |
| 15:52:55 | 1.753 | 1.798 | 0,954 |
| 15:53:00 | 1.755 | 1.797 | 0,953 |
| 15:53:05 | 1.755 | 1.795 | 0,954 |
| 15:53:10 | 1.750 | 1.790 | 0,953 |
| 15:53:15 | 1.750 | 1.792 | 0,954 |
| 15:53:20 | 1.746 | 1.778 | 0,952 |
| 15:53:25 | 1.722 | 1.769 | 0,952 |
| 15:53:30 | 1.752 | 1.811 | 0,954 |
| 15:53:35 | 1.777 | 1.815 | 0,954 |
| 15:53:40 | 1.760 | 1.791 | 0,953 |
| 15:53:45 | 1.746 | 1.794 | 0,953 |
| 15:53:50 | 1.757 | 1.799 | 0,954 |
| 15:53:55 | 1.755 | 1.795 | 0,953 |
| 15:54:00 | 1.754 | 1.798 | 0,953 |
| 15:54:05 | 1.756 | 1.797 | 0,953 |
| 15:54:10 | 1.754 | 1.797 | 0,954 |
| 15:54:15 | 1.759 | 1.800 | 0,954 |
| 15:54:20 | 1.763 | 1.813 | 0,954 |
| 15:54:25 | 1.776 | 1.817 | 0,954 |
| 15:54:30 | 1.766 | 1.798 | 0,954 |
| 15:54:35 | 1.745 | 1.781 | 0,953 |
| 15:54:40 | 1.735 | 1.778 | 0,953 |
| 15:54:45 | 1.747 | 1.799 | 0,954 |
| 15:54:50 | 1.763 | 1.807 | 0,954 |
| 15:54:55 | 1.764 | 1.803 | 0,954 |
| 15:55:00 | 1.758 | 1.798 | 0,954 |
| 15:55:05 | 1.751 | 1.791 | 0,953 |
| 15:55:10 | 1.745 | 1.784 | 0,953 |
| 15:55:15 | 1.748 | 1.799 | 0,954 |
| 15:55:20 | 1.764 | 1.808 | 0,954 |
| 15:55:25 | 1.764 | 1.804 | 0,954 |
| 15:55:30 | 1.757 | 1.792 | 0,953 |
| 15:55:35 | 1.748 | 1.793 | 0,953 |
| 15:55:40 | 1.752 | 1.798 | 0,954 |
| 15:55:45 | 1.763 | 1.811 | 0,954 |
| 15:55:50 | 1.768 | 1.800 | 0,953 |
| 15:55:55 | 1.742 | 1.778 | 0,953 |
| 15:56:00 | 1.738 | 1.781 | 0,953 |
| 15:56:05 | 1.740 | 1.790 | 0,953 |
| 15:56:10 | 1.766 | 1.813 | 0,954 |
| 15:56:15 | 1.765 | 1.804 | 0,954 |
| 15:56:20 | 1.760 | 1.800 | 0,954 |
| 15:56:25 | 1.759 | 1.808 | 0,954 |
| 15:56:30 | 1.771 | 1.809 | 0,954 |
| 15:56:35 | 1.759 | 1.799 | 0,954 |
| 15:56:40 | 1.762 | 1.806 | 0,954 |
| 15:56:45 | 1.764 | 1.801 | 0,954 |
| 15:56:50 | 1.746 | 1.776 | 0,953 |
| 15:56:55 | 1.727 | 1.767 | 0,952 |
| 15:57:00 | 1.733 | 1.784 | 0,952 |
| 15:57:05 | 1.755 | 1.809 | 0,954 |
| 15:57:10 | 1.777 | 1.820 | 0,955 |
| 15:57:15 | 1.773 | 1.812 | 0,954 |
| 15:57:20 | 1.764 | 1.802 | 0,954 |
| 15:57:25 | 1.744 | 1.774 | 0,953 |
| 15:57:30 | 1.734 | 1.780 | 0,953 |
| 15:57:35 | 1.743 | 1.787 | 0,953 |
| 15:57:40 | 1.746 | 1.787 | 0,953 |
| 15:57:45 | 1.748 | 1.796 | 0,954 |
| 15:57:50 | 1.759 | 1.802 | 0,953 |
| 15:57:55 | 1.768 | 1.821 | 0,955 |
| 15:58:00 | 1.780 | 1.816 | 0,954 |
| 15:58:05 | 1.764 | 1.795 | 0,953 |
| 15:58:10 | 1.744 | 1.779 | 0,953 |
| 15:58:15 | 1.733 | 1.780 | 0,953 |
| 15:58:20 | 1.751 | 1.805 | 0,954 |
| 15:58:25 | 1.772 | 1.813 | 0,955 |
| 15:58:30 | 1.764 | 1.805 | 0,954 |
| 15:58:35 | 1.763 | 1.803 | 0,954 |
| 15:58:40 | 1.759 | 1.800 | 0,954 |
| 15:58:45 | 1.751 | 1.782 | 0,953 |
| 15:58:50 | 1.736 | 1.785 | 0,953 |
| 15:58:55 | 1.756 | 1.804 | 0,954 |
| 15:59:00 | 1.760 | 1.796 | 0,953 |
| 15:59:05 | 1.748 | 1.787 | 0,953 |
| 15:59:10 | 1.744 | 1.792 | 0,953 |
| 15:59:15 | 1.767 | 1.822 | 0,955 |
| 15:59:20 | 1.783 | 1.818 | 0,955 |
| 15:59:25 | 1.757 | 1.780 | 0,953 |
| 15:59:30 | 1.728 | 1.771 | 0,953 |
| 15:59:35 | 1.732 | 1.775 | 0,953 |
| 15:59:40 | 1.737 | 1.787 | 0,953 |
| 15:59:45 | 1.755 | 1.800 | 0,954 |
| 15:59:50 | 1.756 | 1.801 | 0,954 |
| 15:59:55 | 1.766 | 1.812 | 0,954 |
| 16:00:00 | 1.766 | 1.799 | 0,954 |
| 16:00:05 | 1.748 | 1.785 | 0,953 |
| 16:00:10 | 1.741 | 1.787 | 0,953 |
| 16:00:15 | 1.758 | 1.812 | 0,954 |
| 16:00:20 | 1.773 | 1.807 | 0,954 |
| 16:00:25 | 1.750 | 1.783 | 0,953 |
| 16:00:30 | 1.739 | 1.785 | 0,953 |
| 16:00:35 | 1.749 | 1.793 | 0,953 |
| 16:00:40 | 1.757 | 1.806 | 0,954 |
| 16:00:45 | 1.761 | 1.792 | 0,953 |
| 16:00:50 | 1.741 | 1.785 | 0,953 |
| 16:00:55 | 1.751 | 1.796 | 0,954 |
| 16:01:00 | 1.750 | 1.791 | 0,953 |
| 16:01:05 | 1.758 | 1.808 | 0,954 |
| 16:01:10 | 1.765 | 1.801 | 0,954 |
| 16:01:15 | 1.750 | 1.787 | 0,953 |
| 16:01:20 | 1.745 | 1.788 | 0,953 |
| 16:01:25 | 1.751 | 1.794 | 0,954 |
| 16:01:30 | 1.752 | 1.793 | 0,953 |
| 16:01:35 | 1.752 | 1.792 | 0,953 |
| 16:01:40 | 1.742 | 1.782 | 0,953 |
| 16:01:45 | 1.753 | 1.810 | 0,954 |
| 16:01:50 | 1.775 | 1.815 | 0,954 |
| 16:01:55 | 1.763 | 1.791 | 0,954 |
| 16:02:00 | 1.736 | 1.771 | 0,953 |
| 16:02:05 | 1.733 | 1.783 | 0,953 |
| 16:02:10 | 1.747 | 1.793 | 0,953 |
| 16:02:15 | 1.757 | 1.803 | 0,954 |
| 16:02:20 | 1.763 | 1.801 | 0,954 |
| 16:02:25 | 1.742 | 1.771 | 0,952 |
| 16:02:30 | 1.735 | 1.792 | 0,953 |
| 16:02:35 | 1.765 | 1.810 | 0,954 |
| 16:02:40 | 1.770 | 1.815 | 0,954 |
| 16:02:45 | 1.768 | 1.802 | 0,954 |
| 16:02:50 | 1.749 | 1.789 | 0,953 |
| 16:02:55 | 1.752 | 1.797 | 0,954 |

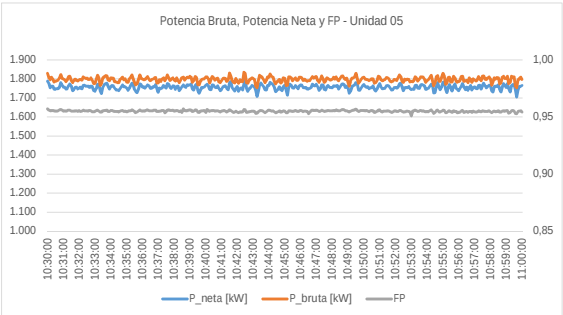
|                 |        |            |
|-----------------|--------|------------|
| C_esp Corregido | 2.198  | kcal / kWh |
| Corrección      | -1,03% |            |

0000

|          |       |       |       |
|----------|-------|-------|-------|
| 16:03:00 | 1.757 | 1.799 | 0,954 |
| 16:03:05 | 1.758 | 1.802 | 0,954 |
| 16:03:10 | 1.758 | 1.792 | 0,953 |
| 16:03:15 | 1.744 | 1.788 | 0,953 |
| 16:03:20 | 1.753 | 1.798 | 0,954 |
| 16:03:25 | 1.753 | 1.795 | 0,954 |
| 16:03:30 | 1.762 | 1.804 | 0,954 |
| 16:03:35 | 1.745 | 1.773 | 0,952 |
| 16:03:40 | 1.732 | 1.784 | 0,953 |
| 16:03:45 | 1.753 | 1.799 | 0,954 |
| 16:03:50 | 1.761 | 1.811 | 0,955 |
| 16:03:55 | 1.773 | 1.814 | 0,954 |
| 16:04:00 | 1.777 | 1.827 | 0,956 |
| 16:04:05 | 1.786 | 1.814 | 0,955 |
| 16:04:10 | 1.749 | 1.776 | 0,953 |
| 16:04:15 | 1.731 | 1.778 | 0,953 |
| 16:04:20 | 1.743 | 1.792 | 0,953 |
| 16:04:25 | 1.764 | 1.816 | 0,955 |
| 16:04:30 | 1.777 | 1.817 | 0,955 |
| 16:04:35 | 1.773 | 1.813 | 0,954 |
| 16:04:40 | 1.759 | 1.786 | 0,953 |
| 16:04:45 | 1.730 | 1.767 | 0,952 |
| 16:04:50 | 1.731 | 1.781 | 0,953 |
| 16:04:55 | 1.751 | 1.798 | 0,954 |
| 16:05:00 | 1.755 | 1.794 | 0,954 |
| 16:05:05 | 1.750 | 1.796 | 0,954 |
| 16:05:10 | 1.761 | 1.800 | 0,954 |
| 16:05:15 | 1.748 | 1.785 | 0,953 |
| 16:05:20 | 1.744 | 1.794 | 0,954 |
| 16:05:25 | 1.764 | 1.808 | 0,954 |
| 16:05:30 | 1.759 | 1.791 | 0,954 |
| 16:05:35 | 1.743 | 1.788 | 0,953 |
| 16:05:40 | 1.757 | 1.808 | 0,954 |
| 16:05:45 | 1.769 | 1.807 | 0,954 |
| 16:05:50 | 1.756 | 1.792 | 0,954 |
| 16:05:55 | 1.744 | 1.783 | 0,953 |
| 16:06:00 | 1.745 | 1.789 | 0,953 |
| 16:06:05 | 1.750 | 1.797 | 0,954 |
| 16:06:10 | 1.762 | 1.814 | 0,955 |
| 16:06:15 | 1.774 | 1.809 | 0,954 |
| 16:06:20 | 1.754 | 1.783 | 0,953 |
| 16:06:25 | 1.734 | 1.780 | 0,953 |
| 16:06:30 | 1.750 | 1.802 | 0,954 |
| 16:06:35 | 1.772 | 1.818 | 0,955 |
| 16:06:40 | 1.770 | 1.803 | 0,954 |
| 16:06:45 | 1.752 | 1.788 | 0,953 |
| 16:06:50 | 1.745 | 1.785 | 0,953 |
| 16:06:55 | 1.738 | 1.781 | 0,953 |
| 16:07:00 | 1.745 | 1.793 | 0,954 |
| 16:07:05 | 1.765 | 1.816 | 0,955 |
| 16:07:10 | 1.776 | 1.815 | 0,955 |
| 16:07:15 | 1.766 | 1.798 | 0,953 |
| 16:07:20 | 1.743 | 1.778 | 0,953 |
| 16:07:25 | 1.734 | 1.778 | 0,953 |
| 16:07:30 | 1.748 | 1.794 | 0,954 |
| 16:07:35 | 1.746 | 1.780 | 0,953 |
| 16:07:40 | 1.734 | 1.781 | 0,953 |
| 16:07:45 | 1.758 | 1.816 | 0,955 |
| 16:07:50 | 1.780 | 1.818 | 0,955 |
| 16:07:55 | 1.766 | 1.798 | 0,954 |
| 16:08:00 | 1.753 | 1.800 | 0,954 |
| 16:08:05 | 1.765 | 1.808 | 0,954 |
| 16:08:10 | 1.765 | 1.805 | 0,954 |
| 16:08:15 | 1.760 | 1.799 | 0,954 |
| 16:08:20 | 1.754 | 1.791 | 0,954 |
| 16:08:25 | 1.746 | 1.788 | 0,953 |
| 16:08:30 | 1.745 | 1.787 | 0,953 |
| 16:08:35 | 1.751 | 1.800 | 0,954 |
| 16:08:40 | 1.763 | 1.811 | 0,954 |
| 16:08:45 | 1.774 | 1.810 | 0,955 |
| 16:08:50 | 1.759 | 1.800 | 0,954 |
| 16:08:55 | 1.763 | 1.805 | 0,954 |
| 16:09:00 | 1.755 | 1.786 | 0,953 |
| 16:09:05 | 1.736 | 1.775 | 0,953 |
| 16:09:10 | 1.737 | 1.783 | 0,953 |
| 16:09:15 | 1.747 | 1.793 | 0,953 |
| 16:09:20 | 1.751 | 1.793 | 0,954 |
| 16:09:25 | 1.755 | 1.795 | 0,954 |
| 16:09:30 | 1.742 | 1.778 | 0,953 |
| 16:09:35 | 1.739 | 1.792 | 0,954 |
| 16:09:40 | 1.764 | 1.816 | 0,955 |
| 16:09:45 | 1.776 | 1.813 | 0,955 |
| 16:09:50 | 1.762 | 1.799 | 0,954 |
| 16:09:55 | 1.754 | 1.797 | 0,954 |
| 16:10:00 | 1.755 | 1.797 | 0,954 |



|           |             |              |       |
|-----------|-------------|--------------|-------|
| Promedio  | 1.756       | 1.797        | 0.96  |
| Unidad 05 |             |              |       |
| Hora      | P_neta [kW] | P_bruta [kW] | FP    |
| 10:30:00  | 1.789       | 1.829        | 0.957 |
| 10:30:05  | 1.775       | 1.805        | 0.956 |
| 10:30:10  | 1.753       | 1.795        | 0.955 |
| 10:30:15  | 1.762       | 1.808        | 0.956 |
| 10:30:20  | 1.762       | 1.798        | 0.956 |
| 10:30:25  | 1.747       | 1.784        | 0.955 |
| 10:30:30  | 1.746       | 1.789        | 0.955 |
| 10:30:35  | 1.748       | 1.788        | 0.955 |
| 10:30:40  | 1.748       | 1.792        | 0.955 |
| 10:30:45  | 1.757       | 1.807        | 0.956 |
| 10:30:50  | 1.779       | 1.822        | 0.957 |
| 10:30:55  | 1.768       | 1.802        | 0.956 |
| 10:31:00  | 1.756       | 1.798        | 0.955 |
| 10:31:05  | 1.756       | 1.796        | 0.955 |
| 10:31:10  | 1.747       | 1.785        | 0.955 |
| 10:31:15  | 1.748       | 1.794        | 0.956 |
| 10:31:20  | 1.762       | 1.810        | 0.956 |
| 10:31:25  | 1.773       | 1.814        | 0.956 |
| 10:31:30  | 1.761       | 1.791        | 0.955 |
| 10:31:35  | 1.739       | 1.780        | 0.955 |
| 10:31:40  | 1.745       | 1.792        | 0.955 |
| 10:31:45  | 1.756       | 1.799        | 0.955 |
| 10:31:50  | 1.756       | 1.792        | 0.955 |
| 10:31:55  | 1.746       | 1.789        | 0.955 |
| 10:32:00  | 1.750       | 1.793        | 0.956 |
| 10:32:05  | 1.757       | 1.796        | 0.955 |
| 10:32:10  | 1.749       | 1.793        | 0.955 |
| 10:32:15  | 1.765       | 1.810        | 0.956 |
| 10:32:20  | 1.767       | 1.806        | 0.955 |
| 10:32:25  | 1.762       | 1.802        | 0.955 |
| 10:32:30  | 1.761       | 1.804        | 0.955 |
| 10:32:35  | 1.761       | 1.798        | 0.955 |
| 10:32:40  | 1.754       | 1.797        | 0.956 |
| 10:32:45  | 1.761       | 1.805        | 0.955 |
| 10:32:50  | 1.760       | 1.794        | 0.955 |
| 10:32:55  | 1.738       | 1.776        | 0.954 |
| 10:33:00  | 1.735       | 1.777        | 0.955 |
| 10:33:05  | 1.748       | 1.798        | 0.955 |
| 10:33:10  | 1.772       | 1.819        | 0.956 |
| 10:33:15  | 1.771       | 1.803        | 0.955 |
| 10:33:20  | 1.737       | 1.765        | 0.954 |
| 10:33:25  | 1.724       | 1.775        | 0.954 |
| 10:33:30  | 1.755       | 1.804        | 0.955 |
| 10:33:35  | 1.770       | 1.813        | 0.956 |
| 10:33:40  | 1.773       | 1.817        | 0.956 |
| 10:33:45  | 1.778       | 1.815        | 0.956 |
| 10:33:50  | 1.760       | 1.793        | 0.955 |
| 10:33:55  | 1.747       | 1.790        | 0.955 |
| 10:34:00  | 1.759       | 1.805        | 0.956 |
| 10:34:05  | 1.765       | 1.804        | 0.956 |
| 10:34:10  | 1.763       | 1.803        | 0.955 |
| 10:34:15  | 1.751       | 1.785        | 0.955 |
| 10:34:20  | 1.742       | 1.784        | 0.955 |
| 10:34:25  | 1.741       | 1.780        | 0.955 |
| 10:34:30  | 1.739       | 1.780        | 0.954 |
| 10:34:35  | 1.748       | 1.797        | 0.955 |
| 10:34:40  | 1.759       | 1.801        | 0.955 |
| 10:34:45  | 1.768       | 1.809        | 0.956 |
| 10:34:50  | 1.759       | 1.795        | 0.955 |
| 10:34:55  | 1.758       | 1.801        | 0.955 |
| 10:35:00  | 1.751       | 1.784        | 0.955 |
| 10:35:05  | 1.739       | 1.781        | 0.955 |
| 10:35:10  | 1.751       | 1.800        | 0.955 |
| 10:35:15  | 1.765       | 1.808        | 0.955 |
| 10:35:20  | 1.776       | 1.821        | 0.956 |
| 10:35:25  | 1.771       | 1.800        | 0.956 |
| 10:35:30  | 1.744       | 1.782        | 0.955 |
| 10:35:35  | 1.734       | 1.769        | 0.954 |
| 10:35:40  | 1.728       | 1.774        | 0.954 |
| 10:35:45  | 1.748       | 1.799        | 0.955 |
| 10:35:50  | 1.774       | 1.820        | 0.956 |
| 10:35:55  | 1.770       | 1.803        | 0.955 |
| 10:36:00  | 1.757       | 1.799        | 0.955 |
| 10:36:05  | 1.759       | 1.796        | 0.955 |
| 10:36:10  | 1.752       | 1.796        | 0.955 |
| 10:36:15  | 1.760       | 1.804        | 0.956 |
| 10:36:20  | 1.769       | 1.812        | 0.956 |
| 10:36:25  | 1.764       | 1.798        | 0.955 |
| 10:36:30  | 1.749       | 1.790        | 0.955 |
| 10:36:35  | 1.752       | 1.796        | 0.955 |
| 10:36:40  | 1.758       | 1.799        | 0.955 |
| 10:36:45  | 1.758       | 1.804        | 0.956 |
| 10:36:50  | 1.770       | 1.808        | 0.956 |
| 10:36:55  | 1.751       | 1.778        | 0.955 |
| 10:37:00  | 1.730       | 1.778        | 0.955 |
| 10:37:05  | 1.752       | 1.796        | 0.955 |
| 10:37:10  | 1.749       | 1.787        | 0.955 |
| 10:37:15  | 1.752       | 1.800        | 0.956 |
| 10:37:20  | 1.765       | 1.806        | 0.956 |
| 10:37:25  | 1.757       | 1.790        | 0.954 |
| 10:37:30  | 1.751       | 1.803        | 0.955 |
| 10:37:35  | 1.776       | 1.820        | 0.956 |
| 10:37:40  | 1.772       | 1.806        | 0.956 |
| 10:37:45  | 1.756       | 1.792        | 0.956 |
| 10:37:50  | 1.750       | 1.798        | 0.956 |
| 10:37:55  | 1.763       | 1.805        | 0.956 |
| 10:38:00  | 1.761       | 1.794        | 0.955 |
| 10:38:05  | 1.744       | 1.789        | 0.955 |
| 10:38:10  | 1.758       | 1.805        | 0.956 |
| 10:38:15  | 1.762       | 1.793        | 0.955 |
| 10:38:20  | 1.738       | 1.780        | 0.954 |
| 10:38:25  | 1.746       | 1.791        | 0.955 |
| 10:38:30  | 1.758       | 1.804        | 0.954 |
| 10:38:35  | 1.768       | 1.809        | 0.957 |
| 10:38:40  | 1.758       | 1.794        | 0.956 |
| 10:38:45  | 1.755       | 1.802        | 0.955 |
| 10:38:50  | 1.768       | 1.809        | 0.956 |
| 10:38:55  | 1.765       | 1.806        | 0.956 |
| 10:39:00  | 1.768       | 1.814        | 0.956 |
| 10:39:05  | 1.774       | 1.808        | 0.956 |
| 10:39:10  | 1.749       | 1.783        | 0.955 |
| 10:39:15  | 1.742       | 1.790        | 0.955 |
| 10:39:20  | 1.764       | 1.812        | 0.956 |
| 10:39:25  | 1.772       | 1.805        | 0.956 |
| 10:39:30  | 1.739       | 1.770        | 0.954 |
| 10:39:35  | 1.725       | 1.768        | 0.954 |
| 10:39:40  | 1.740       | 1.789        | 0.955 |
| 10:39:45  | 1.755       | 1.795        | 0.955 |
| 10:39:50  | 1.754       | 1.798        | 0.955 |
| 10:39:55  | 1.756       | 1.800        | 0.956 |
| 10:40:00  | 1.766       | 1.811        | 0.954 |
| 10:40:05  | 1.771       | 1.811        | 0.956 |
| 10:40:10  | 1.764       | 1.800        | 0.955 |
| 10:40:15  | 1.745       | 1.778        | 0.955 |
| 10:40:20  | 1.743       | 1.796        | 0.955 |
| 10:40:25  | 1.769       | 1.812        | 0.956 |
| 10:40:30  | 1.767       | 1.805        | 0.956 |
| 10:40:35  | 1.756       | 1.794        | 0.955 |
| 10:40:40  | 1.754       | 1.800        | 0.955 |
| 10:40:45  | 1.764       | 1.803        | 0.956 |
| 10:40:50  | 1.750       | 1.784        | 0.955 |
| 10:40:55  | 1.739       | 1.779        | 0.954 |
| 10:41:00  | 1.744       | 1.791        | 0.955 |
| 10:41:05  | 1.756       | 1.799        | 0.955 |
| 10:41:10  | 1.761       | 1.803        | 0.956 |
| 10:41:15  | 1.763       | 1.801        | 0.955 |
| 10:41:20  | 1.752       | 1.787        | 0.954 |
| 10:41:25  | 1.744       | 1.795        | 0.955 |
| 10:41:30  | 1.778       | 1.830        | 0.956 |
| 10:41:35  | 1.784       | 1.814        | 0.956 |
| 10:41:40  | 1.755       | 1.791        | 0.955 |
| 10:41:45  | 1.745       | 1.782        | 0.954 |
| 10:41:50  | 1.737       | 1.779        | 0.954 |
| 10:41:55  | 1.751       | 1.801        | 0.955 |
| 10:42:00  | 1.761       | 1.789        | 0.954 |



|                   |             |        |
|-------------------|-------------|--------|
| Corrección 0,3 -2 |             |        |
| Ambientales       |             |        |
| Tiempo            | T_amb [°C]  | HR [%] |
| 10:29:00          | 19          | 53     |
| 10:31:00          | 19          | 54     |
| 10:33:00          | 19          | 55     |
| 10:35:00          | 18          | 55     |
| 10:37:00          | 17          | 55     |
| 10:39:00          | 17          | 56     |
| 10:41:00          | 16          | 57     |
| 10:43:00          | 18          | 55     |
| 10:45:00          | 18          | 53     |
| 10:47:00          | 18          | 53     |
| 10:49:00          | 19          | 52     |
| 10:51:00          | 17          | 52     |
| 10:53:00          | 19          | 53     |
| 10:55:00          | 19          | 52     |
| 10:57:00          | 19          | 52     |
| 10:59:00          | 19          | 53     |
| 11:01:00          | 18          | 53     |
| Promedio          | 18,05       | 53,6   |
| Corregidos        | 18,34705882 | 51,6   |

|                 |           |             |
|-----------------|-----------|-------------|
| Celda de Carga  |           |             |
| Tiempo          | Masa [kg] | Cons [kg/h] |
| 10:30:00        | 637       | -           |
| 10:31:00        | 631       | 6           |
| 10:32:00        | 625       | 6           |
| 10:33:00        | 619       | 6           |
| 10:34:00        | 614       | 5           |
| 10:35:00        | 608       | 6           |
| 10:36:00        | 602       | 6           |
| 10:37:00        | 596       | 6           |
| 10:38:00        | 590       | 6           |
| 10:39:00        | 584       | 6           |
| 10:40:00        | 578       | 6           |
| 10:41:00        | 572       | 6           |
| 10:42:00        | 566       | 6           |
| 10:43:00        | 560       | 6           |
| 10:44:00        | 554       | 6           |
| 10:45:00        | 549       | 5           |
| 10:46:00        | 543       | 6           |
| 10:47:00        | 537       | 6           |
| 10:48:00        | 531       | 6           |
| 10:49:00        | 525       | 6           |
| 10:50:00        | 519       | 6           |
| 10:51:00        | 513       | 6           |
| 10:52:00        | 508       | 5           |
| 10:53:00        | 502       | 6           |
| 10:54:00        | 496       | 6           |
| 10:55:00        | 490       | 6           |
| 10:56:00        | 484       | 6           |
| 10:57:00        | 478       | 6           |
| 10:58:00        | 472       | 6           |
| 10:59:00        | 466       | 6           |
| 11:00:00        | 460,00    | 6           |
| Promedio [kg/h] |           | 354,0       |
| Consumo [lts/h] |           | 425,2       |

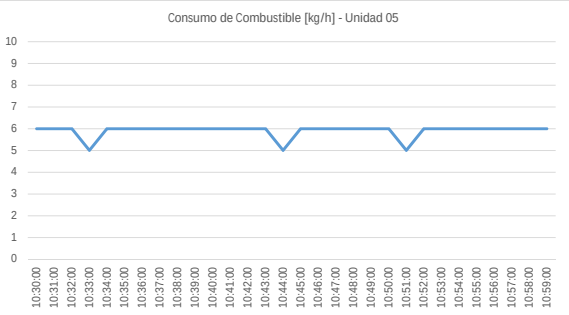
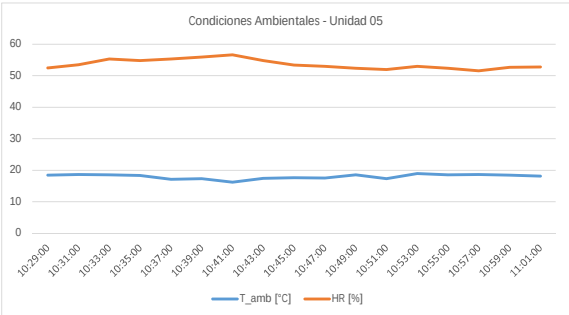
|                                        |       |            |
|----------------------------------------|-------|------------|
| Consumo Específico Neto sin corrección |       |            |
| C_esp_volumen                          | 242,2 | [lts/MWh]  |
| C_esp_masa                             | 201,6 | [kg/MWh]   |
| C_esp_calorias                         | 2.206 | [kcal/MWh] |

|                       |        |         |
|-----------------------|--------|---------|
| Combustible Diesel B2 |        |         |
| Densidad              | 0.8325 | kg/lts  |
| PCI                   | --     | kcal/kg |
| PCS                   | 10.943 | kcal/kg |

|                       |                  |                                   |
|-----------------------|------------------|-----------------------------------|
| Correcciones ISO 3046 |                  |                                   |
| coef a                | 0                | Tabla B.1 ISO 3046-1 motor tipo D |
| coef m                | 0,7              |                                   |
| coef n                | 1,2              |                                   |
| coef s                | 0                |                                   |
| eficiencia mec        | 0,8              | ISO 3046                          |
| alfa                  | 0,9631           | ISO 3046                          |
| k                     | 0,9686           | ISO 3046                          |
| px                    | no aplica correc | Presión Atm Test                  |
| pr                    | no aplica correc | Presión Atm Ref                   |
| Tx [°K]               | 291,3            | Temp Test                         |
| Tr [°K]               | 283,7            | Temp Ref                          |
| Bx                    | 354,0            | C_esp medido                      |
| Br                    | 352,0            | C_esp ISO                         |
| Corrección ISO        | -0,57%           | kg/h                              |

|                                |         |                   |
|--------------------------------|---------|-------------------|
| Corrección Factor de Potencia  |         |                   |
| FP promedio                    | 0,96    | Aplica Correccion |
| Eficiencia @0,96               | 96,8902 | %                 |
| Eficiencia @0,95               | 96,8505 | %                 |
| Potencia Bruta Medida          | 1796,89 | kW                |
| Potencia Bruta Corregida @0,95 | 1796,15 | kW                |
| delta_loss                     | 0,736   | kW                |
| Pneta medida                   | 1.756   | kW                |
| Pneta correg_FP                | 1.755   | kW                |
| Corrección FP                  | -0,04%  |                   |

|                 |        |              |
|-----------------|--------|--------------|
| C_esp Corregido | 0,2005 | kg / kWh     |
| C_esp Corregido | 241    | litros / MWh |
| C_esp Corregido | 2.195  | kcal / kWh   |
| Corrección      | -0,53% |              |



|                    |      |            |         |
|--------------------|------|------------|---------|
| Factor de Potencia |      | Eficiencia |         |
| X0                 | 0,9  | Y0         | 96,652  |
| X1                 | 0,96 | Y1         | 96,8505 |
| X2                 | 0,96 | Y2         | 96,8902 |
| X3                 | 1    | Y3         | 97,049  |

|                 |           |
|-----------------|-----------|
| Factor de Carga | 0,9 %     |
| P_Aparente_Nom  | 2135 kVA  |
| P_Aparente_Meas | 1.881 kVA |

ISO 3046-1:2002(E)

| Table 2 — Numerical values for power adjustment                                    |                  |                                          |                   |          |           |      |
|------------------------------------------------------------------------------------|------------------|------------------------------------------|-------------------|----------|-----------|------|
| Engine type                                                                        | Fuel type        | Conditions                               | Formula reference | Factor   | Exponents |      |
|                                                                                    |                  |                                          |                   | $\alpha$ | $m$       | $n$  |
| Diesel engines and dual fuel compression-ignition engines operating on liquid fuel | Diesel fuel oils | Power limited by air to fuel ratio       | A                 | 1        | 1         | 0,75 |
|                                                                                    |                  | Power limited by thermal loading         | B                 | 0        | 1         | 1    |
|                                                                                    |                  | Turbocharged without charge air cooling  | C                 | 0        | 0,7       | 2    |
|                                                                                    |                  | Low and medium speed four-stroke engines | D                 | 0        | 0,7       | 1,2  |
|                                                                                    |                  | Turbocharged with charge air cooling     | D                 | 0        | 0,7       | 1,2  |

|       |                                                                                                                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NOTES |                                                                                                                                                                                                                                                                                                  |
| 1     | The formula references and exponents have been derived by CIMAC (International Council on Combustion Engines).                                                                                                                                                                                   |
| 2     | The factors and exponents have been established by tests on a number of engines to be representative of the types of engines specified. They may be considered as a guideline.<br>Engine manufacturers may alternatively declare their own values appropriate to their individual engine design. |
| 3     | The values of exponent $n$ applies to power adjustment from a reference charge air coolant temperature.<br>Where the charge air is cooled by engine jacket water at nominally constant temperature the value of 'n' could be taken as zero.                                                      |
| 4     | The formulae reference A and D are applied in the examples given in annexes C and D.                                                                                                                                                                                                             |
| 5     | High speed four-stroke engines subject to power adjustment are not covered in this table. The correction factors and exponents shall be specified by engine manufacturer.                                                                                                                        |
| 6     | nr = There are no values recommended. It is up to the engine manufacturers to use their own values appropriate to their individual engine design.                                                                                                                                                |

|          |       |       |       |
|----------|-------|-------|-------|
| 10:42:05 | 1.735 | 1.778 | 0.954 |
| 10:42:10 | 1.748 | 1.795 | 0.955 |
| 10:42:15 | 1.752 | 1.787 | 0.954 |
| 10:42:20 | 1.741 | 1.786 | 0.954 |
| 10:42:25 | 1.772 | 1.834 | 0.956 |
| 10:42:30 | 1.802 | 1.827 | 0.956 |
| 10:42:35 | 1.751 | 1.779 | 0.954 |
| 10:42:40 | 1.735 | 1.778 | 0.954 |
| 10:42:45 | 1.746 | 1.791 | 0.955 |
| 10:42:50 | 1.754 | 1.801 | 0.955 |
| 10:42:55 | 1.764 | 1.806 | 0.955 |
| 10:43:00 | 1.762 | 1.801 | 0.955 |
| 10:43:05 | 1.759 | 1.796 | 0.955 |
| 10:43:10 | 1.739 | 1.762 | 0.953 |
| 10:43:15 | 1.707 | 1.753 | 0.954 |
| 10:43:20 | 1.735 | 1.790 | 0.955 |
| 10:43:25 | 1.769 | 1.819 | 0.955 |
| 10:43:30 | 1.778 | 1.814 | 0.956 |
| 10:43:35 | 1.767 | 1.806 | 0.955 |
| 10:43:40 | 1.759 | 1.794 | 0.955 |
| 10:43:45 | 1.744 | 1.780 | 0.954 |
| 10:43:50 | 1.742 | 1.791 | 0.955 |
| 10:43:55 | 1.766 | 1.810 | 0.955 |
| 10:44:00 | 1.766 | 1.809 | 0.956 |
| 10:44:05 | 1.781 | 1.826 | 0.956 |
| 10:44:10 | 1.777 | 1.814 | 0.955 |
| 10:44:15 | 1.770 | 1.809 | 0.955 |
| 10:44:20 | 1.757 | 1.787 | 0.955 |
| 10:44:25 | 1.734 | 1.773 | 0.954 |
| 10:44:30 | 1.740 | 1.784 | 0.954 |
| 10:44:35 | 1.745 | 1.790 | 0.954 |
| 10:44:40 | 1.758 | 1.797 | 0.955 |
| 10:44:45 | 1.743 | 1.779 | 0.954 |
| 10:44:50 | 1.738 | 1.785 | 0.955 |
| 10:44:55 | 1.758 | 1.806 | 0.955 |
| 10:45:00 | 1.767 | 1.802 | 0.955 |
| 10:45:05 | 1.742 | 1.764 | 0.954 |
| 10:45:10 | 1.714 | 1.767 | 0.954 |
| 10:45:15 | 1.757 | 1.810 | 0.955 |
| 10:45:20 | 1.772 | 1.810 | 0.955 |
| 10:45:25 | 1.767 | 1.805 | 0.955 |
| 10:45:30 | 1.754 | 1.790 | 0.955 |
| 10:45:35 | 1.752 | 1.799 | 0.955 |
| 10:45:40 | 1.766 | 1.806 | 0.956 |
| 10:45:45 | 1.757 | 1.792 | 0.955 |
| 10:45:50 | 1.748 | 1.793 | 0.955 |
| 10:45:55 | 1.763 | 1.808 | 0.955 |
| 10:46:00 | 1.768 | 1.808 | 0.956 |
| 10:46:05 | 1.766 | 1.805 | 0.955 |
| 10:46:10 | 1.756 | 1.792 | 0.955 |
| 10:46:15 | 1.753 | 1.798 | 0.955 |
| 10:46:20 | 1.755 | 1.792 | 0.955 |
| 10:46:25 | 1.746 | 1.786 | 0.955 |
| 10:46:30 | 1.747 | 1.791 | 0.953 |
| 10:46:35 | 1.750 | 1.791 | 0.954 |
| 10:46:40 | 1.754 | 1.802 | 0.955 |
| 10:46:45 | 1.772 | 1.812 | 0.956 |
| 10:46:50 | 1.764 | 1.803 | 0.956 |
| 10:46:55 | 1.764 | 1.808 | 0.956 |
| 10:47:00 | 1.771 | 1.812 | 0.956 |
| 10:47:05 | 1.760 | 1.791 | 0.956 |
| 10:47:10 | 1.739 | 1.782 | 0.955 |
| 10:47:15 | 1.749 | 1.796 | 0.955 |
| 10:47:20 | 1.768 | 1.815 | 0.956 |
| 10:47:25 | 1.769 | 1.801 | 0.955 |
| 10:47:30 | 1.745 | 1.781 | 0.955 |
| 10:47:35 | 1.742 | 1.789 | 0.955 |
| 10:47:40 | 1.759 | 1.805 | 0.955 |
| 10:47:45 | 1.764 | 1.801 | 0.956 |
| 10:47:50 | 1.755 | 1.796 | 0.955 |
| 10:47:55 | 1.754 | 1.793 | 0.955 |
| 10:48:00 | 1.752 | 1.796 | 0.955 |
| 10:48:05 | 1.764 | 1.809 | 0.956 |
| 10:48:10 | 1.762 | 1.798 | 0.955 |
| 10:48:15 | 1.762 | 1.810 | 0.956 |
| 10:48:20 | 1.765 | 1.797 | 0.956 |
| 10:48:25 | 1.746 | 1.789 | 0.955 |
| 10:48:30 | 1.757 | 1.803 | 0.955 |
| 10:48:35 | 1.769 | 1.813 | 0.956 |
| 10:48:40 | 1.773 | 1.816 | 0.956 |
| 10:48:45 | 1.770 | 1.804 | 0.956 |
| 10:48:50 | 1.755 | 1.797 | 0.956 |
| 10:48:55 | 1.762 | 1.803 | 0.955 |
| 10:49:00 | 1.753 | 1.784 | 0.955 |
| 10:49:05 | 1.725 | 1.762 | 0.954 |
| 10:49:10 | 1.734 | 1.787 | 0.955 |
| 10:49:15 | 1.759 | 1.804 | 0.956 |
| 10:49:20 | 1.764 | 1.805 | 0.956 |
| 10:49:25 | 1.766 | 1.810 | 0.956 |
| 10:49:30 | 1.780 | 1.828 | 0.957 |
| 10:49:35 | 1.776 | 1.802 | 0.956 |
| 10:49:40 | 1.741 | 1.777 | 0.955 |
| 10:49:45 | 1.740 | 1.786 | 0.955 |
| 10:49:50 | 1.751 | 1.797 | 0.956 |
| 10:49:55 | 1.761 | 1.805 | 0.956 |
| 10:50:00 | 1.769 | 1.809 | 0.956 |
| 10:50:05 | 1.761 | 1.798 | 0.956 |
| 10:50:10 | 1.755 | 1.798 | 0.956 |
| 10:50:15 | 1.758 | 1.796 | 0.955 |
| 10:50:20 | 1.749 | 1.790 | 0.955 |
| 10:50:25 | 1.753 | 1.794 | 0.955 |
| 10:50:30 | 1.753 | 1.800 | 0.956 |
| 10:50:35 | 1.763 | 1.800 | 0.955 |
| 10:50:40 | 1.742 | 1.776 | 0.954 |
| 10:50:45 | 1.736 | 1.780 | 0.954 |
| 10:50:50 | 1.746 | 1.791 | 0.955 |
| 10:50:55 | 1.764 | 1.814 | 0.956 |
| 10:51:00 | 1.775 | 1.810 | 0.956 |
| 10:51:05 | 1.758 | 1.795 | 0.955 |
| 10:51:10 | 1.748 | 1.790 | 0.954 |
| 10:51:15 | 1.750 | 1.791 | 0.955 |
| 10:51:20 | 1.750 | 1.795 | 0.955 |
| 10:51:25 | 1.764 | 1.807 | 0.955 |
| 10:51:30 | 1.766 | 1.806 | 0.955 |
| 10:51:35 | 1.762 | 1.801 | 0.955 |
| 10:51:40 | 1.752 | 1.787 | 0.955 |
| 10:51:45 | 1.742 | 1.783 | 0.954 |
| 10:51:50 | 1.743 | 1.786 | 0.954 |
| 10:51:55 | 1.753 | 1.797 | 0.955 |
| 10:52:00 | 1.754 | 1.795 | 0.955 |
| 10:52:05 | 1.752 | 1.792 | 0.955 |
| 10:52:10 | 1.758 | 1.806 | 0.955 |
| 10:52:15 | 1.774 | 1.821 | 0.956 |
| 10:52:20 | 1.777 | 1.812 | 0.956 |
| 10:52:25 | 1.758 | 1.788 | 0.955 |
| 10:52:30 | 1.737 | 1.781 | 0.954 |
| 10:52:35 | 1.753 | 1.799 | 0.954 |
| 10:52:40 | 1.755 | 1.793 | 0.954 |
| 10:52:45 | 1.753 | 1.798 | 0.955 |
| 10:52:50 | 1.760 | 1.797 | 0.955 |
| 10:52:55 | 1.747 | 1.784 | 0.954 |
| 10:53:00 | 1.743 | 1.788 | 0.951 |
| 10:53:05 | 1.747 | 1.785 | 0.955 |
| 10:53:10 | 1.745 | 1.792 | 0.955 |
| 10:53:15 | 1.764 | 1.810 | 0.956 |
| 10:53:20 | 1.767 | 1.803 | 0.955 |
| 10:53:25 | 1.752 | 1.788 | 0.955 |
| 10:53:30 | 1.750 | 1.798 | 0.955 |
| 10:53:35 | 1.766 | 1.810 | 0.956 |
| 10:53:40 | 1.771 | 1.810 | 0.955 |
| 10:53:45 | 1.767 | 1.808 | 0.955 |
| 10:53:50 | 1.764 | 1.798 | 0.955 |
| 10:53:55 | 1.745 | 1.783 | 0.954 |
| 10:54:00 | 1.747 | 1.790 | 0.955 |
| 10:54:05 | 1.750 | 1.795 | 0.955 |
| 10:54:10 | 1.760 | 1.805 | 0.956 |
| 10:54:15 | 1.773 | 1.818 | 0.956 |
| 10:54:20 | 1.768 | 1.790 | 0.955 |
| 10:54:25 | 1.726 | 1.764 | 0.953 |
| 10:54:30 | 1.728 | 1.777 | 0.954 |
| 10:54:35 | 1.758 | 1.812 | 0.955 |
| 10:54:40 | 1.780 | 1.817 | 0.956 |
| 10:54:45 | 1.758 | 1.789 | 0.955 |
| 10:54:50 | 1.742 | 1.786 | 0.954 |
| 10:54:55 | 1.755 | 1.805 | 0.955 |

10.3 Power adjustment for ambient conditions

10.3.1 When it is required that the engine be operated under conditions different from the standard reference conditions given in clause 5 of ISO 15550:2002, and if it is required that the power output be adjusted to or from the standard reference conditions, the following equations shall be used if other methods are not stated by the manufacturer (see note 2 in 10.3.2 and also 10.3.4):

$$P_x = \alpha \times P_r$$
 (1)

NOTE In equation (1), the mathematical approach is inverse of that of equations (1) and (2) of ISO 15550:—, clause 7.

where the power adjustment factor,  $\alpha$ , is given by:

$$\alpha = k - 0,7 \left( 1 - k \right) \left( \frac{1}{\eta_m} - 1 \right)$$
 (2)

where the ratio of indicated power is:

$$k = \left( \frac{P_x - a\phi_x p_{sx}}{P_r - a\phi_r p_{sr}} \right)^m \left( \frac{T_r}{T_x} \right)^n \left( \frac{T_{cr}}{T_{cx}} \right)^s$$
 (3)

10.4 Recalculation of fuel consumption at test or site ambient conditions for adjusted engines

When it is required that the engine be operated under test or site ambient conditions different from the standard reference conditions given in clause 5 of ISO 15550:2002 the specific fuel consumption will differ from that declared for the standard reference conditions and shall be recalculated for or from the standard reference conditions.

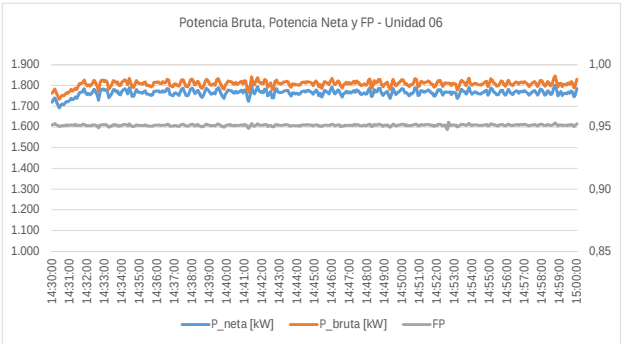
The following equations shall be used if other methods are not declared by the manufacturer:

$$b_x = \beta \ b_r$$
 (7)

where  $\beta = \frac{k}{\alpha}$  (8)

|          |       |       |       |
|----------|-------|-------|-------|
| 10:55:00 | 1.781 | 1.830 | 0.956 |
| 10:55:05 | 1.783 | 1.813 | 0.956 |
| 10:55:10 | 1.746 | 1.772 | 0.954 |
| 10:55:15 | 1.729 | 1.779 | 0.954 |
| 10:55:20 | 1.756 | 1.806 | 0.955 |
| 10:55:25 | 1.770 | 1.808 | 0.955 |
| 10:55:30 | 1.754 | 1.784 | 0.955 |
| 10:55:35 | 1.737 | 1.784 | 0.954 |
| 10:55:40 | 1.762 | 1.814 | 0.955 |
| 10:55:45 | 1.773 | 1.805 | 0.955 |
| 10:55:50 | 1.750 | 1.788 | 0.955 |
| 10:55:55 | 1.745 | 1.782 | 0.954 |
| 10:56:00 | 1.738 | 1.784 | 0.954 |
| 10:56:05 | 1.749 | 1.792 | 0.954 |
| 10:56:10 | 1.762 | 1.812 | 0.955 |
| 10:56:15 | 1.775 | 1.814 | 0.956 |
| 10:56:20 | 1.757 | 1.786 | 0.954 |
| 10:56:25 | 1.743 | 1.791 | 0.955 |
| 10:56:30 | 1.757 | 1.792 | 0.955 |
| 10:56:35 | 1.739 | 1.781 | 0.954 |
| 10:56:40 | 1.754 | 1.805 | 0.955 |
| 10:56:45 | 1.765 | 1.797 | 0.955 |
| 10:56:50 | 1.741 | 1.781 | 0.954 |
| 10:56:55 | 1.753 | 1.800 | 0.955 |
| 10:57:00 | 1.758 | 1.796 | 0.955 |
| 10:57:05 | 1.750 | 1.788 | 0.954 |
| 10:57:10 | 1.749 | 1.795 | 0.955 |
| 10:57:15 | 1.765 | 1.812 | 0.955 |
| 10:57:20 | 1.767 | 1.799 | 0.955 |
| 10:57:25 | 1.747 | 1.789 | 0.954 |
| 10:57:30 | 1.763 | 1.814 | 0.955 |
| 10:57:35 | 1.778 | 1.816 | 0.955 |
| 10:57:40 | 1.764 | 1.799 | 0.955 |
| 10:57:45 | 1.754 | 1.798 | 0.955 |
| 10:57:50 | 1.762 | 1.805 | 0.955 |
| 10:57:55 | 1.767 | 1.810 | 0.955 |
| 10:58:00 | 1.765 | 1.800 | 0.955 |
| 10:58:05 | 1.738 | 1.767 | 0.954 |
| 10:58:10 | 1.732 | 1.786 | 0.955 |
| 10:58:15 | 1.759 | 1.805 | 0.955 |
| 10:58:20 | 1.762 | 1.799 | 0.954 |
| 10:58:25 | 1.760 | 1.806 | 0.955 |
| 10:58:30 | 1.769 | 1.805 | 0.955 |
| 10:58:35 | 1.744 | 1.773 | 0.954 |
| 10:58:40 | 1.731 | 1.779 | 0.954 |
| 10:58:45 | 1.757 | 1.810 | 0.955 |
| 10:58:50 | 1.775 | 1.815 | 0.956 |
| 10:58:55 | 1.766 | 1.802 | 0.955 |
| 10:59:00 | 1.756 | 1.802 | 0.955 |
| 10:59:05 | 1.775 | 1.814 | 0.956 |
| 10:59:10 | 1.751 | 1.776 | 0.953 |
| 10:59:15 | 1.731 | 1.782 | 0.954 |
| 10:59:20 | 1.765 | 1.814 | 0.956 |
| 10:59:25 | 1.769 | 1.809 | 0.956 |
| 10:59:30 | 1.771 | 1.810 | 0.955 |
| 10:59:35 | 1.744 | 1.761 | 0.953 |
| 10:59:40 | 1.705 | 1.753 | 0.953 |
| 10:59:45 | 1.739 | 1.794 | 0.954 |
| 10:59:50 | 1.760 | 1.800 | 0.955 |
| 10:59:55 | 1.761 | 1.808 | 0.955 |
| 11:00:00 | 1.766 | 1.796 | 0.954 |

| Promedio  | 1.765       | 1.808        | 0.95  |
|-----------|-------------|--------------|-------|
| Unidad 06 |             |              |       |
| Hora      | P_neta [kW] | P_bruta [kW] | FP    |
| 14:30:00  | 1.720       | 1.764        | 0,952 |
| 14:30:05  | 1.732       | 1.774        | 0,952 |
| 14:30:10  | 1.740       | 1.783        | 0,953 |
| 14:30:15  | 1.725       | 1.766        | 0,952 |
| 14:30:20  | 1.707       | 1.747        | 0,951 |
| 14:30:25  | 1.693       | 1.734        | 0,950 |
| 14:30:30  | 1.704       | 1.746        | 0,951 |
| 14:30:35  | 1.711       | 1.753        | 0,951 |
| 14:30:40  | 1.708       | 1.751        | 0,951 |
| 14:30:45  | 1.716       | 1.758        | 0,951 |
| 14:30:50  | 1.723       | 1.765        | 0,952 |
| 14:30:55  | 1.721       | 1.764        | 0,951 |
| 14:31:00  | 1.728       | 1.771        | 0,952 |
| 14:31:05  | 1.738       | 1.782        | 0,952 |
| 14:31:10  | 1.732       | 1.773        | 0,951 |
| 14:31:15  | 1.736       | 1.779        | 0,951 |
| 14:31:20  | 1.745       | 1.786        | 0,952 |
| 14:31:25  | 1.738       | 1.781        | 0,951 |
| 14:31:30  | 1.753       | 1.796        | 0,951 |
| 14:31:35  | 1.767       | 1.810        | 0,951 |
| 14:31:40  | 1.767       | 1.809        | 0,951 |
| 14:31:45  | 1.769       | 1.815        | 0,952 |
| 14:31:50  | 1.785       | 1.827        | 0,952 |
| 14:31:55  | 1.767       | 1.809        | 0,951 |
| 14:32:00  | 1.757       | 1.799        | 0,951 |
| 14:32:05  | 1.761       | 1.804        | 0,951 |
| 14:32:10  | 1.755       | 1.798        | 0,951 |
| 14:32:15  | 1.760       | 1.803        | 0,951 |
| 14:32:20  | 1.769       | 1.812        | 0,952 |
| 14:32:25  | 1.781       | 1.825        | 0,952 |
| 14:32:30  | 1.770       | 1.812        | 0,951 |
| 14:32:35  | 1.754       | 1.796        | 0,951 |
| 14:32:40  | 1.730       | 1.772        | 0,949 |
| 14:32:45  | 1.768       | 1.814        | 0,952 |
| 14:32:50  | 1.782       | 1.825        | 0,952 |
| 14:32:55  | 1.782       | 1.826        | 0,952 |
| 14:33:00  | 1.776       | 1.819        | 0,952 |
| 14:33:05  | 1.780       | 1.824        | 0,952 |
| 14:33:10  | 1.775       | 1.816        | 0,951 |
| 14:33:15  | 1.741       | 1.784        | 0,950 |
| 14:33:20  | 1.752       | 1.796        | 0,951 |
| 14:33:25  | 1.760       | 1.803        | 0,951 |
| 14:33:30  | 1.781       | 1.824        | 0,952 |
| 14:33:35  | 1.780       | 1.822        | 0,952 |
| 14:33:40  | 1.769       | 1.813        | 0,951 |
| 14:33:45  | 1.774       | 1.818        | 0,952 |
| 14:33:50  | 1.759       | 1.800        | 0,951 |
| 14:33:55  | 1.755       | 1.800        | 0,951 |
| 14:34:00  | 1.772       | 1.815        | 0,952 |
| 14:34:05  | 1.780       | 1.824        | 0,952 |
| 14:34:10  | 1.785       | 1.828        | 0,952 |
| 14:34:15  | 1.773       | 1.815        | 0,952 |
| 14:34:20  | 1.761       | 1.805        | 0,951 |
| 14:34:25  | 1.789       | 1.834        | 0,952 |
| 14:34:30  | 1.774       | 1.815        | 0,952 |
| 14:34:35  | 1.748       | 1.791        | 0,950 |
| 14:34:40  | 1.748       | 1.791        | 0,951 |
| 14:34:45  | 1.764       | 1.808        | 0,951 |
| 14:34:50  | 1.781       | 1.823        | 0,952 |
| 14:34:55  | 1.772       | 1.815        | 0,951 |
| 14:35:00  | 1.766       | 1.810        | 0,951 |
| 14:35:05  | 1.766       | 1.809        | 0,951 |
| 14:35:10  | 1.763       | 1.806        | 0,951 |
| 14:35:15  | 1.769       | 1.813        | 0,951 |
| 14:35:20  | 1.775       | 1.818        | 0,952 |
| 14:35:25  | 1.758       | 1.800        | 0,951 |
| 14:35:30  | 1.759       | 1.802        | 0,951 |
| 14:35:35  | 1.757       | 1.799        | 0,951 |
| 14:35:40  | 1.752       | 1.794        | 0,951 |
| 14:35:45  | 1.755       | 1.799        | 0,951 |
| 14:35:50  | 1.773       | 1.816        | 0,951 |
| 14:35:55  | 1.772       | 1.814        | 0,951 |
| 14:36:00  | 1.773       | 1.817        | 0,952 |
| 14:36:05  | 1.774       | 1.817        | 0,952 |
| 14:36:10  | 1.768       | 1.811        | 0,951 |
| 14:36:15  | 1.767       | 1.810        | 0,951 |
| 14:36:20  | 1.774       | 1.818        | 0,952 |
| 14:36:25  | 1.769       | 1.812        | 0,951 |
| 14:36:30  | 1.773       | 1.816        | 0,951 |
| 14:36:35  | 1.784       | 1.829        | 0,952 |
| 14:36:40  | 1.784       | 1.826        | 0,952 |
| 14:36:45  | 1.757       | 1.799        | 0,951 |
| 14:36:50  | 1.754       | 1.797        | 0,951 |
| 14:36:55  | 1.751       | 1.794        | 0,951 |
| 14:37:00  | 1.764       | 1.808        | 0,951 |
| 14:37:05  | 1.764       | 1.807        | 0,951 |
| 14:37:10  | 1.759       | 1.800        | 0,951 |
| 14:37:15  | 1.752       | 1.797        | 0,950 |
| 14:37:20  | 1.768       | 1.811        | 0,951 |
| 14:37:25  | 1.784       | 1.827        | 0,952 |
| 14:37:30  | 1.786       | 1.828        | 0,952 |
| 14:37:35  | 1.768       | 1.810        | 0,951 |
| 14:37:40  | 1.753       | 1.795        | 0,951 |
| 14:37:45  | 1.751       | 1.793        | 0,951 |
| 14:37:50  | 1.760       | 1.805        | 0,951 |
| 14:37:55  | 1.782       | 1.826        | 0,952 |
| 14:38:00  | 1.788       | 1.831        | 0,952 |
| 14:38:05  | 1.778       | 1.821        | 0,952 |
| 14:38:10  | 1.761       | 1.803        | 0,951 |
| 14:38:15  | 1.768       | 1.812        | 0,952 |
| 14:38:20  | 1.777       | 1.821        | 0,952 |
| 14:38:25  | 1.766       | 1.809        | 0,951 |
| 14:38:30  | 1.751       | 1.792        | 0,951 |
| 14:38:35  | 1.743       | 1.786        | 0,950 |
| 14:38:40  | 1.753       | 1.796        | 0,951 |
| 14:38:45  | 1.773       | 1.818        | 0,952 |
| 14:38:50  | 1.787       | 1.830        | 0,952 |
| 14:38:55  | 1.779       | 1.823        | 0,952 |
| 14:39:00  | 1.769       | 1.810        | 0,951 |
| 14:39:05  | 1.759       | 1.802        | 0,951 |
| 14:39:10  | 1.762       | 1.805        | 0,951 |
| 14:39:15  | 1.765       | 1.809        | 0,951 |
| 14:39:20  | 1.759       | 1.802        | 0,951 |
| 14:39:25  | 1.783       | 1.828        | 0,952 |
| 14:39:30  | 1.790       | 1.833        | 0,952 |
| 14:39:35  | 1.777       | 1.819        | 0,952 |
| 14:39:40  | 1.760       | 1.803        | 0,951 |
| 14:39:45  | 1.747       | 1.789        | 0,950 |
| 14:39:50  | 1.738       | 1.781        | 0,950 |
| 14:39:55  | 1.758       | 1.803        | 0,951 |
| 14:40:00  | 1.771       | 1.814        | 0,951 |
| 14:40:05  | 1.778       | 1.822        | 0,952 |
| 14:40:10  | 1.775       | 1.819        | 0,952 |
| 14:40:15  | 1.775       | 1.819        | 0,951 |
| 14:40:20  | 1.767       | 1.809        | 0,951 |
| 14:40:25  | 1.763       | 1.806        | 0,951 |
| 14:40:30  | 1.772       | 1.816        | 0,951 |
| 14:40:35  | 1.764       | 1.807        | 0,951 |
| 14:40:40  | 1.768       | 1.811        | 0,951 |
| 14:40:45  | 1.772       | 1.816        | 0,952 |
| 14:40:50  | 1.778       | 1.820        | 0,952 |
| 14:40:55  | 1.765       | 1.808        | 0,951 |
| 14:41:00  | 1.779       | 1.823        | 0,952 |



| Corrección  |            |        | 0,3 | -0,9 |
|-------------|------------|--------|-----|------|
| Ambientales |            |        |     |      |
| Tiempo      | T_amb [°C] | HR [%] |     |      |
| 14:30:00    | 23         | 38     |     |      |
| 14:31:00    | 22         | 38     |     |      |
| 14:32:00    | 23         | 38     |     |      |
| 14:33:00    | 24         | 37     |     |      |
| 14:34:00    | 23         | 37     |     |      |
| 14:35:00    | 23         | 38     |     |      |
| 14:36:00    | 23         | 38     |     |      |
| 14:37:00    | 24         | 37     |     |      |
| 14:38:00    | 23         | 37     |     |      |
| 14:39:00    | 23         | 38     |     |      |
| 14:40:00    | 24         | 38     |     |      |
| 14:41:00    | 23         | 38     |     |      |
| 14:42:00    | 23         | 37     |     |      |
| 14:43:00    | 23         | 38     |     |      |
| 14:44:00    | 23         | 38     |     |      |
| 14:45:00    | 23         | 37     |     |      |
| 14:46:00    | 22         | 37     |     |      |
| 14:47:00    | 24         | 38     |     |      |
| 14:48:00    | 23         | 38     |     |      |
| 14:49:00    | 23         | 37     |     |      |
| 14:50:00    | 23         | 36     |     |      |
| 14:51:00    | 23         | 37     |     |      |
| 14:52:00    | 23         | 36     |     |      |
| 14:53:00    | 23         | 36     |     |      |
| 14:54:00    | 23         | 36     |     |      |
| 14:55:00    | 23         | 37     |     |      |
| 14:56:00    | 23         | 36     |     |      |
| 14:57:00    | 23         | 36     |     |      |
| 14:58:00    | 24         | 35     |     |      |
| 14:59:00    | 23         | 36     |     |      |
| 15:00:00    | 23         | 34     |     |      |
| Promedio    | 23,05      | 37,0   |     |      |
| Corregidos  | 23,3483871 | 36,1   |     |      |

| Celda de Carga  |           |             |
|-----------------|-----------|-------------|
| Tiempo          | Masa [kg] | Cons [kg/h] |
| 14:30:00        | 866       | -           |
| 14:31:00        | 860       | 6           |
| 14:32:00        | 854       | 6           |
| 14:33:00        | 848       | 6           |
| 14:34:00        | 842       | 6           |
| 14:35:00        | 836       | 6           |
| 14:36:00        | 830       | 6           |
| 14:37:00        | 824       | 6           |
| 14:38:00        | 818       | 6           |
| 14:39:00        | 812       | 6           |
| 14:40:00        | 806       | 6           |
| 14:41:00        | 800       | 6           |
| 14:42:00        | 794       | 6           |
| 14:43:00        | 788       | 6           |
| 14:44:00        | 782       | 6           |
| 14:45:00        | 776       | 6           |
| 14:46:00        | 770       | 6           |
| 14:47:00        | 764       | 6           |
| 14:48:00        | 757       | 7           |
| 14:49:00        | 751       | 6           |
| 14:50:00        | 746       | 5           |
| 14:51:00        | 740       | 6           |
| 14:52:00        | 734       | 6           |
| 14:53:00        | 728       | 6           |
| 14:54:00        | 721       | 7           |
| 14:55:00        | 715       | 6           |
| 14:56:00        | 709       | 6           |
| 14:57:00        | 703       | 6           |
| 14:58:00        | 697       | 6           |
| 14:59:00        | 691       | 5           |
| 15:00:00        | 686       | 5           |
| Promedio [kg/h] | 360,0     |             |
| Consumo [lts/h] | 426,8     |             |

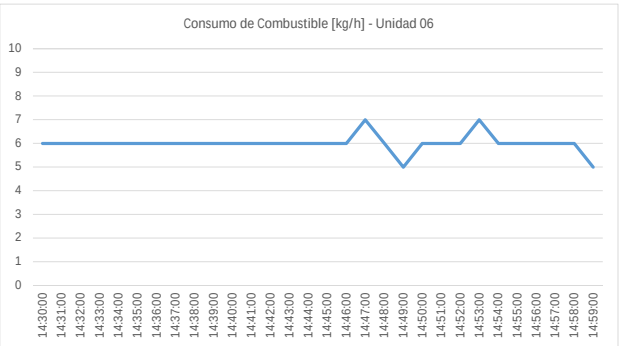
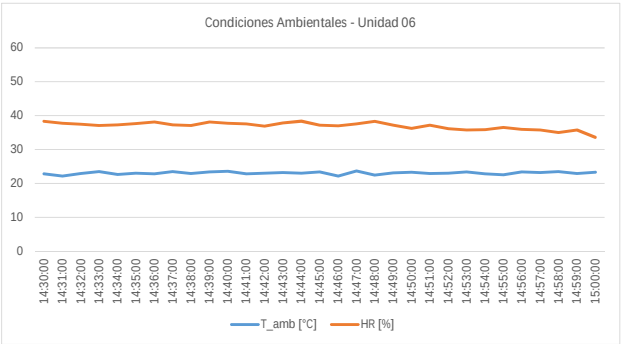
| Consumo Específico Neto sin corrección |       |            |
|----------------------------------------|-------|------------|
| C_esp_volumen                          | 241.8 | [lts/MWh]  |
| C_esp_masa                             | 204.0 | [kg/MWh]   |
| C_esp_calorias                         | 2.232 | [kcal/MWh] |

| Combustible Diesel B2 |        |         |
|-----------------------|--------|---------|
| Densidad              | 0,8434 | kg/lts  |
| PCI                   | --     | kcal/kg |
| PCS                   | 10.944 | kcal/kg |

| Correcciones ISO 3046 |                  |                                   |               |
|-----------------------|------------------|-----------------------------------|---------------|
| coef a                | 0                | Tabla B.1 ISO 3046-1 motor tipo D |               |
| coef m                | 0,7              |                                   |               |
| coef n                | 1,2              |                                   |               |
| coef s                | 0                | no aplica                         |               |
| eficiencia mec        | 0,8              | ISO 3046                          |               |
| alfa                  | 0,9401           | ISO 3046                          |               |
| k                     | 0,9490           | ISO 3046                          |               |
| px                    | no aplica correc | Presión Atm Test                  | kPa           |
| pr                    | no aplica correc | Presión Atm Ref                   | kPa           |
| Tx [°K]               | 296,3            | Temp Test                         | grados Kelvin |
| Tr [°K]               | 283,7            | Temp Ref                          | grados Kelvin |
| Bx                    | 360,0            | C_esp medido                      | kg/h          |
| Br                    | 356,6            | C_esp ISO                         | kg/h          |
| Corrección ISO        | -0,94%           |                                   |               |

| Corrección Factor de Potencia     |       |    |
|-----------------------------------|-------|----|
| FP promedio                       | 0,95  |    |
| FP = 0,95 >> NO APLICA CORRECCIÓN |       |    |
| Pneta                             | 1.765 | kW |
| Pneta correg_FP                   | 1.765 | kW |
| Corrección FP                     | 0,00% |    |

|                 |        |              |
|-----------------|--------|--------------|
| C_esp Corregido | 0,2021 | kg / kWh     |
| C_esp Corregido | 240    | litros / MWh |



ISO 3046-1:2002(E)

| Table 2 — Numerical values for power adjustment                                    |                  |                                         |                                          |                   |          |           |          |
|------------------------------------------------------------------------------------|------------------|-----------------------------------------|------------------------------------------|-------------------|----------|-----------|----------|
| Engine type                                                                        | Fuel type        | Conditions                              |                                          | Formula reference | Factor   | Exponents |          |
|                                                                                    |                  |                                         |                                          |                   | <i>a</i> | <i>m</i>  | <i>n</i> |
| Diesel engines and dual fuel compression-ignition engines operating on liquid fuel | Diesel fuel oils | Non-turbocharged                        | Power limited by air to fuel ratio       | A                 | 1        | 1         | 0,75     |
|                                                                                    |                  |                                         | Power limited by thermal loading         | B                 | 0        | 1         | 1        |
|                                                                                    |                  | Turbocharged without charge air cooling | Low and medium speed four-stroke engines | C                 | 0        | 0,7       | 2        |
|                                                                                    |                  |                                         | Turbocharged with charge air cooling     | D                 | 0        | 0,7       | 1,2      |

NOTES

1

The formula references and exponents have been derived by CIMAC (International Council on Combustion Engines).

2

The factors and exponents have been established by tests on a number of engines to be representative of the types of engines specified. They may be considered as a guideline.  
Engine manufacturers may alternatively declare their own values appropriate to their individual engine design.

3

The values of exponent *s* applies to power adjustment from a reference charge air coolant temperature.  
Where the charge air is cooled by engine jacket water at nominally constant temperature the value of 's' could be taken as zero.

4

The formulae reference A and D are applied in the examples given in annexes C and D.

5

High speed four-stroke engines subject to power adjustment are not covered in this table. The correction factors and exponents shall be specified by engine manufacturer.

6

*n* ≠ 7 There are no values recommended. It is up to the engine manufacturers to use their own values appropriate to their individual engine design.



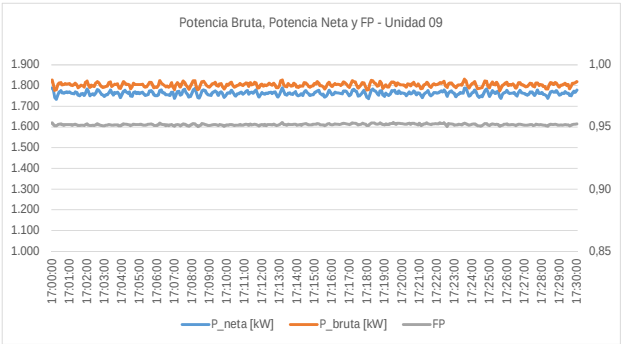
|          |       |       |       |
|----------|-------|-------|-------|
| 14:41:05 | 1.778 | 1.820 | 0,952 |
| 14:41:10 | 1.737 | 1.777 | 0,950 |
| 14:41:15 | 1.724 | 1.768 | 0,949 |
| 14:41:20 | 1.757 | 1.803 | 0,951 |
| 14:41:25 | 1.799 | 1.841 | 0,953 |
| 14:41:30 | 1.767 | 1.810 | 0,951 |
| 14:41:35 | 1.760 | 1.803 | 0,951 |
| 14:41:40 | 1.779 | 1.823 | 0,952 |
| 14:41:45 | 1.793 | 1.837 | 0,952 |
| 14:41:50 | 1.774 | 1.817 | 0,952 |
| 14:41:55 | 1.768 | 1.812 | 0,951 |
| 14:42:00 | 1.771 | 1.815 | 0,951 |
| 14:42:05 | 1.767 | 1.810 | 0,951 |
| 14:42:10 | 1.783 | 1.829 | 0,952 |
| 14:42:15 | 1.783 | 1.824 | 0,952 |
| 14:42:20 | 1.751 | 1.792 | 0,951 |
| 14:42:25 | 1.757 | 1.803 | 0,951 |
| 14:42:30 | 1.771 | 1.813 | 0,951 |
| 14:42:35 | 1.739 | 1.781 | 0,950 |
| 14:42:40 | 1.742 | 1.786 | 0,950 |
| 14:42:45 | 1.775 | 1.820 | 0,952 |
| 14:42:50 | 1.784 | 1.826 | 0,952 |
| 14:42:55 | 1.769 | 1.811 | 0,951 |
| 14:43:00 | 1.767 | 1.811 | 0,951 |
| 14:43:05 | 1.766 | 1.808 | 0,951 |
| 14:43:10 | 1.768 | 1.811 | 0,951 |
| 14:43:15 | 1.773 | 1.817 | 0,952 |
| 14:43:20 | 1.775 | 1.818 | 0,952 |
| 14:43:25 | 1.777 | 1.821 | 0,952 |
| 14:43:30 | 1.775 | 1.818 | 0,952 |
| 14:43:35 | 1.758 | 1.800 | 0,951 |
| 14:43:40 | 1.750 | 1.793 | 0,951 |
| 14:43:45 | 1.765 | 1.808 | 0,951 |
| 14:43:50 | 1.765 | 1.807 | 0,951 |
| 14:43:55 | 1.760 | 1.804 | 0,951 |
| 14:44:00 | 1.762 | 1.805 | 0,951 |
| 14:44:05 | 1.758 | 1.801 | 0,951 |
| 14:44:10 | 1.760 | 1.803 | 0,951 |
| 14:44:15 | 1.769 | 1.812 | 0,951 |
| 14:44:20 | 1.772 | 1.816 | 0,952 |
| 14:44:25 | 1.774 | 1.817 | 0,952 |
| 14:44:30 | 1.769 | 1.813 | 0,951 |
| 14:44:35 | 1.775 | 1.819 | 0,952 |
| 14:44:40 | 1.776 | 1.818 | 0,952 |
| 14:44:45 | 1.772 | 1.815 | 0,951 |
| 14:44:50 | 1.768 | 1.812 | 0,952 |
| 14:44:55 | 1.758 | 1.800 | 0,951 |
| 14:45:00 | 1.768 | 1.812 | 0,951 |
| 14:45:05 | 1.778 | 1.822 | 0,952 |
| 14:45:10 | 1.772 | 1.814 | 0,952 |
| 14:45:15 | 1.750 | 1.793 | 0,951 |
| 14:45:20 | 1.763 | 1.805 | 0,951 |
| 14:45:25 | 1.744 | 1.787 | 0,950 |
| 14:45:30 | 1.757 | 1.803 | 0,951 |
| 14:45:35 | 1.776 | 1.819 | 0,951 |
| 14:45:40 | 1.772 | 1.814 | 0,952 |
| 14:45:45 | 1.767 | 1.811 | 0,951 |
| 14:45:50 | 1.761 | 1.804 | 0,951 |
| 14:45:55 | 1.777 | 1.822 | 0,952 |
| 14:46:00 | 1.792 | 1.835 | 0,952 |
| 14:46:05 | 1.776 | 1.818 | 0,952 |
| 14:46:10 | 1.760 | 1.804 | 0,951 |
| 14:46:15 | 1.767 | 1.811 | 0,951 |
| 14:46:20 | 1.778 | 1.821 | 0,952 |
| 14:46:25 | 1.774 | 1.817 | 0,952 |
| 14:46:30 | 1.757 | 1.799 | 0,951 |
| 14:46:35 | 1.745 | 1.788 | 0,951 |
| 14:46:40 | 1.760 | 1.803 | 0,951 |
| 14:46:45 | 1.765 | 1.809 | 0,951 |
| 14:46:50 | 1.772 | 1.815 | 0,951 |
| 14:46:55 | 1.765 | 1.808 | 0,951 |
| 14:47:00 | 1.770 | 1.813 | 0,951 |
| 14:47:05 | 1.764 | 1.808 | 0,951 |
| 14:47:10 | 1.769 | 1.812 | 0,951 |
| 14:47:15 | 1.776 | 1.820 | 0,952 |
| 14:47:20 | 1.768 | 1.811 | 0,951 |
| 14:47:25 | 1.779 | 1.822 | 0,952 |
| 14:47:30 | 1.774 | 1.816 | 0,952 |
| 14:47:35 | 1.766 | 1.808 | 0,951 |
| 14:47:40 | 1.757 | 1.800 | 0,951 |
| 14:47:45 | 1.758 | 1.801 | 0,951 |
| 14:47:50 | 1.765 | 1.808 | 0,951 |
| 14:47:55 | 1.759 | 1.802 | 0,951 |
| 14:48:00 | 1.759 | 1.803 | 0,951 |
| 14:48:05 | 1.780 | 1.825 | 0,952 |
| 14:48:10 | 1.787 | 1.831 | 0,952 |
| 14:48:15 | 1.748 | 1.789 | 0,950 |
| 14:48:20 | 1.750 | 1.795 | 0,951 |
| 14:48:25 | 1.780 | 1.824 | 0,952 |
| 14:48:30 | 1.770 | 1.813 | 0,951 |
| 14:48:35 | 1.771 | 1.815 | 0,951 |
| 14:48:40 | 1.786 | 1.830 | 0,952 |
| 14:48:45 | 1.786 | 1.829 | 0,952 |
| 14:48:50 | 1.761 | 1.803 | 0,951 |
| 14:48:55 | 1.752 | 1.794 | 0,951 |
| 14:49:00 | 1.763 | 1.807 | 0,951 |
| 14:49:05 | 1.767 | 1.811 | 0,951 |
| 14:49:10 | 1.773 | 1.816 | 0,952 |
| 14:49:15 | 1.753 | 1.794 | 0,951 |
| 14:49:20 | 1.738 | 1.782 | 0,950 |
| 14:49:25 | 1.762 | 1.808 | 0,951 |
| 14:49:30 | 1.786 | 1.829 | 0,952 |
| 14:49:35 | 1.767 | 1.810 | 0,951 |
| 14:49:40 | 1.756 | 1.799 | 0,951 |
| 14:49:45 | 1.766 | 1.810 | 0,951 |
| 14:49:50 | 1.769 | 1.813 | 0,952 |
| 14:49:55 | 1.777 | 1.821 | 0,952 |
| 14:50:00 | 1.784 | 1.827 | 0,952 |
| 14:50:05 | 1.783 | 1.827 | 0,952 |
| 14:50:10 | 1.765 | 1.807 | 0,951 |
| 14:50:15 | 1.766 | 1.809 | 0,952 |
| 14:50:20 | 1.758 | 1.800 | 0,951 |
| 14:50:25 | 1.751 | 1.795 | 0,951 |
| 14:50:30 | 1.762 | 1.805 | 0,951 |
| 14:50:35 | 1.760 | 1.803 | 0,951 |
| 14:50:40 | 1.768 | 1.813 | 0,952 |
| 14:50:45 | 1.789 | 1.833 | 0,952 |
| 14:50:50 | 1.787 | 1.830 | 0,952 |
| 14:50:55 | 1.752 | 1.793 | 0,951 |
| 14:51:00 | 1.754 | 1.798 | 0,951 |
| 14:51:05 | 1.776 | 1.820 | 0,952 |
| 14:51:10 | 1.774 | 1.817 | 0,952 |
| 14:51:15 | 1.769 | 1.812 | 0,951 |
| 14:51:20 | 1.771 | 1.815 | 0,952 |
| 14:51:25 | 1.774 | 1.818 | 0,952 |
| 14:51:30 | 1.778 | 1.822 | 0,952 |
| 14:51:35 | 1.774 | 1.817 | 0,952 |
| 14:51:40 | 1.765 | 1.808 | 0,951 |
| 14:51:45 | 1.763 | 1.806 | 0,951 |
| 14:51:50 | 1.749 | 1.792 | 0,951 |
| 14:51:55 | 1.753 | 1.797 | 0,951 |
| 14:52:00 | 1.768 | 1.812 | 0,951 |
| 14:52:05 | 1.780 | 1.823 | 0,952 |
| 14:52:10 | 1.781 | 1.824 | 0,952 |
| 14:52:15 | 1.772 | 1.815 | 0,952 |
| 14:52:20 | 1.754 | 1.796 | 0,951 |
| 14:52:25 | 1.764 | 1.808 | 0,951 |
| 14:52:30 | 1.769 | 1.813 | 0,951 |
| 14:52:35 | 1.768 | 1.812 | 0,948 |
| 14:52:40 | 1.768 | 1.812 | 0,954 |
| 14:52:45 | 1.769 | 1.812 | 0,951 |
| 14:52:50 | 1.756 | 1.800 | 0,951 |
| 14:52:55 | 1.767 | 1.811 | 0,952 |

|                 |        |            |
|-----------------|--------|------------|
| C_esp Corregido | 2.211  | kcal / kWh |
| Corrección      | -0,94% |            |

|          |       |       |       |
|----------|-------|-------|-------|
| 14:53:00 | 1.766 | 1.809 | 0,952 |
| 14:53:05 | 1.763 | 1.806 | 0,951 |
| 14:53:10 | 1.738 | 1.779 | 0,950 |
| 14:53:15 | 1.747 | 1.792 | 0,951 |
| 14:53:20 | 1.770 | 1.814 | 0,952 |
| 14:53:25 | 1.781 | 1.824 | 0,952 |
| 14:53:30 | 1.773 | 1.817 | 0,952 |
| 14:53:35 | 1.771 | 1.815 | 0,952 |
| 14:53:40 | 1.759 | 1.801 | 0,951 |
| 14:53:45 | 1.770 | 1.815 | 0,952 |
| 14:53:50 | 1.791 | 1.836 | 0,953 |
| 14:53:55 | 1.770 | 1.812 | 0,952 |
| 14:54:00 | 1.758 | 1.801 | 0,951 |
| 14:54:05 | 1.764 | 1.809 | 0,952 |
| 14:54:10 | 1.769 | 1.812 | 0,952 |
| 14:54:15 | 1.767 | 1.810 | 0,952 |
| 14:54:20 | 1.762 | 1.805 | 0,951 |
| 14:54:25 | 1.760 | 1.803 | 0,951 |
| 14:54:30 | 1.759 | 1.802 | 0,951 |
| 14:54:35 | 1.764 | 1.807 | 0,951 |
| 14:54:40 | 1.768 | 1.811 | 0,952 |
| 14:54:45 | 1.772 | 1.816 | 0,952 |
| 14:54:50 | 1.777 | 1.821 | 0,952 |
| 14:54:55 | 1.753 | 1.795 | 0,951 |
| 14:55:00 | 1.766 | 1.811 | 0,951 |
| 14:55:05 | 1.788 | 1.833 | 0,952 |
| 14:55:10 | 1.783 | 1.826 | 0,952 |
| 14:55:15 | 1.770 | 1.812 | 0,952 |
| 14:55:20 | 1.765 | 1.809 | 0,952 |
| 14:55:25 | 1.755 | 1.797 | 0,951 |
| 14:55:30 | 1.755 | 1.798 | 0,951 |
| 14:55:35 | 1.767 | 1.811 | 0,952 |
| 14:55:40 | 1.777 | 1.821 | 0,952 |
| 14:55:45 | 1.777 | 1.819 | 0,952 |
| 14:55:50 | 1.761 | 1.805 | 0,951 |
| 14:55:55 | 1.754 | 1.797 | 0,951 |
| 14:56:00 | 1.765 | 1.810 | 0,952 |
| 14:56:05 | 1.782 | 1.825 | 0,952 |
| 14:56:10 | 1.771 | 1.813 | 0,952 |
| 14:56:15 | 1.761 | 1.804 | 0,951 |
| 14:56:20 | 1.757 | 1.800 | 0,951 |
| 14:56:25 | 1.767 | 1.812 | 0,952 |
| 14:56:30 | 1.774 | 1.817 | 0,952 |
| 14:56:35 | 1.773 | 1.816 | 0,952 |
| 14:56:40 | 1.764 | 1.808 | 0,951 |
| 14:56:45 | 1.771 | 1.815 | 0,952 |
| 14:56:50 | 1.773 | 1.817 | 0,952 |
| 14:56:55 | 1.770 | 1.813 | 0,952 |
| 14:57:00 | 1.775 | 1.819 | 0,952 |
| 14:57:05 | 1.769 | 1.812 | 0,952 |
| 14:57:10 | 1.765 | 1.808 | 0,952 |
| 14:57:15 | 1.753 | 1.796 | 0,951 |
| 14:57:20 | 1.759 | 1.803 | 0,951 |
| 14:57:25 | 1.766 | 1.809 | 0,952 |
| 14:57:30 | 1.772 | 1.816 | 0,952 |
| 14:57:35 | 1.776 | 1.819 | 0,952 |
| 14:57:40 | 1.767 | 1.810 | 0,951 |
| 14:57:45 | 1.753 | 1.796 | 0,951 |
| 14:57:50 | 1.767 | 1.811 | 0,952 |
| 14:57:55 | 1.782 | 1.825 | 0,952 |
| 14:58:00 | 1.778 | 1.822 | 0,952 |
| 14:58:05 | 1.767 | 1.809 | 0,951 |
| 14:58:10 | 1.755 | 1.797 | 0,951 |
| 14:58:15 | 1.759 | 1.803 | 0,951 |
| 14:58:20 | 1.774 | 1.818 | 0,952 |
| 14:58:25 | 1.769 | 1.812 | 0,952 |
| 14:58:30 | 1.757 | 1.799 | 0,951 |
| 14:58:35 | 1.762 | 1.806 | 0,952 |
| 14:58:40 | 1.785 | 1.829 | 0,952 |
| 14:58:45 | 1.802 | 1.846 | 0,953 |
| 14:58:50 | 1.784 | 1.825 | 0,952 |
| 14:58:55 | 1.750 | 1.794 | 0,951 |
| 14:59:00 | 1.765 | 1.809 | 0,952 |
| 14:59:05 | 1.770 | 1.812 | 0,952 |
| 14:59:10 | 1.752 | 1.796 | 0,951 |
| 14:59:15 | 1.762 | 1.806 | 0,951 |
| 14:59:20 | 1.763 | 1.806 | 0,951 |
| 14:59:25 | 1.760 | 1.803 | 0,951 |
| 14:59:30 | 1.768 | 1.813 | 0,952 |
| 14:59:35 | 1.764 | 1.806 | 0,951 |
| 14:59:40 | 1.774 | 1.819 | 0,952 |
| 14:59:45 | 1.770 | 1.811 | 0,952 |
| 14:59:50 | 1.746 | 1.789 | 0,950 |
| 14:59:55 | 1.756 | 1.800 | 0,951 |
| 15:00:00 | 1.784 | 1.829 | 0,952 |



|           |             |              |       |
|-----------|-------------|--------------|-------|
| Promedio  | 1.763       | 1.803        | 0.95  |
| Unidad 09 |             |              |       |
| Hora      | P_neta [kW] | P_bruta [kW] | FP    |
| 17:00:00  | 1.788       | 1.826        | 0,953 |
| 17:00:05  | 1.777       | 1.803        | 0,952 |
| 17:00:10  | 1.743       | 1.777        | 0,951 |
| 17:00:15  | 1.734       | 1.780        | 0,951 |
| 17:00:20  | 1.756       | 1.805        | 0,952 |
| 17:00:25  | 1.769       | 1.813        | 0,952 |
| 17:00:30  | 1.775       | 1.815        | 0,953 |
| 17:00:35  | 1.765       | 1.803        | 0,952 |
| 17:00:40  | 1.764       | 1.805        | 0,952 |
| 17:00:45  | 1.766       | 1.810        | 0,952 |
| 17:00:50  | 1.769       | 1.806        | 0,952 |
| 17:00:55  | 1.766       | 1.808        | 0,952 |
| 17:01:00  | 1.769       | 1.809        | 0,952 |
| 17:01:05  | 1.763       | 1.801        | 0,952 |
| 17:01:10  | 1.761       | 1.801        | 0,951 |
| 17:01:15  | 1.760       | 1.806        | 0,952 |
| 17:01:20  | 1.769       | 1.810        | 0,952 |
| 17:01:25  | 1.767       | 1.803        | 0,952 |
| 17:01:30  | 1.754       | 1.790        | 0,951 |
| 17:01:35  | 1.750       | 1.796        | 0,951 |
| 17:01:40  | 1.761       | 1.802        | 0,951 |
| 17:01:45  | 1.762       | 1.799        | 0,951 |
| 17:01:50  | 1.752       | 1.793        | 0,951 |
| 17:01:55  | 1.763       | 1.815        | 0,952 |
| 17:02:00  | 1.782       | 1.821        | 0,952 |
| 17:02:05  | 1.773       | 1.804        | 0,952 |
| 17:02:10  | 1.751       | 1.790        | 0,951 |
| 17:02:15  | 1.757       | 1.801        | 0,951 |
| 17:02:20  | 1.760       | 1.797        | 0,951 |
| 17:02:25  | 1.754       | 1.796        | 0,951 |
| 17:02:30  | 1.763       | 1.812        | 0,952 |
| 17:02:35  | 1.779       | 1.819        | 0,952 |
| 17:02:40  | 1.777       | 1.815        | 0,952 |
| 17:02:45  | 1.766       | 1.802        | 0,951 |
| 17:02:50  | 1.757       | 1.796        | 0,951 |
| 17:02:55  | 1.754       | 1.791        | 0,951 |
| 17:03:00  | 1.748       | 1.792        | 0,951 |
| 17:03:05  | 1.755       | 1.796        | 0,951 |
| 17:03:10  | 1.755       | 1.797        | 0,951 |
| 17:03:15  | 1.765       | 1.814        | 0,952 |
| 17:03:20  | 1.779       | 1.817        | 0,952 |
| 17:03:25  | 1.766       | 1.796        | 0,952 |
| 17:03:30  | 1.754       | 1.801        | 0,951 |
| 17:03:35  | 1.767       | 1.806        | 0,952 |
| 17:03:40  | 1.764       | 1.804        | 0,952 |
| 17:03:45  | 1.768       | 1.808        | 0,952 |
| 17:03:50  | 1.757       | 1.788        | 0,951 |
| 17:03:55  | 1.742       | 1.786        | 0,951 |
| 17:04:00  | 1.758       | 1.804        | 0,952 |
| 17:04:05  | 1.772       | 1.818        | 0,952 |
| 17:04:10  | 1.776       | 1.813        | 0,952 |
| 17:04:15  | 1.768       | 1.805        | 0,952 |
| 17:04:20  | 1.762       | 1.806        | 0,952 |
| 17:04:25  | 1.769       | 1.803        | 0,952 |
| 17:04:30  | 1.750       | 1.785        | 0,951 |
| 17:04:35  | 1.748       | 1.796        | 0,952 |
| 17:04:40  | 1.767       | 1.811        | 0,952 |
| 17:04:45  | 1.769       | 1.804        | 0,952 |
| 17:04:50  | 1.761       | 1.805        | 0,952 |
| 17:04:55  | 1.766       | 1.805        | 0,952 |
| 17:05:00  | 1.762       | 1.805        | 0,952 |
| 17:05:05  | 1.765       | 1.805        | 0,952 |
| 17:05:10  | 1.767       | 1.806        | 0,952 |
| 17:05:15  | 1.761       | 1.797        | 0,951 |
| 17:05:20  | 1.752       | 1.792        | 0,952 |
| 17:05:25  | 1.753       | 1.794        | 0,952 |
| 17:05:30  | 1.757       | 1.806        | 0,952 |
| 17:05:35  | 1.774       | 1.816        | 0,952 |
| 17:05:40  | 1.776       | 1.815        | 0,953 |
| 17:05:45  | 1.768       | 1.802        | 0,952 |
| 17:05:50  | 1.755       | 1.790        | 0,951 |
| 17:05:55  | 1.750       | 1.792        | 0,951 |
| 17:06:00  | 1.751       | 1.791        | 0,951 |
| 17:06:05  | 1.755       | 1.802        | 0,952 |
| 17:06:10  | 1.775       | 1.823        | 0,953 |
| 17:06:15  | 1.778       | 1.810        | 0,952 |
| 17:06:20  | 1.765       | 1.807        | 0,952 |
| 17:06:25  | 1.765       | 1.801        | 0,952 |
| 17:06:30  | 1.755       | 1.795        | 0,951 |
| 17:06:35  | 1.756       | 1.797        | 0,952 |
| 17:06:40  | 1.755       | 1.793        | 0,951 |
| 17:06:45  | 1.753       | 1.797        | 0,952 |
| 17:06:50  | 1.767       | 1.814        | 0,952 |
| 17:06:55  | 1.767       | 1.793        | 0,951 |
| 17:07:00  | 1.739       | 1.780        | 0,951 |
| 17:07:05  | 1.752       | 1.803        | 0,952 |
| 17:07:10  | 1.772       | 1.815        | 0,952 |
| 17:07:15  | 1.772       | 1.805        | 0,952 |
| 17:07:20  | 1.754       | 1.793        | 0,951 |
| 17:07:25  | 1.759       | 1.808        | 0,952 |
| 17:07:30  | 1.777       | 1.823        | 0,952 |
| 17:07:35  | 1.781       | 1.814        | 0,952 |
| 17:07:40  | 1.765       | 1.802        | 0,952 |
| 17:07:45  | 1.757       | 1.792        | 0,951 |
| 17:07:50  | 1.744       | 1.781        | 0,951 |
| 17:07:55  | 1.748       | 1.797        | 0,951 |
| 17:08:00  | 1.764       | 1.811        | 0,952 |
| 17:08:05  | 1.780       | 1.824        | 0,953 |
| 17:08:10  | 1.786       | 1.823        | 0,952 |
| 17:08:15  | 1.767       | 1.795        | 0,951 |
| 17:08:20  | 1.743       | 1.780        | 0,951 |
| 17:08:25  | 1.741       | 1.784        | 0,951 |
| 17:08:30  | 1.756       | 1.806        | 0,952 |
| 17:08:35  | 1.774       | 1.819        | 0,953 |
| 17:08:40  | 1.779       | 1.820        | 0,953 |
| 17:08:45  | 1.775       | 1.810        | 0,952 |
| 17:08:50  | 1.763       | 1.800        | 0,952 |
| 17:08:55  | 1.756       | 1.795        | 0,951 |
| 17:09:00  | 1.755       | 1.793        | 0,951 |
| 17:09:05  | 1.753       | 1.800        | 0,951 |
| 17:09:10  | 1.765       | 1.807        | 0,952 |
| 17:09:15  | 1.770       | 1.811        | 0,952 |
| 17:09:20  | 1.774       | 1.815        | 0,952 |
| 17:09:25  | 1.768       | 1.800        | 0,952 |
| 17:09:30  | 1.752       | 1.797        | 0,951 |
| 17:09:35  | 1.765       | 1.808        | 0,952 |
| 17:09:40  | 1.770       | 1.809        | 0,952 |
| 17:09:45  | 1.762       | 1.793        | 0,951 |
| 17:09:50  | 1.743       | 1.784        | 0,951 |
| 17:09:55  | 1.749       | 1.793        | 0,951 |
| 17:10:00  | 1.761       | 1.806        | 0,952 |
| 17:10:05  | 1.764       | 1.802        | 0,951 |
| 17:10:10  | 1.763       | 1.811        | 0,952 |
| 17:10:15  | 1.777       | 1.815        | 0,952 |
| 17:10:20  | 1.768       | 1.802        | 0,952 |
| 17:10:25  | 1.755       | 1.792        | 0,951 |
| 17:10:30  | 1.750       | 1.795        | 0,951 |
| 17:10:35  | 1.760       | 1.800        | 0,951 |
| 17:10:40  | 1.760       | 1.802        | 0,951 |
| 17:10:45  | 1.765       | 1.809        | 0,952 |
| 17:10:50  | 1.768       | 1.804        | 0,951 |
| 17:10:55  | 1.758       | 1.800        | 0,951 |
| 17:11:00  | 1.765       | 1.808        | 0,952 |



|             |             |        |     |      |
|-------------|-------------|--------|-----|------|
| Corrección  |             |        | 0,3 | -0,9 |
| Ambientales |             |        |     |      |
| Tiempo      | T_amb [°C]  | HR [%] |     |      |
| 17:00:00    | 28          | 38     |     |      |
| 17:01:00    | 29          | 37     |     |      |
| 17:02:00    | 28          | 37     |     |      |
| 17:03:00    | 28          | 37     |     |      |
| 17:04:00    | 27          | 37     |     |      |
| 17:05:00    | 28          | 36     |     |      |
| 17:06:00    | 28          | 36     |     |      |
| 17:07:00    | 28          | 37     |     |      |
| 17:08:00    | 28          | 36     |     |      |
| 17:09:00    | 27          | 36     |     |      |
| 17:10:00    | 28          | 39     |     |      |
| 17:11:00    | 28          | 38     |     |      |
| 17:12:00    | 27          | 39     |     |      |
| 17:13:00    | 27          | 39     |     |      |
| 17:14:00    | 27          | 37     |     |      |
| 17:15:00    | 27          | 39     |     |      |
| 17:16:00    | 27          | 38     |     |      |
| 17:17:00    | 27          | 37     |     |      |
| 17:18:00    | 27          | 36     |     |      |
| 17:19:00    | 28          | 38     |     |      |
| 17:20:00    | 29          | 37     |     |      |
| 17:21:00    | 28          | 35     |     |      |
| 17:22:00    | 29          | 34     |     |      |
| 17:23:00    | 29          | 35     |     |      |
| 17:24:00    | 28          | 37     |     |      |
| 17:25:00    | 28          | 37     |     |      |
| 17:26:00    | 28          | 38     |     |      |
| 17:27:00    | 29          | 36     |     |      |
| 17:28:00    | 29          | 35     |     |      |
| 17:29:00    | 28          | 36     |     |      |
| 17:30:00    | 29          | 37     |     |      |
| Promedio    | 27,85       | 36,9   |     |      |
| Corregidos  | 28,14677419 | 36,0   |     |      |

|                 |           |             |
|-----------------|-----------|-------------|
| Celda de Carga  |           |             |
| Tiempo          | Masa [kg] | Cons [kg/h] |
| 17:00:00        | 500       | -           |
| 17:01:00        | 494       | 6           |
| 17:02:00        | 488       | 6           |
| 17:03:00        | 482       | 6           |
| 17:04:00        | 476       | 6           |
| 17:05:00        | 470       | 6           |
| 17:06:00        | 464       | 6           |
| 17:07:00        | 458       | 6           |
| 17:08:00        | 452       | 6           |
| 17:09:00        | 446       | 6           |
| 17:10:00        | 440       | 6           |
| 17:11:00        | 433       | 7           |
| 17:12:00        | 428       | 5           |
| 17:13:00        | 422       | 6           |
| 17:14:00        | 416       | 6           |
| 17:15:00        | 410       | 6           |
| 17:16:00        | 404       | 6           |
| 17:17:00        | 398       | 6           |
| 17:18:00        | 392       | 6           |
| 17:19:00        | 386       | 6           |
| 17:20:00        | 380       | 6           |
| 17:21:00        | 374       | 6           |
| 17:22:00        | 368       | 6           |
| 17:23:00        | 362       | 6           |
| 17:24:00        | 356       | 6           |
| 17:25:00        | 350       | 6           |
| 17:26:00        | 344       | 6           |
| 17:27:00        | 338       | 6           |
| 17:28:00        | 332       | 6           |
| 17:29:00        | 326       | 6           |
| 17:30:00        | 320       | 6           |
| Promedio [kg/h] |           | 360,0       |

|                 |         |
|-----------------|---------|
| Consumo [lts/h] | 25958,4 |
|-----------------|---------|

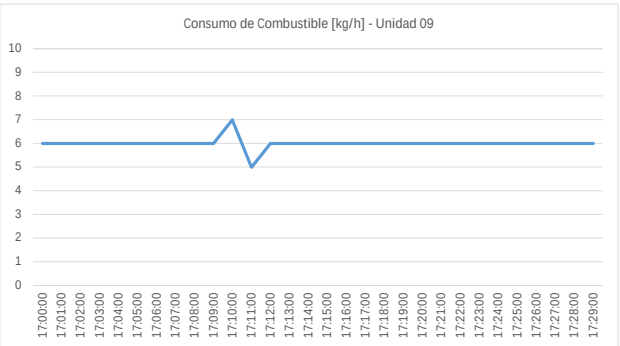
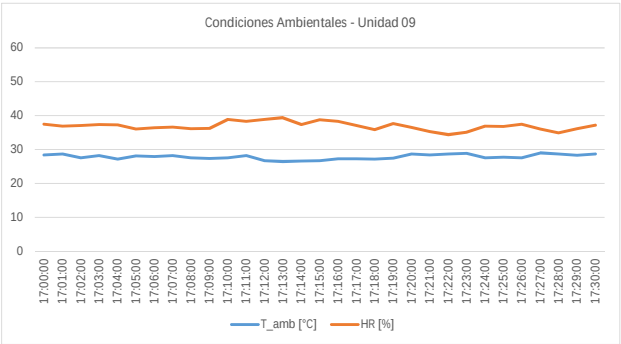
|                                        |       |            |
|----------------------------------------|-------|------------|
| Consumo Específico Neto sin corrección |       |            |
| C_esp_volumen                          | 245,4 | [lts/MWh]  |
| C_esp_masa                             | 204,2 | [kg/MWh]   |
| C_esp_calorias                         | 2.235 | [kcal/MWh] |

|                       |        |         |
|-----------------------|--------|---------|
| Combustible Diesel B2 |        |         |
| Densidad              | 0,8321 | kg/lts  |
| PCI                   | --     | kcal/kg |
| PCS                   | 10.945 | kcal/kg |

|                       |                  |                                   |               |
|-----------------------|------------------|-----------------------------------|---------------|
| Correcciones ISO 3046 |                  |                                   |               |
| coef a                | 0                | Tabla B.1 ISO 3046-1 motor tipo D |               |
| coef m                | 0,7              |                                   |               |
| coef n                | 1,2              |                                   |               |
| coef s                | 0                | no aplica                         |               |
| eficiencia mec        | 0,8              | ISO 3046                          |               |
| alfa                  | 0,9188           | ISO 3046                          |               |
| k                     | 0,9309           | ISO 3046                          |               |
| px                    | no aplica correc | Presión Atm Test                  | kPa           |
| pr                    | no aplica correc | Presión Atm Ref                   | kPa           |
| Tx [°K]               | 301,1            | Temp Test                         | grados Kelvin |
| Tr [°K]               | 283,7            | Temp Ref                          | grados Kelvin |
| Bx                    | 360,0            | C_esp medido                      | kg/h          |
| Br                    | 355,3            | C_esp ISO                         | kg/h          |
| Corrección ISO        | -1,30%           |                                   |               |

|                               |       |    |
|-------------------------------|-------|----|
| Corrección Factor de Potencia |       |    |
| FP promedio                   | 0,95  |    |
|                               |       |    |
| Pneta                         | 1.763 | kW |
| Pneta correg_FP               | 1.763 | kW |
| Corrección FP                 | 0,00% |    |

|                 |        |              |
|-----------------|--------|--------------|
| C_esp Corregido | 0,2016 | kg / kWh     |
| C_esp Corregido | 242    | litros / MWh |



ISO 3046-1:2002(E)

| Table 2 — Numerical values for power adjustment                                    |                  |                                         |                                          |                                      |          |           |                   |
|------------------------------------------------------------------------------------|------------------|-----------------------------------------|------------------------------------------|--------------------------------------|----------|-----------|-------------------|
| Engine type                                                                        | Fuel type        | Conditions                              |                                          | Formula reference                    | Factor   | Exponents |                   |
|                                                                                    |                  |                                         |                                          |                                      | <i>a</i> | <i>m</i>  | <i>n</i> <i>s</i> |
| Diesel engines and dual fuel compression-ignition engines operating on liquid fuel | Diesel fuel oils | Non-turbocharged                        | Power limited by air to fuel ratio       | A                                    | 1        | 1         | 0,75   0          |
|                                                                                    |                  |                                         | Power limited by thermal loading         | B                                    | 0        | 1         | 1   0             |
|                                                                                    |                  | Turbocharged without charge air cooling | Low and medium speed four-stroke engines | C                                    | 0        | 0,7       | 2   0             |
|                                                                                    |                  |                                         |                                          | Turbocharged with charge air cooling | D        | 0         | 0,7               |

| NOTES |                                                                                                                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | The formula references and exponents have been derived by CIMAC (International Council on Combustion Engines).                                                                                                                                                                                   |
| 2     | The factors and exponents have been established by tests on a number of engines to be representative of the types of engines specified. They may be considered as a guideline.<br>Engine manufacturers may alternatively declare their own values appropriate to their individual engine design. |
| 3     | The values of exponent <i>s</i> applies to power adjustment from a reference charge air coolant temperature.<br>Where the charge air is cooled by engine jacket water at nominally constant temperature the value of 's' could be taken as zero.                                                 |
| 4     | The formulae reference A and D are applied in the examples given in annexes C and D.                                                                                                                                                                                                             |
| 5     | High speed four-stroke engines subject to power adjustment are not covered in this table. The correction factors and exponents shall be specified by engine manufacturer.                                                                                                                        |
| 6     | <i>n<sub>r</sub></i> = There are no values recommended. It is up to the engine manufacturers to use their own values appropriate to their individual engine design.                                                                                                                              |

### 10.3 Power adjustment for ambient conditions

**10.3.1** When it is required that the engine be operated under conditions different from the standard reference conditions given in clause 5 of ISO 15550:2002, and if it is required that the power output be adjusted to or from the standard reference conditions, the following equations shall be used if other methods are not stated by the manufacturer (see note 2 in 10.3.2 and also 10.3.4):

|          |       |       |       |
|----------|-------|-------|-------|
| 17:11:05 | 1.770 | 1.813 | 0,952 |
| 17:11:10 | 1.775 | 1.812 | 0,952 |
| 17:11:15 | 1.758 | 1.795 | 0,951 |
| 17:11:20 | 1.766 | 1.813 | 0,952 |
| 17:11:25 | 1.768 | 1.803 | 0,952 |
| 17:11:30 | 1.763 | 1.807 | 0,952 |
| 17:11:35 | 1.770 | 1.816 | 0,952 |
| 17:11:40 | 1.778 | 1.813 | 0,952 |
| 17:11:45 | 1.757 | 1.788 | 0,951 |
| 17:11:50 | 1.745 | 1.789 | 0,951 |
| 17:11:55 | 1.757 | 1.803 | 0,952 |
| 17:12:00 | 1.767 | 1.806 | 0,952 |
| 17:12:05 | 1.759 | 1.797 | 0,951 |
| 17:12:10 | 1.759 | 1.804 | 0,952 |
| 17:12:15 | 1.763 | 1.801 | 0,951 |
| 17:12:20 | 1.761 | 1.803 | 0,952 |
| 17:12:25 | 1.766 | 1.810 | 0,952 |
| 17:12:30 | 1.768 | 1.805 | 0,952 |
| 17:12:35 | 1.761 | 1.803 | 0,952 |
| 17:12:40 | 1.767 | 1.811 | 0,952 |
| 17:12:45 | 1.769 | 1.804 | 0,952 |
| 17:12:50 | 1.755 | 1.790 | 0,951 |
| 17:12:55 | 1.744 | 1.789 | 0,951 |
| 17:13:00 | 1.758 | 1.801 | 0,952 |
| 17:13:05 | 1.771 | 1.823 | 0,953 |
| 17:13:10 | 1.789 | 1.827 | 0,953 |
| 17:13:15 | 1.774 | 1.805 | 0,952 |
| 17:13:20 | 1.757 | 1.796 | 0,952 |
| 17:13:25 | 1.753 | 1.794 | 0,951 |
| 17:13:30 | 1.764 | 1.809 | 0,952 |
| 17:13:35 | 1.764 | 1.802 | 0,952 |
| 17:13:40 | 1.759 | 1.798 | 0,952 |
| 17:13:45 | 1.757 | 1.798 | 0,952 |
| 17:13:50 | 1.764 | 1.811 | 0,952 |
| 17:13:55 | 1.770 | 1.805 | 0,952 |
| 17:14:00 | 1.755 | 1.792 | 0,951 |
| 17:14:05 | 1.751 | 1.792 | 0,952 |
| 17:14:10 | 1.754 | 1.798 | 0,952 |
| 17:14:15 | 1.760 | 1.797 | 0,952 |
| 17:14:20 | 1.753 | 1.797 | 0,952 |
| 17:14:25 | 1.768 | 1.814 | 0,952 |
| 17:14:30 | 1.775 | 1.813 | 0,953 |
| 17:14:35 | 1.767 | 1.807 | 0,952 |
| 17:14:40 | 1.760 | 1.796 | 0,952 |
| 17:14:45 | 1.753 | 1.793 | 0,952 |
| 17:14:50 | 1.755 | 1.798 | 0,952 |
| 17:14:55 | 1.756 | 1.799 | 0,952 |
| 17:15:00 | 1.765 | 1.809 | 0,952 |
| 17:15:05 | 1.769 | 1.809 | 0,952 |
| 17:15:10 | 1.774 | 1.819 | 0,953 |
| 17:15:15 | 1.776 | 1.811 | 0,952 |
| 17:15:20 | 1.762 | 1.798 | 0,952 |
| 17:15:25 | 1.755 | 1.798 | 0,952 |
| 17:15:30 | 1.759 | 1.795 | 0,952 |
| 17:15:35 | 1.744 | 1.784 | 0,951 |
| 17:15:40 | 1.750 | 1.794 | 0,952 |
| 17:15:45 | 1.758 | 1.807 | 0,952 |
| 17:15:50 | 1.777 | 1.815 | 0,953 |
| 17:15:55 | 1.768 | 1.803 | 0,952 |
| 17:16:00 | 1.756 | 1.795 | 0,952 |
| 17:16:05 | 1.756 | 1.803 | 0,952 |
| 17:16:10 | 1.769 | 1.809 | 0,953 |
| 17:16:15 | 1.765 | 1.804 | 0,952 |
| 17:16:20 | 1.765 | 1.806 | 0,952 |
| 17:16:25 | 1.764 | 1.805 | 0,952 |
| 17:16:30 | 1.762 | 1.800 | 0,952 |
| 17:16:35 | 1.761 | 1.806 | 0,953 |
| 17:16:40 | 1.774 | 1.817 | 0,953 |
| 17:16:45 | 1.774 | 1.813 | 0,953 |
| 17:16:50 | 1.770 | 1.806 | 0,952 |
| 17:16:55 | 1.759 | 1.796 | 0,952 |
| 17:17:00 | 1.751 | 1.791 | 0,952 |
| 17:17:05 | 1.757 | 1.808 | 0,953 |
| 17:17:10 | 1.779 | 1.824 | 0,953 |
| 17:17:15 | 1.782 | 1.818 | 0,953 |
| 17:17:20 | 1.774 | 1.818 | 0,953 |
| 17:17:25 | 1.771 | 1.801 | 0,952 |
| 17:17:30 | 1.750 | 1.788 | 0,952 |
| 17:17:35 | 1.751 | 1.795 | 0,952 |
| 17:17:40 | 1.759 | 1.804 | 0,952 |
| 17:17:45 | 1.768 | 1.814 | 0,953 |
| 17:17:50 | 1.777 | 1.813 | 0,952 |
| 17:17:55 | 1.760 | 1.793 | 0,952 |
| 17:18:00 | 1.743 | 1.778 | 0,951 |
| 17:18:05 | 1.736 | 1.780 | 0,951 |
| 17:18:10 | 1.754 | 1.806 | 0,952 |
| 17:18:15 | 1.778 | 1.824 | 0,953 |
| 17:18:20 | 1.784 | 1.823 | 0,953 |
| 17:18:25 | 1.776 | 1.813 | 0,953 |
| 17:18:30 | 1.772 | 1.810 | 0,953 |
| 17:18:35 | 1.762 | 1.797 | 0,952 |
| 17:18:40 | 1.753 | 1.800 | 0,952 |
| 17:18:45 | 1.773 | 1.820 | 0,953 |
| 17:18:50 | 1.775 | 1.809 | 0,953 |
| 17:18:55 | 1.754 | 1.786 | 0,952 |
| 17:19:00 | 1.748 | 1.795 | 0,952 |
| 17:19:05 | 1.763 | 1.804 | 0,952 |
| 17:19:10 | 1.755 | 1.793 | 0,952 |
| 17:19:15 | 1.752 | 1.793 | 0,952 |
| 17:19:20 | 1.758 | 1.808 | 0,953 |
| 17:19:25 | 1.776 | 1.817 | 0,953 |
| 17:19:30 | 1.774 | 1.818 | 0,953 |
| 17:19:35 | 1.777 | 1.813 | 0,953 |
| 17:19:40 | 1.764 | 1.798 | 0,952 |
| 17:19:45 | 1.762 | 1.813 | 0,953 |
| 17:19:50 | 1.773 | 1.808 | 0,953 |
| 17:19:55 | 1.761 | 1.803 | 0,953 |
| 17:20:00 | 1.764 | 1.804 | 0,953 |
| 17:20:05 | 1.763 | 1.803 | 0,953 |
| 17:20:10 | 1.760 | 1.798 | 0,952 |
| 17:20:15 | 1.751 | 1.792 | 0,952 |
| 17:20:20 | 1.760 | 1.808 | 0,953 |
| 17:20:25 | 1.769 | 1.807 | 0,953 |
| 17:20:30 | 1.759 | 1.799 | 0,952 |
| 17:20:35 | 1.762 | 1.809 | 0,953 |
| 17:20:40 | 1.775 | 1.816 | 0,953 |
| 17:20:45 | 1.769 | 1.803 | 0,953 |
| 17:20:50 | 1.756 | 1.798 | 0,952 |
| 17:20:55 | 1.765 | 1.809 | 0,952 |
| 17:21:00 | 1.762 | 1.798 | 0,953 |
| 17:21:05 | 1.751 | 1.785 | 0,951 |
| 17:21:10 | 1.741 | 1.786 | 0,952 |
| 17:21:15 | 1.757 | 1.803 | 0,952 |
| 17:21:20 | 1.763 | 1.805 | 0,953 |
| 17:21:25 | 1.769 | 1.816 | 0,953 |
| 17:21:30 | 1.776 | 1.809 | 0,953 |
| 17:21:35 | 1.758 | 1.796 | 0,952 |
| 17:21:40 | 1.751 | 1.791 | 0,952 |
| 17:21:45 | 1.757 | 1.804 | 0,953 |
| 17:21:50 | 1.766 | 1.807 | 0,953 |
| 17:21:55 | 1.766 | 1.804 | 0,953 |
| 17:22:00 | 1.763 | 1.805 | 0,952 |
| 17:22:05 | 1.765 | 1.808 | 0,952 |
| 17:22:10 | 1.770 | 1.814 | 0,953 |
| 17:22:15 | 1.774 | 1.812 | 0,953 |
| 17:22:20 | 1.770 | 1.813 | 0,953 |
| 17:22:25 | 1.778 | 1.821 | 0,953 |
| 17:22:30 | 1.768 | 1.797 | 0,952 |
| 17:22:35 | 1.747 | 1.791 | 0,950 |
| 17:22:40 | 1.762 | 1.809 | 0,953 |
| 17:22:45 | 1.770 | 1.812 | 0,952 |
| 17:22:50 | 1.773 | 1.813 | 0,953 |
| 17:22:55 | 1.765 | 1.804 | 0,952 |

|                 |        |            |
|-----------------|--------|------------|
| C_esp Corregido | 2.206  | kcal / kWh |
| Corrección      | -1,30% |            |

17:22:55

17:22:55

|          |       |       |       |
|----------|-------|-------|-------|
| 17:23:00 | 1.763 | 1.796 | 0,952 |
| 17:23:05 | 1.747 | 1.789 | 0,952 |
| 17:23:10 | 1.756 | 1.798 | 0,952 |
| 17:23:15 | 1.758 | 1.803 | 0,952 |
| 17:23:20 | 1.766 | 1.803 | 0,952 |
| 17:23:25 | 1.762 | 1.801 | 0,952 |
| 17:23:30 | 1.763 | 1.816 | 0,952 |
| 17:23:35 | 1.788 | 1.831 | 0,953 |
| 17:23:40 | 1.788 | 1.822 | 0,952 |
| 17:23:45 | 1.769 | 1.800 | 0,952 |
| 17:23:50 | 1.749 | 1.788 | 0,951 |
| 17:23:55 | 1.753 | 1.798 | 0,952 |
| 17:24:00 | 1.765 | 1.807 | 0,952 |
| 17:24:05 | 1.768 | 1.812 | 0,952 |
| 17:24:10 | 1.778 | 1.819 | 0,952 |
| 17:24:15 | 1.766 | 1.798 | 0,952 |
| 17:24:20 | 1.751 | 1.785 | 0,951 |
| 17:24:25 | 1.743 | 1.786 | 0,951 |
| 17:24:30 | 1.749 | 1.787 | 0,951 |
| 17:24:35 | 1.745 | 1.790 | 0,951 |
| 17:24:40 | 1.759 | 1.805 | 0,952 |
| 17:24:45 | 1.775 | 1.822 | 0,953 |
| 17:24:50 | 1.783 | 1.821 | 0,953 |
| 17:24:55 | 1.770 | 1.797 | 0,952 |
| 17:25:00 | 1.747 | 1.789 | 0,951 |
| 17:25:05 | 1.759 | 1.807 | 0,952 |
| 17:25:10 | 1.775 | 1.817 | 0,952 |
| 17:25:15 | 1.769 | 1.804 | 0,952 |
| 17:25:20 | 1.762 | 1.803 | 0,952 |
| 17:25:25 | 1.770 | 1.816 | 0,952 |
| 17:25:30 | 1.773 | 1.804 | 0,952 |
| 17:25:35 | 1.745 | 1.775 | 0,951 |
| 17:25:40 | 1.738 | 1.788 | 0,951 |
| 17:25:45 | 1.759 | 1.802 | 0,952 |
| 17:25:50 | 1.765 | 1.805 | 0,952 |
| 17:25:55 | 1.768 | 1.812 | 0,952 |
| 17:26:00 | 1.777 | 1.815 | 0,952 |
| 17:26:05 | 1.765 | 1.800 | 0,952 |
| 17:26:10 | 1.761 | 1.805 | 0,952 |
| 17:26:15 | 1.763 | 1.801 | 0,952 |
| 17:26:20 | 1.764 | 1.807 | 0,952 |
| 17:26:25 | 1.767 | 1.802 | 0,952 |
| 17:26:30 | 1.753 | 1.788 | 0,951 |
| 17:26:35 | 1.749 | 1.796 | 0,952 |
| 17:26:40 | 1.768 | 1.814 | 0,952 |
| 17:26:45 | 1.778 | 1.814 | 0,952 |
| 17:26:50 | 1.765 | 1.804 | 0,952 |
| 17:26:55 | 1.763 | 1.804 | 0,952 |
| 17:27:00 | 1.761 | 1.799 | 0,951 |
| 17:27:05 | 1.756 | 1.795 | 0,952 |
| 17:27:10 | 1.753 | 1.796 | 0,951 |
| 17:27:15 | 1.759 | 1.803 | 0,952 |
| 17:27:20 | 1.770 | 1.811 | 0,952 |
| 17:27:25 | 1.769 | 1.809 | 0,952 |
| 17:27:30 | 1.762 | 1.797 | 0,951 |
| 17:27:35 | 1.753 | 1.794 | 0,951 |
| 17:27:40 | 1.763 | 1.813 | 0,952 |
| 17:27:45 | 1.779 | 1.812 | 0,952 |
| 17:27:50 | 1.761 | 1.800 | 0,952 |
| 17:27:55 | 1.762 | 1.806 | 0,952 |
| 17:28:00 | 1.766 | 1.803 | 0,952 |
| 17:28:05 | 1.757 | 1.795 | 0,952 |
| 17:28:10 | 1.755 | 1.796 | 0,951 |
| 17:28:15 | 1.751 | 1.783 | 0,951 |
| 17:28:20 | 1.739 | 1.783 | 0,951 |
| 17:28:25 | 1.753 | 1.800 | 0,952 |
| 17:28:30 | 1.769 | 1.814 | 0,952 |
| 17:28:35 | 1.772 | 1.811 | 0,952 |
| 17:28:40 | 1.768 | 1.805 | 0,952 |
| 17:28:45 | 1.768 | 1.814 | 0,952 |
| 17:28:50 | 1.775 | 1.812 | 0,952 |
| 17:28:55 | 1.763 | 1.799 | 0,952 |
| 17:29:00 | 1.754 | 1.793 | 0,951 |
| 17:29:05 | 1.757 | 1.801 | 0,952 |
| 17:29:10 | 1.763 | 1.802 | 0,951 |
| 17:29:15 | 1.762 | 1.807 | 0,952 |
| 17:29:20 | 1.771 | 1.811 | 0,952 |
| 17:29:25 | 1.764 | 1.800 | 0,952 |
| 17:29:30 | 1.764 | 1.805 | 0,952 |
| 17:29:35 | 1.753 | 1.785 | 0,951 |
| 17:29:40 | 1.750 | 1.797 | 0,951 |
| 17:29:45 | 1.764 | 1.810 | 0,952 |
| 17:29:50 | 1.772 | 1.810 | 0,952 |
| 17:29:55 | 1.768 | 1.814 | 0,952 |
| 17:30:00 | 1.779 | 1.819 | 0,952 |

$$\text{where } \beta = \frac{k}{\alpha} \quad (8)$$



|          |       |       |       |
|----------|-------|-------|-------|
| 18:11:05 | 1.761 | 1.803 | 0,945 |
| 18:11:10 | 1.756 | 1.799 | 0,945 |
| 18:11:15 | 1.767 | 1.810 | 0,946 |
| 18:11:20 | 1.766 | 1.808 | 0,945 |
| 18:11:25 | 1.764 | 1.807 | 0,946 |
| 18:11:30 | 1.771 | 1.814 | 0,946 |
| 18:11:35 | 1.771 | 1.813 | 0,946 |
| 18:11:40 | 1.764 | 1.806 | 0,945 |
| 18:11:45 | 1.761 | 1.803 | 0,945 |
| 18:11:50 | 1.757 | 1.800 | 0,945 |
| 18:11:55 | 1.771 | 1.815 | 0,946 |
| 18:12:00 | 1.775 | 1.817 | 0,946 |
| 18:12:05 | 1.757 | 1.799 | 0,945 |
| 18:12:10 | 1.762 | 1.804 | 0,945 |
| 18:12:15 | 1.763 | 1.807 | 0,946 |
| 18:12:20 | 1.767 | 1.809 | 0,946 |
| 18:12:25 | 1.762 | 1.805 | 0,946 |
| 18:12:30 | 1.786 | 1.830 | 0,946 |
| 18:12:35 | 1.779 | 1.821 | 0,946 |
| 18:12:40 | 1.763 | 1.806 | 0,945 |
| 18:12:45 | 1.769 | 1.812 | 0,946 |
| 18:12:50 | 1.756 | 1.798 | 0,945 |
| 18:12:55 | 1.762 | 1.805 | 0,945 |
| 18:13:00 | 1.776 | 1.819 | 0,946 |
| 18:13:05 | 1.760 | 1.801 | 0,945 |
| 18:13:10 | 1.752 | 1.795 | 0,945 |
| 18:13:15 | 1.770 | 1.814 | 0,946 |
| 18:13:20 | 1.764 | 1.805 | 0,945 |
| 18:13:25 | 1.744 | 1.786 | 0,944 |
| 18:13:30 | 1.766 | 1.810 | 0,945 |
| 18:13:35 | 1.783 | 1.825 | 0,946 |
| 18:13:40 | 1.755 | 1.796 | 0,945 |
| 18:13:45 | 1.750 | 1.794 | 0,945 |
| 18:13:50 | 1.773 | 1.817 | 0,946 |
| 18:13:55 | 1.783 | 1.826 | 0,946 |
| 18:14:00 | 1.780 | 1.823 | 0,946 |
| 18:14:05 | 1.773 | 1.814 | 0,946 |
| 18:14:10 | 1.763 | 1.805 | 0,945 |
| 18:14:15 | 1.765 | 1.809 | 0,945 |
| 18:14:20 | 1.771 | 1.813 | 0,946 |
| 18:14:25 | 1.770 | 1.814 | 0,946 |
| 18:14:30 | 1.772 | 1.815 | 0,946 |
| 18:14:35 | 1.776 | 1.819 | 0,946 |
| 18:14:40 | 1.758 | 1.798 | 0,945 |
| 18:14:45 | 1.746 | 1.789 | 0,944 |
| 18:14:50 | 1.755 | 1.798 | 0,945 |
| 18:14:55 | 1.766 | 1.808 | 0,945 |
| 18:15:00 | 1.763 | 1.806 | 0,945 |
| 18:15:05 | 1.777 | 1.820 | 0,946 |
| 18:15:10 | 1.770 | 1.812 | 0,946 |
| 18:15:15 | 1.767 | 1.810 | 0,945 |
| 18:15:20 | 1.770 | 1.812 | 0,945 |
| 18:15:25 | 1.756 | 1.797 | 0,945 |
| 18:15:30 | 1.749 | 1.791 | 0,945 |
| 18:15:35 | 1.777 | 1.822 | 0,946 |
| 18:15:40 | 1.791 | 1.835 | 0,947 |
| 18:15:45 | 1.778 | 1.819 | 0,946 |
| 18:15:50 | 1.770 | 1.812 | 0,946 |
| 18:15:55 | 1.773 | 1.816 | 0,946 |
| 18:16:00 | 1.759 | 1.800 | 0,945 |
| 18:16:05 | 1.746 | 1.787 | 0,945 |
| 18:16:10 | 1.756 | 1.799 | 0,945 |
| 18:16:15 | 1.776 | 1.820 | 0,946 |
| 18:16:20 | 1.778 | 1.819 | 0,946 |
| 18:16:25 | 1.759 | 1.802 | 0,945 |
| 18:16:30 | 1.776 | 1.820 | 0,946 |
| 18:16:35 | 1.770 | 1.811 | 0,945 |
| 18:16:40 | 1.744 | 1.786 | 0,944 |
| 18:16:45 | 1.748 | 1.791 | 0,945 |
| 18:16:50 | 1.778 | 1.822 | 0,946 |
| 18:16:55 | 1.783 | 1.824 | 0,946 |
| 18:17:00 | 1.758 | 1.799 | 0,945 |
| 18:17:05 | 1.755 | 1.798 | 0,945 |
| 18:17:10 | 1.768 | 1.811 | 0,946 |
| 18:17:15 | 1.777 | 1.821 | 0,946 |
| 18:17:20 | 1.777 | 1.819 | 0,946 |
| 18:17:25 | 1.762 | 1.803 | 0,945 |
| 18:17:30 | 1.754 | 1.796 | 0,945 |
| 18:17:35 | 1.759 | 1.802 | 0,945 |
| 18:17:40 | 1.767 | 1.810 | 0,945 |
| 18:17:45 | 1.763 | 1.805 | 0,945 |
| 18:17:50 | 1.759 | 1.802 | 0,945 |
| 18:17:55 | 1.769 | 1.813 | 0,946 |
| 18:18:00 | 1.782 | 1.825 | 0,946 |
| 18:18:05 | 1.776 | 1.818 | 0,946 |
| 18:18:10 | 1.766 | 1.808 | 0,946 |
| 18:18:15 | 1.759 | 1.802 | 0,945 |
| 18:18:20 | 1.767 | 1.811 | 0,946 |
| 18:18:25 | 1.770 | 1.811 | 0,945 |
| 18:18:30 | 1.759 | 1.802 | 0,945 |
| 18:18:35 | 1.762 | 1.804 | 0,945 |
| 18:18:40 | 1.761 | 1.804 | 0,945 |
| 18:18:45 | 1.773 | 1.816 | 0,946 |
| 18:18:50 | 1.775 | 1.818 | 0,946 |
| 18:18:55 | 1.772 | 1.814 | 0,946 |
| 18:19:00 | 1.774 | 1.817 | 0,946 |
| 18:19:05 | 1.771 | 1.813 | 0,946 |
| 18:19:10 | 1.756 | 1.798 | 0,945 |
| 18:19:15 | 1.755 | 1.798 | 0,945 |
| 18:19:20 | 1.784 | 1.829 | 0,947 |
| 18:19:25 | 1.792 | 1.834 | 0,947 |
| 18:19:30 | 1.775 | 1.816 | 0,946 |
| 18:19:35 | 1.761 | 1.802 | 0,945 |
| 18:19:40 | 1.755 | 1.797 | 0,945 |
| 18:19:45 | 1.764 | 1.807 | 0,945 |
| 18:19:50 | 1.768 | 1.812 | 0,946 |
| 18:19:55 | 1.774 | 1.816 | 0,946 |
| 18:20:00 | 1.764 | 1.806 | 0,945 |
| 18:20:05 | 1.757 | 1.799 | 0,945 |
| 18:20:10 | 1.761 | 1.805 | 0,945 |
| 18:20:15 | 1.773 | 1.816 | 0,946 |
| 18:20:20 | 1.783 | 1.826 | 0,946 |
| 18:20:25 | 1.771 | 1.813 | 0,946 |
| 18:20:30 | 1.758 | 1.800 | 0,945 |
| 18:20:35 | 1.767 | 1.811 | 0,946 |
| 18:20:40 | 1.772 | 1.814 | 0,946 |
| 18:20:45 | 1.761 | 1.802 | 0,945 |
| 18:20:50 | 1.758 | 1.802 | 0,945 |
| 18:20:55 | 1.780 | 1.823 | 0,946 |
| 18:21:00 | 1.768 | 1.809 | 0,946 |
| 18:21:05 | 1.761 | 1.804 | 0,945 |
| 18:21:10 | 1.762 | 1.804 | 0,945 |
| 18:21:15 | 1.759 | 1.802 | 0,945 |
| 18:21:20 | 1.774 | 1.818 | 0,946 |
| 18:21:25 | 1.777 | 1.819 | 0,946 |
| 18:21:30 | 1.762 | 1.804 | 0,945 |
| 18:21:35 | 1.768 | 1.811 | 0,945 |
| 18:21:40 | 1.770 | 1.813 | 0,946 |
| 18:21:45 | 1.769 | 1.812 | 0,945 |
| 18:21:50 | 1.770 | 1.813 | 0,945 |
| 18:21:55 | 1.765 | 1.807 | 0,946 |
| 18:22:00 | 1.753 | 1.795 | 0,945 |
| 18:22:05 | 1.754 | 1.798 | 0,945 |
| 18:22:10 | 1.781 | 1.824 | 0,946 |
| 18:22:15 | 1.775 | 1.817 | 0,946 |
| 18:22:20 | 1.752 | 1.794 | 0,945 |
| 18:22:25 | 1.756 | 1.799 | 0,945 |
| 18:22:30 | 1.768 | 1.812 | 0,945 |
| 18:22:35 | 1.779 | 1.822 | 0,946 |
| 18:22:40 | 1.770 | 1.813 | 0,946 |
| 18:22:45 | 1.765 | 1.807 | 0,945 |
| 18:22:50 | 1.766 | 1.808 | 0,945 |
| 18:22:55 | 1.766 | 1.808 | 0,945 |

|                 |        |            |
|-----------------|--------|------------|
| C_esp Corregido | 2.224  | kcal / kWh |
| Corrección      | -1,37% |            |

|          |       |       |       |
|----------|-------|-------|-------|
| 18:23:00 | 1.755 | 1.797 | 0,945 |
| 18:23:05 | 1.761 | 1.805 | 0,945 |
| 18:23:10 | 1.771 | 1.814 | 0,945 |
| 18:23:15 | 1.773 | 1.815 | 0,946 |
| 18:23:20 | 1.773 | 1.816 | 0,945 |
| 18:23:25 | 1.766 | 1.808 | 0,945 |
| 18:23:30 | 1.767 | 1.810 | 0,945 |
| 18:23:35 | 1.771 | 1.813 | 0,946 |
| 18:23:40 | 1.759 | 1.801 | 0,945 |
| 18:23:45 | 1.766 | 1.809 | 0,945 |
| 18:23:50 | 1.761 | 1.802 | 0,945 |
| 18:23:55 | 1.754 | 1.796 | 0,945 |
| 18:24:00 | 1.765 | 1.808 | 0,945 |
| 18:24:05 | 1.773 | 1.817 | 0,946 |
| 18:24:10 | 1.781 | 1.823 | 0,946 |
| 18:24:15 | 1.767 | 1.808 | 0,945 |
| 18:24:20 | 1.747 | 1.789 | 0,944 |
| 18:24:25 | 1.767 | 1.811 | 0,945 |
| 18:24:30 | 1.782 | 1.825 | 0,946 |
| 18:24:35 | 1.769 | 1.810 | 0,945 |
| 18:24:40 | 1.760 | 1.803 | 0,945 |
| 18:24:45 | 1.769 | 1.812 | 0,946 |
| 18:24:50 | 1.767 | 1.808 | 0,945 |
| 18:24:55 | 1.763 | 1.807 | 0,945 |
| 18:25:00 | 1.773 | 1.814 | 0,946 |
| 18:25:05 | 1.758 | 1.800 | 0,945 |
| 18:25:10 | 1.750 | 1.792 | 0,944 |
| 18:25:15 | 1.754 | 1.796 | 0,945 |
| 18:25:20 | 1.750 | 1.793 | 0,945 |
| 18:25:25 | 1.773 | 1.817 | 0,946 |
| 18:25:30 | 1.790 | 1.834 | 0,947 |
| 18:25:35 | 1.784 | 1.825 | 0,946 |
| 18:25:40 | 1.774 | 1.816 | 0,946 |
| 18:25:45 | 1.766 | 1.808 | 0,945 |
| 18:25:50 | 1.753 | 1.795 | 0,945 |
| 18:25:55 | 1.765 | 1.809 | 0,945 |
| 18:26:00 | 1.770 | 1.812 | 0,945 |
| 18:26:05 | 1.763 | 1.805 | 0,945 |
| 18:26:10 | 1.754 | 1.794 | 0,944 |
| 18:26:15 | 1.740 | 1.782 | 0,944 |
| 18:26:20 | 1.756 | 1.800 | 0,945 |
| 18:26:25 | 1.773 | 1.816 | 0,946 |
| 18:26:30 | 1.781 | 1.823 | 0,946 |
| 18:26:35 | 1.777 | 1.819 | 0,946 |
| 18:26:40 | 1.763 | 1.805 | 0,945 |
| 18:26:45 | 1.750 | 1.792 | 0,944 |
| 18:26:50 | 1.767 | 1.811 | 0,945 |
| 18:26:55 | 1.771 | 1.813 | 0,945 |
| 18:27:00 | 1.763 | 1.805 | 0,945 |
| 18:27:05 | 1.762 | 1.804 | 0,945 |
| 18:27:10 | 1.779 | 1.823 | 0,946 |
| 18:27:15 | 1.788 | 1.830 | 0,946 |
| 18:27:20 | 1.780 | 1.821 | 0,946 |
| 18:27:25 | 1.773 | 1.814 | 0,945 |
| 18:27:30 | 1.746 | 1.786 | 0,944 |
| 18:27:35 | 1.746 | 1.789 | 0,944 |
| 18:27:40 | 1.767 | 1.811 | 0,945 |
| 18:27:45 | 1.776 | 1.819 | 0,946 |
| 18:27:50 | 1.773 | 1.816 | 0,945 |
| 18:27:55 | 1.763 | 1.804 | 0,945 |
| 18:28:00 | 1.765 | 1.807 | 0,945 |
| 18:28:05 | 1.753 | 1.793 | 0,944 |
| 18:28:10 | 1.750 | 1.795 | 0,945 |
| 18:28:15 | 1.785 | 1.829 | 0,946 |
| 18:28:20 | 1.778 | 1.819 | 0,946 |
| 18:28:25 | 1.755 | 1.796 | 0,945 |
| 18:28:30 | 1.750 | 1.793 | 0,945 |
| 18:28:35 | 1.766 | 1.809 | 0,945 |
| 18:28:40 | 1.774 | 1.817 | 0,946 |
| 18:28:45 | 1.770 | 1.813 | 0,944 |
| 18:28:50 | 1.772 | 1.815 | 0,944 |
| 18:28:55 | 1.771 | 1.813 | 0,946 |
| 18:29:00 | 1.764 | 1.806 | 0,945 |
| 18:29:05 | 1.771 | 1.814 | 0,945 |
| 18:29:10 | 1.765 | 1.807 | 0,945 |
| 18:29:15 | 1.754 | 1.796 | 0,945 |
| 18:29:20 | 1.757 | 1.800 | 0,945 |
| 18:29:25 | 1.765 | 1.808 | 0,945 |
| 18:29:30 | 1.767 | 1.810 | 0,945 |
| 18:29:35 | 1.761 | 1.803 | 0,945 |
| 18:29:40 | 1.758 | 1.800 | 0,945 |
| 18:29:45 | 1.765 | 1.808 | 0,945 |
| 18:29:50 | 1.772 | 1.815 | 0,946 |
| 18:29:55 | 1.769 | 1.812 | 0,945 |
| 18:30:00 | 1.762 | 1.804 | 0,945 |