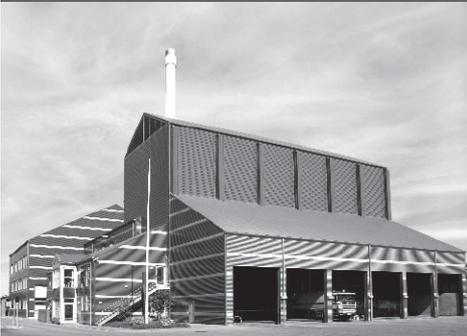




-power in control



## DESIGNER'S HANDBOOK



### **Compact Genset Controller, CGC 200**

- Functions and sequences
- Parameter list
- Utility software, for design and configuration



DEIF A/S · Frisenborgvej 33 · DK-7800 Skive  
Tel.: +45 9614 9614 · Fax: +45 9614 9615  
info@deif.com · www.deif.com

Document no.: 4189340805A  
SW version:

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# 1. Introduction

## 1.1 About the Designer's handbook

### 1.1.1 General purpose

This is the **Designer's handbook** for DEIF's Compact Genset Controller, CGC 200. The general purpose is to give the designer information for using CGC 200 and its functions to protect and control a genset system.

Information on controller functions and sequences is given, so that you can specify the design that best fits your system. Input, output and parameter information is then given. This allows the input and output configuration and controller parameters to be set appropriately. The Utility Software is described, so that the designer can enter the design parameter values, along with the input and output configuration. The design information can be saved in a file using the Utility Software. This information can be written to one or more controllers during commissioning.



**Read this handbook before designing the genset system. Failure to do this could result in damage to the equipment or human injury.**

### 1.1.2 Intended users

The handbook is mainly intended for the person responsible for designing the genset control system. The handbook also serves as a reference for those responsible for installation and commissioning, as well as for operators.

### 1.1.3 Revision information

The letter at the end of the document number on the front page indicates the revision number of this document.

The latest version of this document can be downloaded at [www.deif.com](http://www.deif.com). If you click on the revision letter to the right of the document name, the revision history is displayed.

### 1.1.4 Software version

This document is based on the following software versions:

| Software type    | Software version                     |
|------------------|--------------------------------------|
| CGC 200 firmware | CGC 200 SW version 1.xx              |
| Utility software | Multi-line 2 Utility Software v.3.x. |

### 1.1.5 Other technical documentation

The CGC 200 documentation consists of the following documents:

- Quick start guide
  - Front panel
  - Initial start-up
  - Parameter setting
  - Wiring diagram
  - Mounting

- Some technical specifications
- Data sheet
  - Description, features, functions and approvals
  - Layout and dimensions
  - Terminals and wiring diagram
  - Technical specifications
- Designer's handbook
  - Description of functions and sequences
  - Parameters
  - Utility software
- Installation and commissioning instructions
  - Tools required
  - Mounting the controller
  - Terminals and wiring diagram
  - Parameters
  - Sequence for commissioning
  - Commissioning using the utility software
  - Commissioning using the front panel
  - Technical support
- Operator's manual
  - Basic operator tasks
  - Front panel
  - Parameters
  - Utility software
  - Technical support

Glossaries are included in the **Designer's handbook**, the **Installation and commissioning instructions** and the **Operator's manual**.

### 1.1.6 Getting technical support

You can read about service and support options on the DEIF website, [www.deif.com](http://www.deif.com). You can also find contact details on the DEIF website.

You have the following options if you need technical support for your controller:

- Technical documentation: All the product technical documentation is available on the DEIF website.
- Training: You can ask for training.
- Support: You can call or email DEIF. DEIF offers 24-hour support. There may also be a local DEIF subsidiary.
- Service: DEIF engineers can help with design, commissioning, operating and optimisation.

## 1.2 Warnings, legal information and safety

### 1.2.1 Warnings and notes

A number of warnings and notes are included in this document. These are highlighted, to separate them from the general text.



**Warnings indicate potentially dangerous situations. If the guidelines are not followed, these situations could result in death, personal injury or damaged equipment.**



Notes provide general, helpful information.

### 1.2.2 Safety issues

Installing and operating the unit may require work with dangerous currents and voltages. The installation must only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.



**Hazardous live currents and voltages. Do not touch any terminals, especially the AC measurement inputs. Touching the terminals could lead to injury or death.**



**DEIF does not recommend using the PC USB as the primary power supply for the CGC 200. The power drawn on start up exceeds the USB standard and may damage the PC.**

### 1.2.3 Factory settings

The controller is delivered pre-programmed from the factory with a set of factory settings. These are based on average values and are therefore not necessarily correct for your genset. All controller parameters must be checked before running the genset.

### 1.2.4 Electrostatic discharge awareness

Protect the controller terminals from static discharge during installation. You must also protect the terminals if you need to remove the controller.

These precautions are no longer necessary once the controller is correctly installed and connected, as required by the designer's wiring diagram.

### 1.2.5 Legal information

DEIF takes no responsibility for the installation or operation of the genset. Contact the genset company if you have any doubt about installing or operating the genset.



**The controller must not be opened by unauthorised personnel. If opened, the warranty is void.**

#### Disclaimer

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## 2. Description of functions

### 2.1 General functions

#### 2.1.1 Features and functions

##### Overview

- Auto start
- Monitoring of operating data
- Warnings and shutdown protections
- Both fixed and user-configurable digital inputs and relay outputs
- Configurable for other applications
- Power saving mode
- Licence-free PC Utility Software
  - Design: select configurable inputs and outputs, set parameters
  - Commissioning: upload parameters to the controller
  - Operation: monitor operating data and alarms

##### Front panel

- 20 mm × 40 mm display with backlight
- Four push-buttons and two LEDs
- Display genset operating data
- Icons for alarms and the genset mode
- Configure timers and parameter settings using the push-buttons

##### Engine control

- Start preparation (pre-heating or pre-lubrication)
- Start and stop sequences, with a selectable number of start attempts
- Fuel solenoid control (coil type)
- Idle speed time control
- Manual (local) or remote start and stop
- Stop sequence with cooling down
- Running feedback detection (select one):
  - Generator frequency and voltage
  - Engine speed
  - Combination of engine speed, and generator frequency and voltage

##### Engine monitoring and protection

- Engine speed input (from an MPU)
- Configurable digital inputs (select up to four):
  - Remote start
  - High coolant temperature shutdown
  - Low lube oil pressure shutdown
  - Auxiliary (emergency) shutdown
  - Low fuel level warning
  - High coolant temperature warning
  - Low lube oil pressure warning
- Non-configurable Fuel and Start relay outputs
- Battery voltage

##### Configurable relay output functions (select up to three)

- Common alarm
- Stop coil

- Idle control
- Pre-heat
- Close generator breaker

#### **Generator monitoring and protection**

- Phase-to-neutral and phase-to-phase generator monitoring
- Voltage and frequency monitoring
- Over- and under-voltage
- Over- and under-frequency

## **2.2 Controller functions**

### **2.2.1 Alarms**

The controller detects and displays individual alarms.



 flashes when active alarms are present. All the active alarms are displayed on the front panel as icons. You can see all the active alarms on the display at the same time, so that screen navigation is not needed.

You can also configure one relay for common alarms. The common alarm relay closes when shutdown alarms are present. It opens when the alarms are reset.

Alarms can be reset by pressing  on the front panel.  resets all alarms.

When  is pressed:

- The alarm LED changes from **flashing** to **off**.
- The alarm icons disappear.
- If configured, the common relay alarm opens.

However, if the cause of an alarm is still present, after the alarms are reset:

- The alarm LED starts to flash again.
- The alarm icon reappears.
- If configured, and the alarm is a shutdown alarm, the common alarm relay closes.

### 2.2.2 Alarm icons

The table below lists the CGC 200 display alarms icons, along with their descriptions.

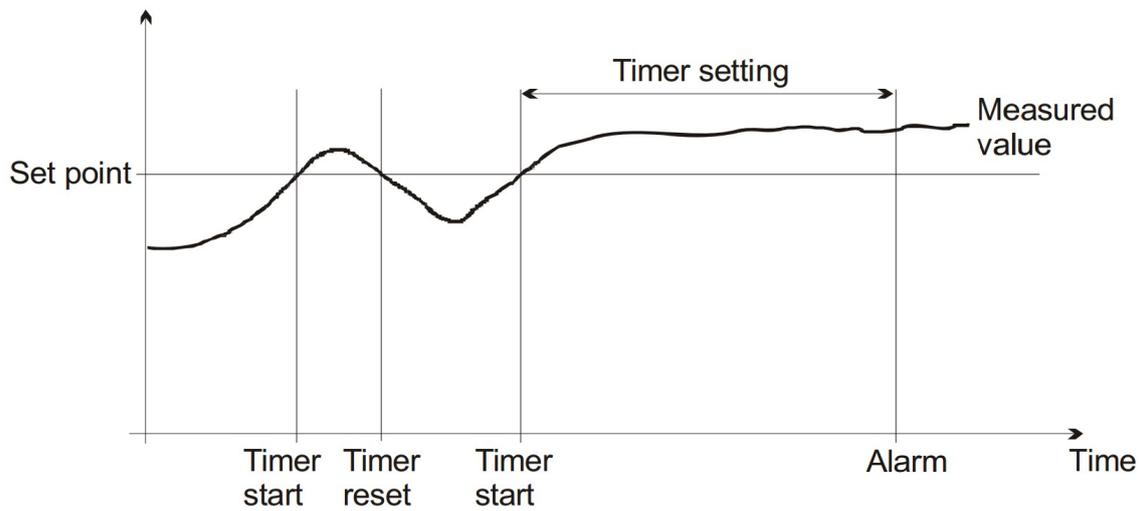
| Alarm icons   | Description                    |
|---|--------------------------------|
|    | High temperature               |
|    | Low oil pressure               |
|    | Over-speed                     |
|    | Under-speed                    |
|    | Emergency stop                 |
|    | Generator over-voltage         |
|    | Generator under-voltage        |
|    | Start failure                  |
|    | Stop failure                   |
|   | Battery over- or under-voltage |
|  | Auxilliary alarm               |
|  | Low fuel level                 |

### 2.2.3 Timer function

The delay timers are all of the definite time type. In other words, a set point and a time are selected.

If the operating value is more than the set point, the timer will be started. If the operating value drops below the set point before the time elapses, then the timer will be stopped and reset. If the operating value is more than the set point for the whole of the time period specified, the alarm is activated. The common alarm output relay closes, if it was selected.

This is illustrated in the graph below.



The description above is for a situation where the operating value must be more than the set point to start the timer. Examples of such situations include over-speed and over-voltage.

For some set points, the timer will be started when the operating value falls below the set point. Examples include under-speed and low fuel level.

## 2.2.4 Input functions

You can configure the inputs in the following table using the utility software. The controller has a number of digital inputs (input terminals 3 to 8). All digital inputs are continuous.

The MPU input is fixed, and not configurable.

**Not used** is selected when no digital input is connected to a specific terminal.

| Configurable input functions      | Input source                | Input condition           | Effect  |
|-----------------------------------|-----------------------------|---------------------------|---|
| Remote start/stop                 |                             |                           | Activating this input starts the genset. Deactivating it stops the genset after cool down ( <b>Auto</b> mode only). |
| Low fuel level warning            | Fuel level switch           | Low fuel level            | Activates the alarm on the display and closes the common alarm relay output.  |
| Low oil pressure warning          | Lube oil pressure switch    | Low oil pressure          | Activates the alarm on the display and closes the common alarm relay output.  |
| Low oil pressure shutdown         | Lube oil pressure switch    | Low oil pressure          | Shuts down the engine. Also activates the alarm on the display and closes the common alarm relay output.            |
| High oil temperature warning      | Lube oil temperature switch | High lube oil temperature | Activates the alarm on the display and closes the common alarm relay output.  |
| High oil temperature shutdown     | Lube oil temperature switch | High lube oil temperature | Shuts down the engine. Also activates the alarm on the display and closes the common alarm relay output.            |
| High coolant temperature shutdown | Coolant temperature switch  | High coolant temperature  | Shuts down the engine. Also activates the alarm on the display and closes the common alarm relay output.            |
| Auxiliary                         | Customer-defined            | Customer-defined          | Shuts down the engine.  |

## 2.2.5 Output functions

### Pre-configured outputs

The controller has two fixed relay outputs, listed in the table below. These relays are fixed and cannot be configured.

| Fixed output function | Terminal | Description   |
|-----------------------|----------|---|
| Fuel output/Run coil  | 11       | Closed the entire time the engine is supposed to run.                               |
| Starter output        | 12       | Closed for the time selected in parameter <b>P04</b> in the CGC 200 start sequence. |

### Configurable outputs

You can configure the outputs listed in the table below. The controller has three configurable relay outputs (terminals 13, 14 and 15). All configurable relays are continuous. They cannot be set as pulse relays.

| Configurable output function | Terminal     | Description   |
|------------------------------|--------------|---|
| Not used                     | 13, 14 or 15 | Disables the relay output.  |
| Common alarm                 | 13, 14 or 15 | Closes when an alarm is present. Opens again when the alarm is reset.   |
| Stop coil                    | 13, 14 or 15 | Performs like a stop coil, except it will not stop the flow of fuel between the start attempts.   |
| Preheat                      | 13, 14 or 15 | Closes the relay as the first step in the start sequence, for the time selected in parameter <b>P03</b> . Used for pre-heating the engine or pre-lubrication.   |
| Idle                         | 13, 14 or 15 | Closes to give the engine governor the idle (low speed) command.  |
| Close breaker                | 13, 14 or 15 | Output relay closes when Hz/V is OK and the timer for close breaker has elapsed. Activates the <b>Generator on load</b> alarm in the utility software.<br>Note: CGC 200 does not have breaker feedback input. |

## 2.2.6 Voltage calibration

The voltage measured by the CGC 200 can be calibrated using **P43** for the genset (AC) voltage and **P44** for the battery (DC) voltage. For example, this would be used to correct the voltage if the measured voltage was lower at the controller than at the genset or battery.

Use the following equations to calculate the new calibration parameter. The equations are based on the current calibration parameters, along with the ratio of the voltages at the source and controller.

$$P43_{new} = P43_{now} \times (\text{voltage at genset}) / (\text{voltage measured by controller})$$

$$P44_{new} = P44_{now} \times (\text{voltage at battery}) / (\text{voltage measured by controller})$$

### Example

The voltage measured at the genset is 220.0 V<sub>ac</sub> and the voltage measured by the controller is 218.9 V<sub>ac</sub>. P43 has not been used before and is therefore 1000 (the default value).

To calibrate the genset voltage, use the following value for **P43**:

$$P43 = 1000 \times 220.0 / 218.9 = 1005$$

## 2.3 Sequences

### 2.3.1 Information about start sequences

If a start command is given, the start sequence will be activated. The start sequence can include the start prepare or preheat, starter output, start attempts, running detection and run coil/stop output. These steps are described in the table below.

| Relay output              | Description   | Parameter  |
|---------------------------|---|--|
| Start prepare or pre-heat | Closed when the start sequence is initiated for the adjusted time, and before each start attempt. It opens before cranking.   | Start prepare delay is set in parameter <b>P03</b> .   |
| Start output              | After start prepare, the start output at terminal 12 is closed for the self-starter solenoid.   | For up to the time delay set in parameter <b>P04</b> . |
| Stop output               | Closed during the rest time between two crankings. This relay is also closed during a stop or any shutdown fault.   | Stop delay can be set in parameter <b>P11</b> .        |
| Run coil                  | At the time of start output, the run coil relay output at terminal 11 is closed and remains closed until the engine is running. This relay output will be opened during a stop or any shutdown fault. | None   |

### Start attempts

The offset for start attempts, or the number of start attempts in one start sequence, is set in parameter **P02**.

### Running detection

You can select between using MPU (genset speed), voltage and frequency, or a combination of these, to determine the running status of the engine. This selection is done by setting parameter **P40**. If the engine is running, the display will show the  icon.

- **MPU speed (RPM) input:** The number of teeth on the flywheel must be entered in parameter **P13**.
- **Frequency and voltage:** The frequency measurement requires a voltage measurement of 30%  $U_{nom}$ . You can only use running detection based on the frequency measurement where the voltage builds up rapidly.

### Start failure alarm

The start failure alarm will occur if the engine did not start after the last start attempt (in other words, the last crank period). A start failure will be shown on the display by the  icon. A start failure alarm will close the common alarm relay output if this is selected.

### Interruption of start sequence

The start sequence is interrupted in the following situations:

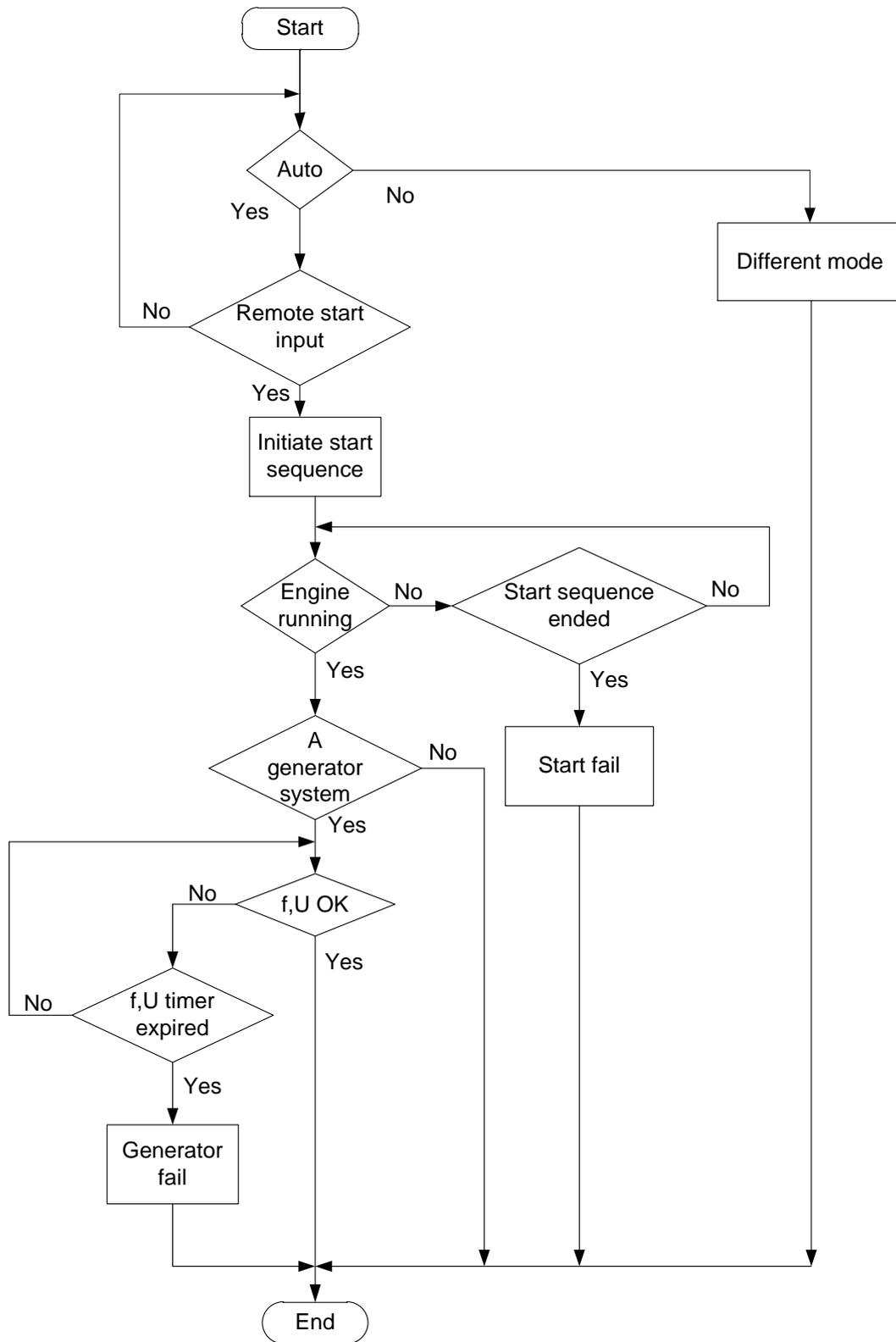
| Events                          | Remarks   |
|---------------------------------|---|
| Auto mode stop                  | Remote start input removal can cause shutdown.                                      |
| Start failure                   | The start failure may be due to any reason.   |
| No running detection            | If running feedback is not received.  |
| Emergency stop                  | If the emergency input is activated.  |
| Stop push-button on front panel | Pressing the stop push-button causes a shutdown, in manual as well as in auto mode. |

## 2.3.2 Auto start

The following flow diagram shows the auto start sequence.

In summary, for a successful auto start:

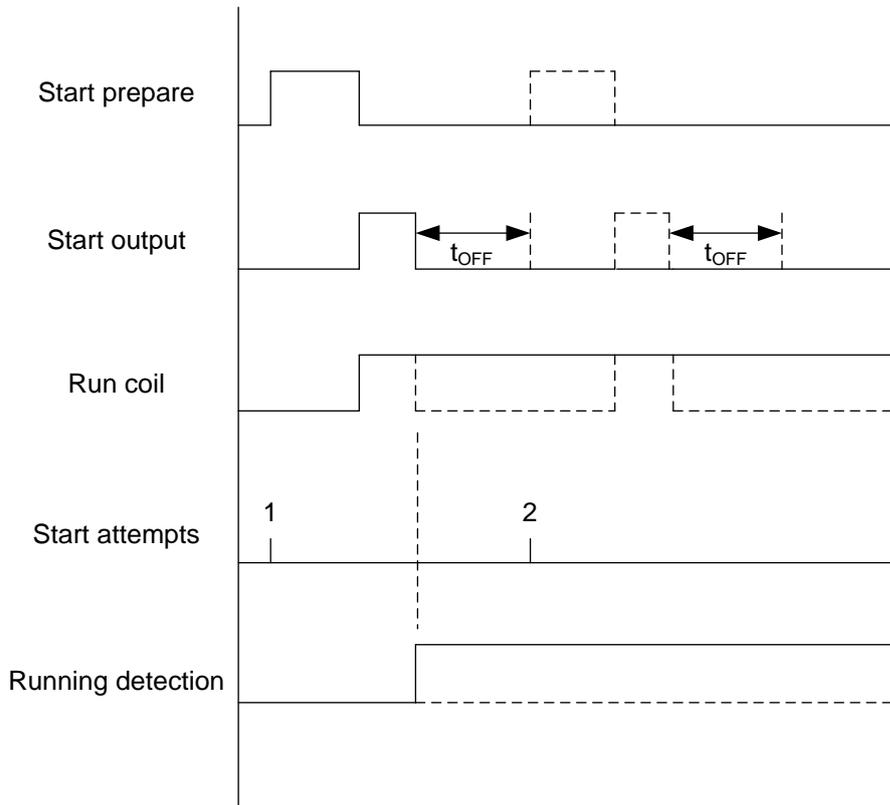
1. The mode is checked and is **Auto**.
2. The remote start input is checked and is present.
3. The start sequence is initiated.
4. The engine is checked and is running.
5. If the system is a generator system, the generator frequency and voltage are checked, and are okay.



### 2.3.3 Start sequence: run coil/normal prepare

You cannot use both the run coil and the stop coil at the same time for the start sequence.

The following diagram shows the timing for the run coil/normal prepare start sequence. The solid lines show a successful start. The dashed lines show what happens if the start fails.  $t_{OFF}$  is set in **P05**.



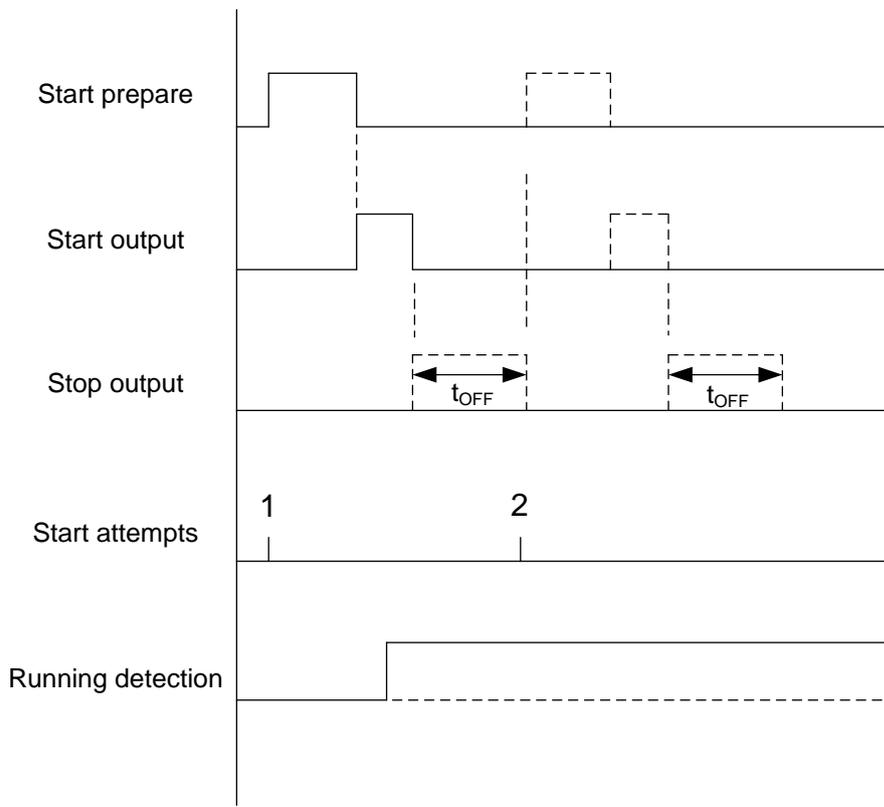
### 2.3.4 Start sequence: stop coil/normal prepare

You cannot use both the run coil and the stop coil at the same time for the start sequence.

The following diagram shows the timing for the stop coil/normal prepare start sequence. The solid lines show a successful start. The dashed lines show what happens if the start fails.  $t_{OFF}$  is set in **P05**.



**Stop coil is a configurable output. This sequence therefore only applies if stop coil is configured.**



### 2.3.5 Information about stop sequences

The stop sequence is started when a stop command is given. If the stop is a normal or controlled stop, the stop sequence can include cooling down time.

| Description                | Cooling down | Stop |
|----------------------------|--------------|------|
| Auto mode stop             | X            | X    |
| Stop button on front panel | X            | X    |
| Shutdown alarm             |              | X    |
| Emergency stop             |              | X    |

The stop sequence can only be interrupted during the cooling down period. Interruptions can occur in the following situations:

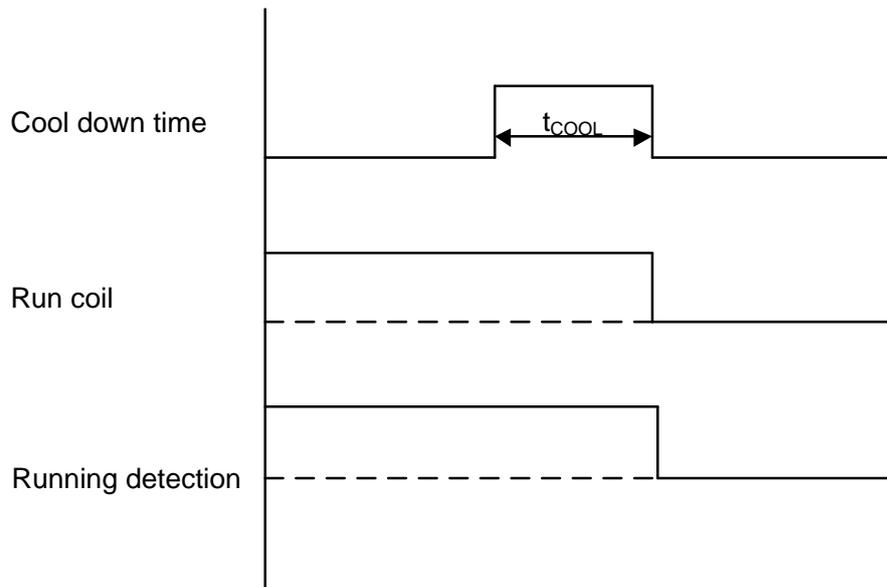
| Event                                  | Comment          |
|--|------------------|
| Start button on front panel is pressed | Manual mode only |
| Remote start input activated           | Auto mode only   |

### Stop failure

A stop failure alarm will occur if the running detection, generator voltage and/or generator frequency are still present. The stop failure timer is set in parameter **P12**. Stop failure will close the common alarm relay output, if configured.

### 2.3.6 Stop sequence: run coil

The following diagram shows the timing for the run coil stop sequence. The dashed lines show what happens if the genset has already stopped.  $t_{COOL}$  is set in **P08**.

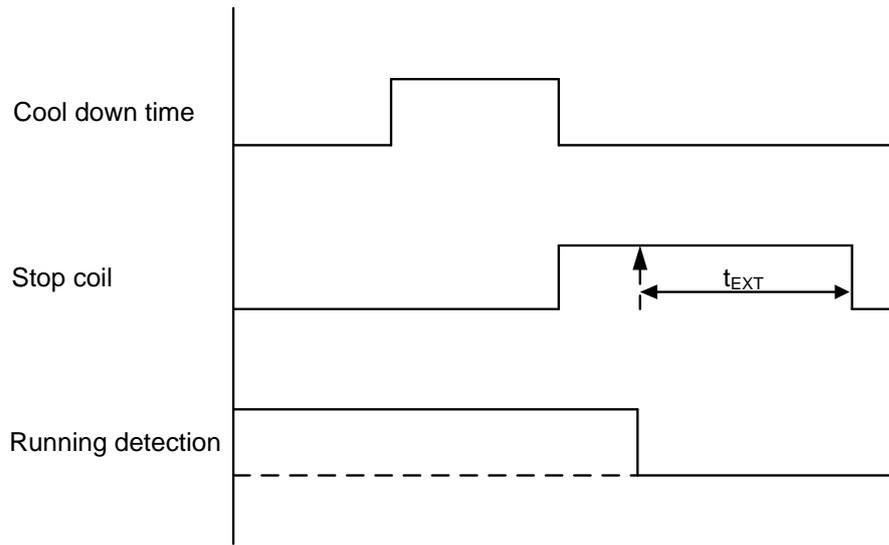


### 2.3.7 Stop sequence: stop coil

The following diagram shows the timing for the stop coil stop sequence. The dashed line shows what happens if the genset has already stopped.  $t_{EXT}$  is set in **P11**.



**Stop coil is a configurable output. This sequence therefore only applies if stop coil is configured.**



## 3. Inputs, outputs and parameters

### 3.1 Parameter list and changes

#### 3.1.1 Options for changing parameter settings

You can change the parameter settings by making the changes in the utility software, then writing the information to the controller. This is described in a later chapter. Configuration of the controller inputs and outputs also is done using the parameter settings.

Alternatively, you can use the controller front panel to change the parameter settings. This may be time consuming. See the **Operator's manual** for more information.

### 3.1.2 Parameter list

The parameters used by CGC 200 that can be changed from the controller front panel are listed in the table below.

| Parameter number | Parameter name        | Range         | Default value | Value chosen* | Description   |
|------------------|-----------------------|---------------|---------------|---------------|---|
| P00              | Auto start delay      | 0 to 3600 s   | 1             |               | Timer for starting using the Auto start signal  |
| P01              | Auto stop delay       | 0 to 3600 s   | 1             |               | Timer for stopping after the Auto start signal is removed   |
| P02              | Start attempts        | 1 to 10       | 3             |               | Number of start attempts in one start sequence  |
| P03              | Start prepare         | 0 to 300 s    | 0             |               | Timer for start prepare   |
| P04              | Start on time         | 3 to 60 s     | 8             |               | Timer for starter ON time during cranking   |
| P05              | Start off time        | 3 to 60 s     | 10            |               | Timer for starter OFF time before a new start attempt is made   |
| P06              | Initial inhibit delay | 1 to 60 s     | 10            |               | Timer for bypassing frequency and voltage shutdown during starting  |
| P07              | Idle start            | 0 to 3600 s   | 0             |               | Timer for idle speed after starting   |
| P08              | GB close delay        | 3 to 3600 s   | 10            |               | Timer for generator breaker close after frequency and voltage OK  |
| P09              | Cooldown time         | 3 to 3600 s   | 10            |               | Cooling down time   |
| P10              | Idle stop             | 0 to 3600 s   | 0             |               | Timer for idle speed before stopping  |
| P11              | Extended stop         | 0 to 120 s    | 20            |               | Timer for extended stop   |
| P12              | Stop failure          | 0 to 120 s    | 0             |               | Maximum allowable time for stopping the genset  |
| P13              | Number of teeth       | 10 to 300     | 118           |               | The number of teeth on flywheel. This is only used when MPU is selected as running detection (see <b>P40</b> ). |
| P14              | Number of gen. poles  | 2 to 32       | 4             |               | The number of genset poles. This is used in the frequency calculation.  |
| P15              | Hz/V OK delay         | 0 to 20.0 s   | 10.0          |               | Voltage and frequency OK delay after starting of genset   |
| P16              | G U >                 | 30 to 360 V   | 264           |               | Generator over-voltage protection   |
| P17              | G U <                 | 30 to 360 V   | 196           |               | Generator under-voltage protection  |
| P18              | G RPM <               | 0 to 6000 RPM | 1200          |               | Generator under-speed protection, if running detection (see <b>P40</b> ) is RPM input only                      |

| Parameter number | Parameter name         | Range          | Default value | Value chosen* | Description   |
|------------------|------------------------|----------------|---------------|---------------|---|
| P19              | G RPM >                | 0 to 6000 RPM  | 1710          |               | Generator over-speed protection, if running detection (see <b>P40</b> ) is RPM input only |
| P20              | G f <                  | 0 to 75.0 Hz   | 45.0          |               | Generator under-frequency protection  |
| P21              | G f >                  | 0 to 75.0 Hz   | 57.0          |               | Generator over-frequency protection   |
| P22              | Running feedback timer | 0 to 20.0 s    | 5.0           |               | Maximum allowable time for running detection (see <b>P40</b> )                            |
| P23              | U > aux. term.1        | 12.0 to 40.0 V | 33.0          |               | High battery supply voltage   |
| P24              | U < aux. term.1        | 4.0 to 30.0 V  | 8.0           |               | Low battery supply voltage  |
| P25              | Relay 01               | 0 to 6         | 4             |               | See Table 1: Configurable output functions  |
| P26              | Relay 02               | 0 to 6         | 1             |               |   |
| P27              | Relay 03               | 0 to 6         | 2             |               |   |
| P28              | Digital input 1        | 0 to 10        | 5             |               | See Table 2: Configurable input functions   |
| P29              | Digital input 1 timer  | 0 to 20.0 s    | 10.0          |               |   |
| P30              | Digital input 2        | 0 to 10        | 6             |               |   |
| P31              | Digital input 2 timer  | 0 to 20.0 s    | 2.0           |               |   |
| P32              | Digital input 3        | 0 to 10        | 4             |               |   |
| P33              | Digital input 3 timer  | 0 to 20.0 s    | 1.0           |               |   |
| P34              | Digital input 4        | 0 to 10        | 2             |               |   |
| P35              | Digital input 4 timer  | 0 to 20.0 s    | 3.0           |               |   |
| P36              | Digital input 5        | 0 to 10        | 1             |               |   |
| P37              | Digital input 5 timer  | 0 to 20.0 s    | 10.0          |               |   |
| P38              | Default genset mode    | 0 to 2         | 0             |               | 0: Stop mode<br>1: Manual start<br>2: Auto start  |
| P39              | Display password       | 0 to 9999      | 2000          |               | Prevents unauthorised changes to parameters using the controller front panel              |

| Parameter number | Parameter name     | Range           | Default value | Value chosen* | Description   |
|------------------|--------------------|-----------------|---------------|---------------|---|
| P40              | Running detect.    | 0 to 2          | 2             |               | <p>0: RPM</p> <p>1: Genset frequency</p> <p>2: RPM and frequency (running detection is present when the value required to remove the starter is met for either engine speed (see <b>P41</b>) or genset frequency (see <b>P42</b>))</p> <p>For RPM, <b>P13</b> and <b>P41</b> must be defined.</p> <p>For frequency, <b>P42</b> must be defined.</p> |
| P41              | Remove starter RPM | 0 to 3000 RPM   | 360           |               | Minimum engine speed required for removal of the starter and running detection  |
| P42              | Remove starter Hz  | 10.0 to 30.0 Hz | 14.0          |               | Minimum genset frequency required for removal of the starter and running detection  |

\*You can fill in the values chosen for your system.

The parameters used by CGC 200 that can only be viewed and changed from the utility software are listed in the table below.

| Parameter number | Parameter name                     | Range           | De-fault value | Value chosen* | Description   |
|------------------|------------------------------------|-----------------|----------------|---------------|---|
| 43               | Calibrate AC voltage               | 700 to 1300     | 1000           |               | See the <b>Designer's handbook</b> for more information   |
| 44               | Calibrate battery voltage          | 700 to 1300     | 1000           |               | See the <b>Designer's handbook</b> for more information   |
| 45               | Running hours offset (9999-19998)  | 0 to 9999 hours | 0              |               | Additional offset for the genset's running time timer     |
| 46               | Running hours offset (0-9999)      | 0 to 9999 hours | 0              |               | Additional offset for the genset's running time timer     |
| 47               | Running minutes offset             | 0 to 59 minutes | 0              |               | Additional offset for the genset's running time timer     |
| 48               | Running seconds offset             | 0 to 59 s       | 0              |               | Additional offset for the genset's running time timer     |
| 49               | Start attempts offset (9999-19998) | 0 to 9999       | 0              |               | Additional offset for the genset's start attempts counter |
| 50               | Start attempts offset (0-9999)     | 0 to 9999       | 0              |               | Additional offset for the genset's start attempts counter |

\*You can fill in the values chosen for your system.

**Table 1: Configurable output functions**

| Configurable output function | Value in the controller | Config. output* |
|------------------------------|-------------------------|-----------------|
| Not used                     | 0                       |                 |
| Common alarm                 | 1                       |                 |
| Stop coil                    | 2                       |                 |
| Pre-heat                     | 4                       |                 |
| Idle speed                   | 3                       |                 |
| Close breaker                | 6                       |                 |

\*You can fill in the number of the corresponding relay configured for this function in your system.

**Table 2: Configurable input functions**

| <b>Configurable input function</b>        | <b>Value in the controller</b> | <b>Digital input*</b> |
|---|--------------------------------|-----------------------|
| Not used                                  | 0                              |                       |
| Remote start/stop                         | 6                              |                       |
| Low fuel level warning                    | 5                              |                       |
| Low oil pressure warning                  | 8                              |                       |
| Low oil pressure shutdown                 | 2                              |                       |
| High oil temperature warning              | 7                              |                       |
| High oil temperature shutdown             | 1                              |                       |
| High coolant temperature shutdown         | 9                              |                       |
| Auxiliary alarm shutdown (Emergency stop) | 4                              |                       |

\*You can fill in the number of the corresponding digital input configured for this function in your system.

## 4. Utility Software

### 4.1 Getting started

#### 4.1.1 Installing the Utility Software

The Utility Software (USW) must be installed on a PC (either a laptop or a desktop computer) running the Microsoft Windows operating system.

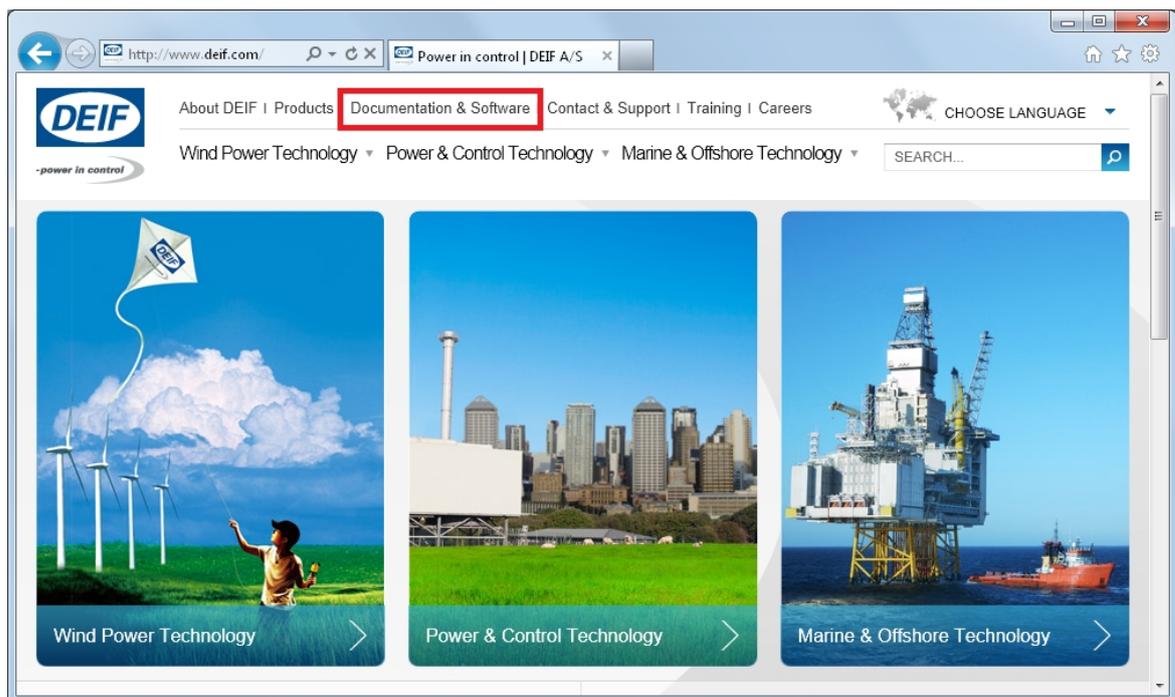


**Do not connect the controller to the PC (using the USB cable) before the software is installed. Microsoft Windows creates an incorrect USB driver if the controller is connected before the software is installed. If you have this problem, you need to find the correct USB driver in the software installation folder and install it.**

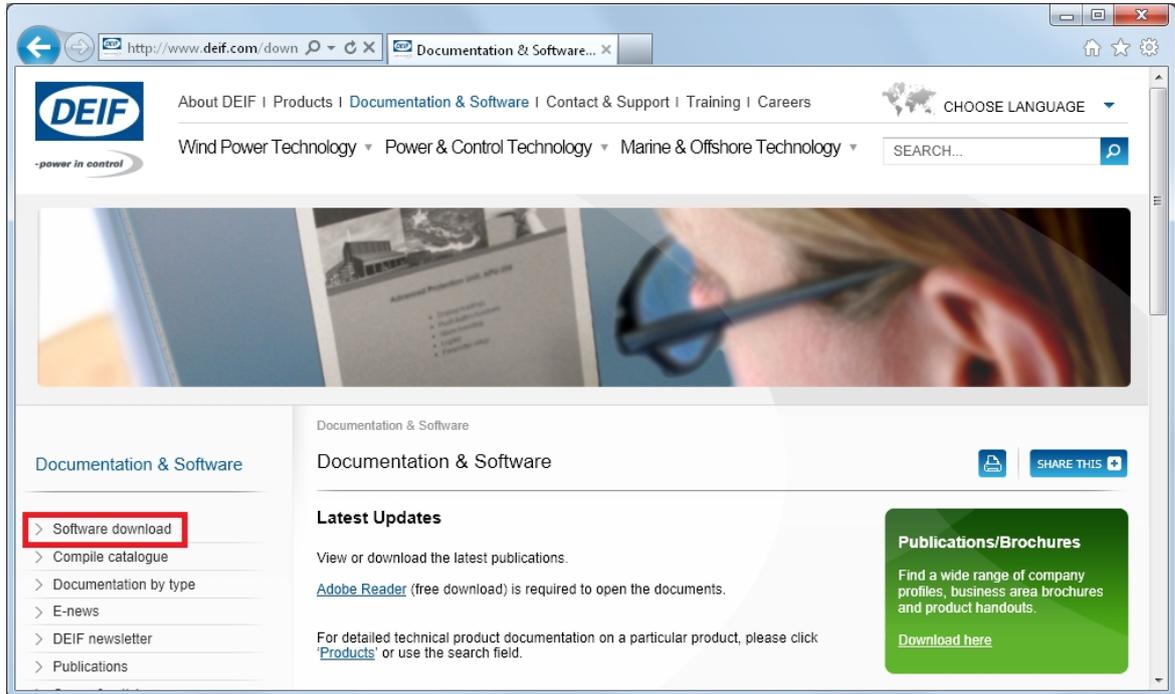
The USW is normally downloaded from DEIF via the internet.

To download the Utility Software:

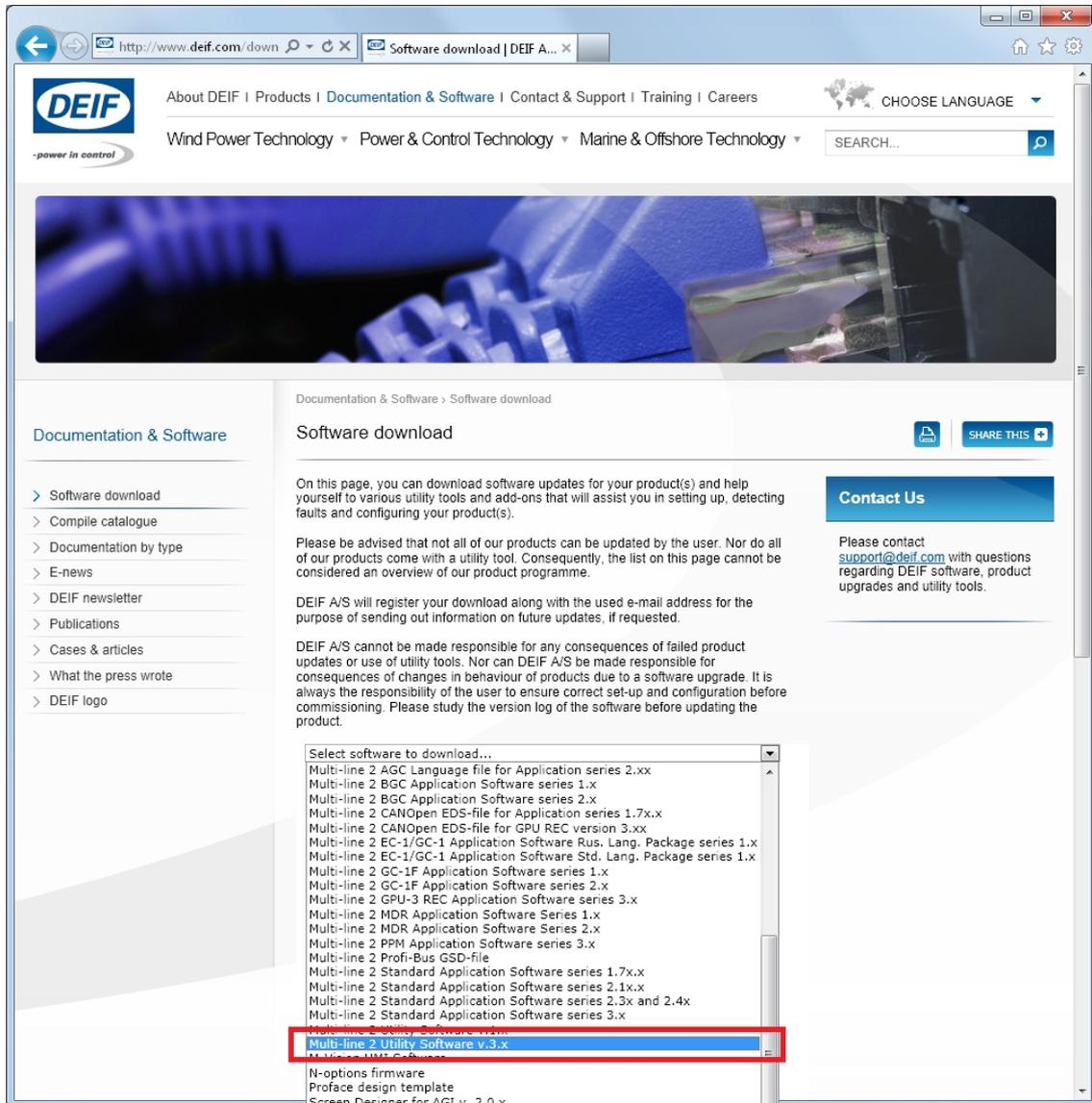
1. Open [www.deif.com](http://www.deif.com) in a browser.
2. Click **Documentation and Software** in the top menu.



3. Click **Software download** on the left side of the page.

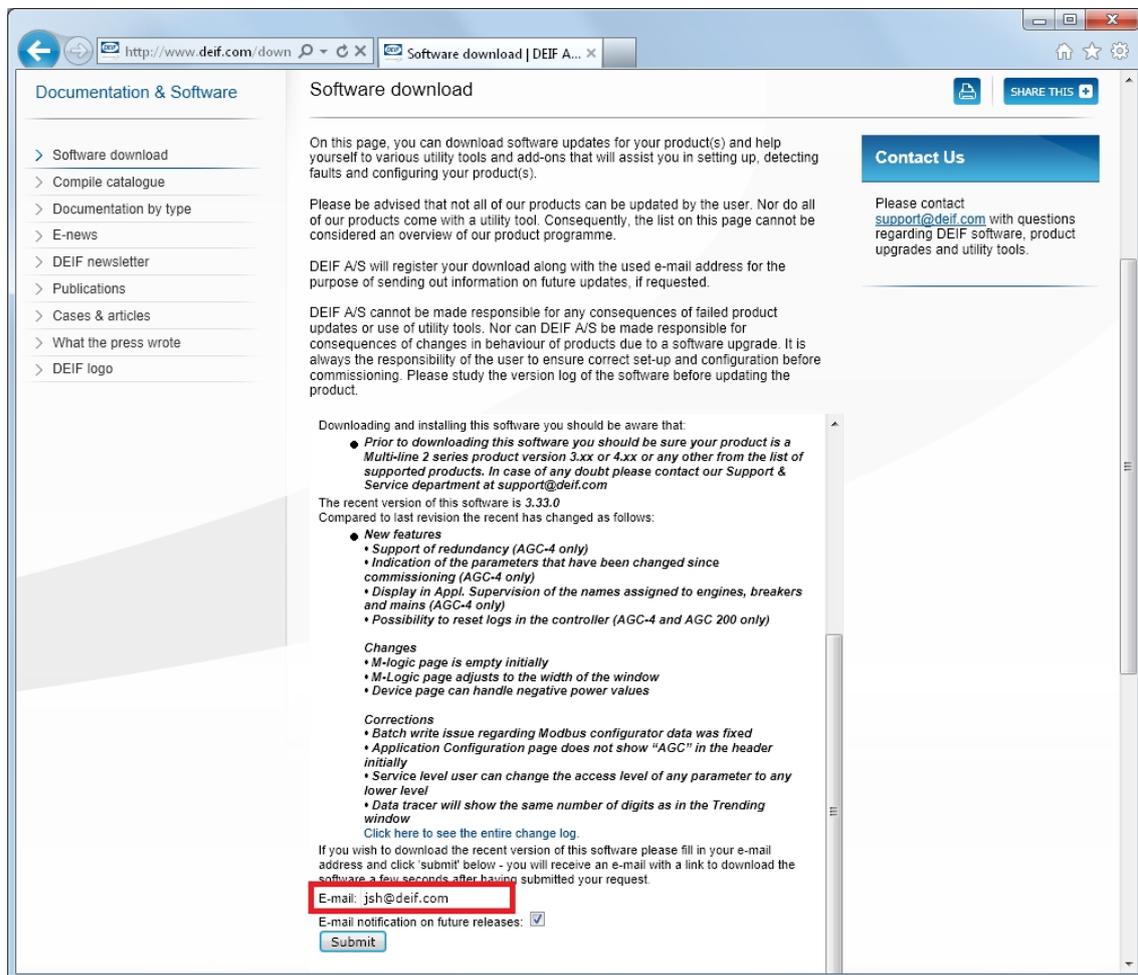


4. Select **Multi-line 2 Utility Software v.3.x.** from the drop-down list.



A dialogue box opens, with information about the most recent version of the software.

5. Enter your email address. Click **Submit**. An email with a link to download the software will be sent to you.



6. Click the link in the email to download the executable Utility Software setup file.

To install the Utility Software:

1. After downloading the software, choose **Run**. An installation wizard opens.
2. Use the suggested default settings.
  - Note: Option N refers to a TCP/IP connection, and is not relevant for CGC 200.

3. When the installation is complete, there will be a Utility Software shortcut icon (  ) on your PC desktop.

### 4.1.2 Starting the Utility Software

To start using the Utility Software:

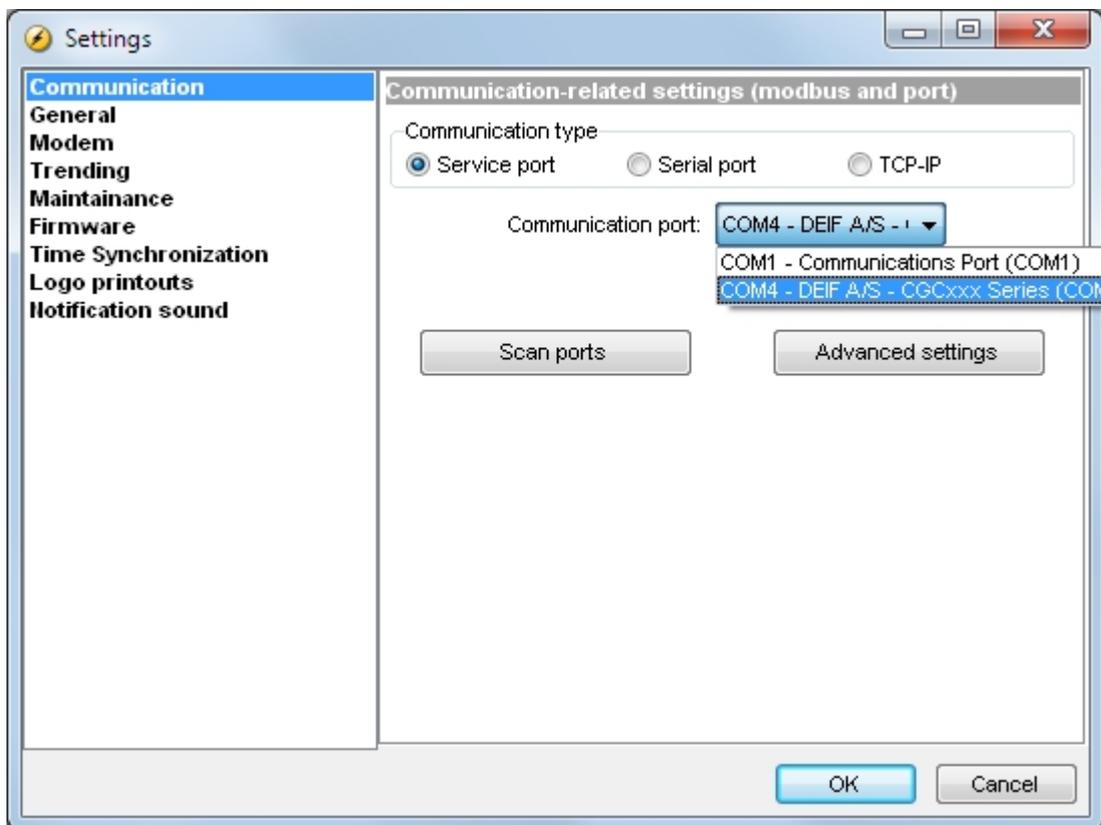


1. Double click the Utility Software shortcut icon (  ) on your desktop. The Utility Software program will open.
2. The first time you use the Utility Software, you need to set up the connection to the CGC 200:



**DEIF does not recommend using the PC USB as the primary power supply for the CGC 200. The power drawn on start up exceeds the USB standard and may damage the PC.**

1. Use the USB cable to connect the CGC 200 to the PC. The CGC 200 Power OK LED should light up.
2. If the Settings dialogue box does not open automatically, select **File**, then click **Settings**. Alternatively, press F3, or click the Settings icon (  ) on the toolbar.



3. Under **Communication**, in the Communication type field, select **Service port**. The other communication types are not relevant for CGC 200.
4. In the **Communication port** drop-down list, select the port that indicates that the CGC 200 is present, as indicated above. If no ports indicate the CGC 200, check the connection and click **Scan ports**.
5. Click **OK**.
3. If you already have a connection set up, select **Connection** from the menu, then click **Connect**. Alternatively, press F5.

After successful connection, a **Device** page opens (see example below). The **Device** page shows the current status of the device, the type of device, the connection status, the device software version, and so on.

**DEIF utility software - 3.34.0.754 [DEBUG VERSION]**

File Connection Parameters Help

**DEIF** CGC 200

|                 |       |                |                          |
|-----------------|-------|----------------|--------------------------|
| Engine Speed    | 0 RPM | Start attempts | 0                        |
| Voltage         | 0 V   | Running hours  | 0 h : 0 m : 0 s          |
| Frequency       | 0 Hz  | Mode           | Standby, Stop            |
| Battery voltage | 0,0 V | Alarm          | <input type="checkbox"/> |

Consumer

Standby, Stop

Hz

0,0 Hz

V

0 V

| Text            | Timestamp              | Active   |
|-----------------|------------------------|----------|
| Common shutdown | 2013-02-01 07:43:16.73 | Inactive |
| Generators load | 2013-02-01 07:43:16.73 | Inactive |

Communication active Connected to "CGC 200" (version 1.40.0 rev. 0) COM4 (ID 1)

**i** You must have a CGC 200 connected to your PC in order to see the Device, Alarms, Trending, Parameters and Inputs/Outputs pages.

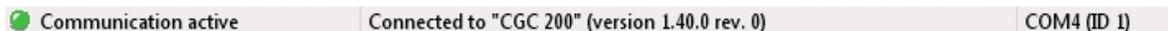
## 4.2 Utility Software overview

### 4.2.1 Utility Software pages and icons

The table below lists and describes the Utility Software pages. The pages are used to display and edit the controller information and settings.

| Page   | Name           | Description   |
|--|----------------|---|
| <br><b>Device</b>           | Device         | Overview for the connected CGC 200  |
| <br><b>Alarms</b>           | Alarms         | Alarm history   |
| <br><b>Trending</b>         | Trending       | Real-time trending of measured values   |
| <br><b>Parameters</b>     | Parameters     | View and edit parameters, configure inputs and outputs, and set delays and timers in Tree and List view modes |
| <br><b>Inputs/Outputs</b> | Inputs/Outputs | Status of digital inputs and relay outputs  |

For all pages, information about the connection, controller type and software version is displayed in the bottom status bar. An example is given in the following screenshot:

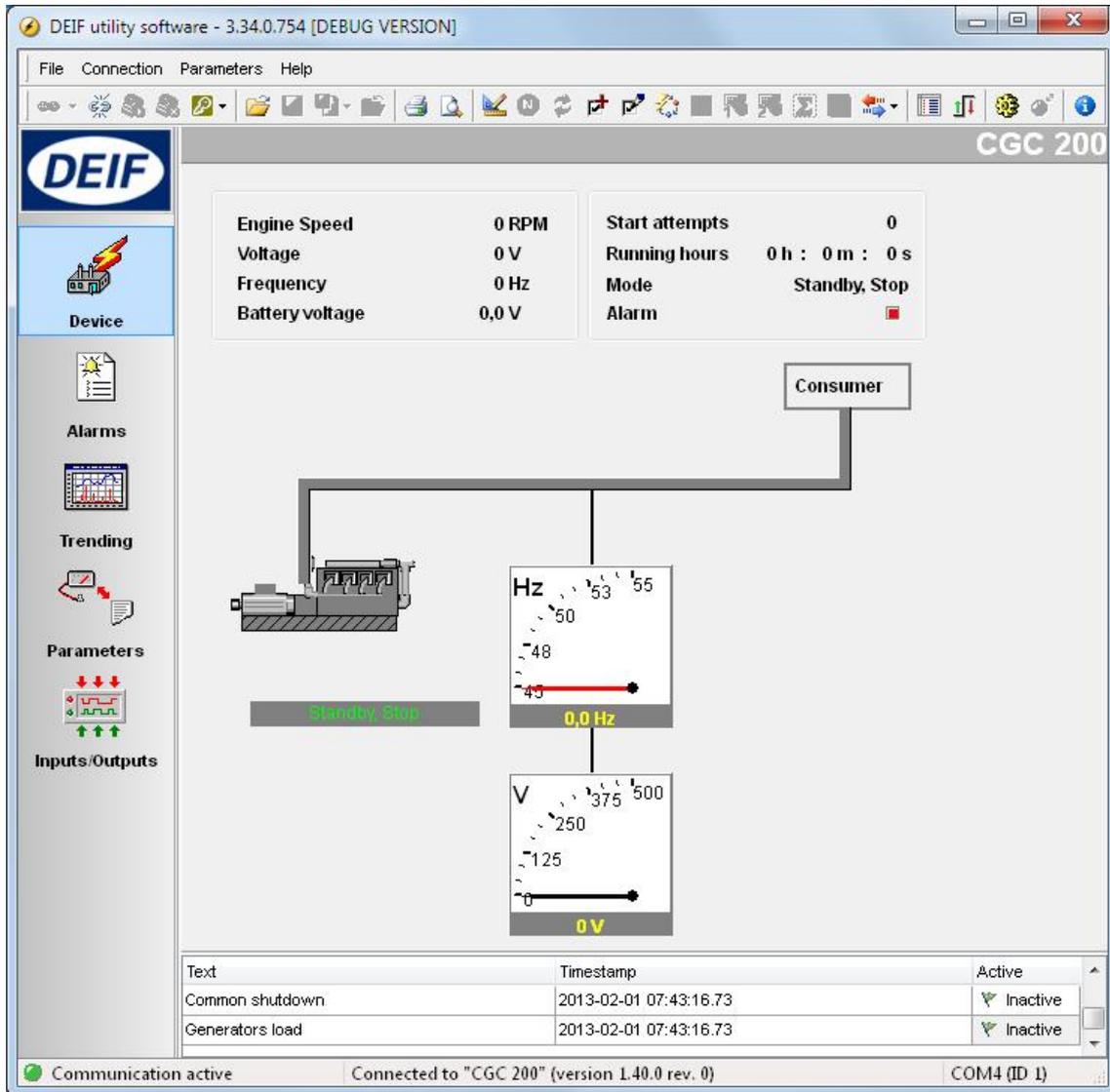


The table below lists and describes the most commonly used Utility Software icons.

| Commonly used icons   | Description                                      |
|---|--|
|    | Connect the device to the Utility Software       |
|    | Disconnect the device from the Utility Software  |
|    | Change or View the permission level              |
|    | Open a Utility Software or project file          |
|    | Print  |
|    | Print preview                                    |
|    | Settings   |
|    | Write firmware to the controller                 |
|    | Batch read or write parameters to the controller |
|    | Monitor parameters in real time                  |
|  | Send a command to the device using the PC        |
|  | About the Utility Software                       |

## 4.2.2 Device page

The **Device** page is shown after successful connection with the controller.



The following information is shown:

- Engine speed (RPM)
- Generator voltage
- Generator frequency
- Battery voltage
- Start attempts
- Running hours, minutes and seconds
- Genset mode (Auto or Manual) and current status (Standby, Crank, Fuel on, and so on)
- Alarm status

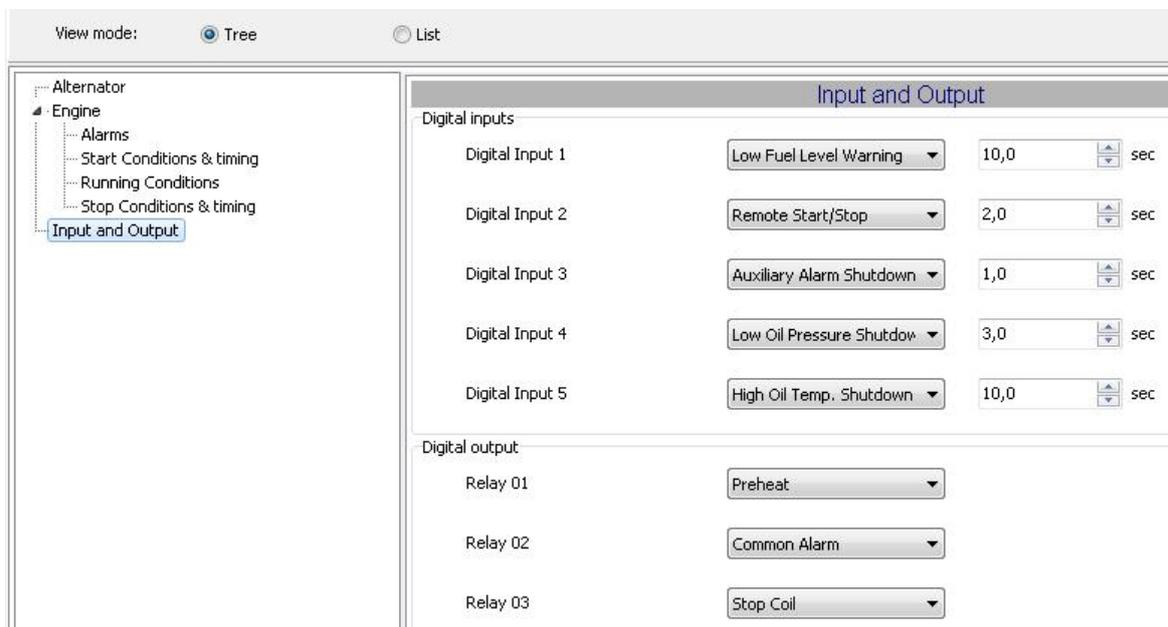
### 4.2.3 Parameters page

You can read and edit parameters in either tree view (the default) or list view. Select the radio button at the top of the **Parameter** page to choose the view that you want.



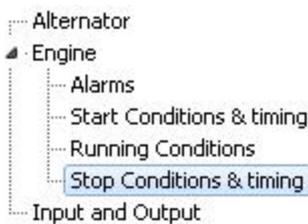
#### Tree view

In Tree view, the parameters are listed in groups, as shown below. Click on the group name to display all the parameters in that group.



You can edit the parameters using the sliders, selectable text and values boxes. The parameter range and units are given (where applicable).

Click the folder symbol to expand or collapse sub-groups.



### List view

In List view, you can read and write all parameters from one table.

View mode:  Tree  List

Drag a column header here to group by that column

| Pe | LCDN | Address | Text                  | Unit | MinVal | MaxVs | Value | Default |
|----|------|---------|-----------------------|------|--------|-------|-------|---------|
| 24 | P24  | 4137    | U <aux. Term. 1       | V    | 4      | 30    | 8     | 8       |
| 25 | P25  | 4148    | Relay 01              |      | 0      | 6     | 4     | 4       |
| 26 | P26  | 4149    | Relay 02              |      | 0      | 6     | 1     | 1       |
| 27 | P27  | 4150    | Relay 03              |      | 0      | 6     | 2     | 2       |
| 28 | P28  | 4154    | Digital Input 1       |      | 0      | 10    | 5     | 5       |
| 29 | P29  | 4155    | Digital input 1 Timer | sec  | 0,0    | 20,0  | 10,0  | 10,0    |
| 30 | P30  | 4156    | Digital Input 2       |      | 0      | 10    | 6     | 6       |
| 31 | P31  | 4157    | Digital input 2 Timer | sec  | 0,0    | 20,0  | 2,0   | 2,0     |
| 32 | P32  | 4158    | Digital Input 3       |      | 0      | 10    | 4     | 4       |
| 33 | P33  | 4159    | Digital input 3 Timer | sec  | 0,0    | 20,0  | 1,0   | 1,0     |
| 34 | P34  | 4160    | Digital Input 4       |      | 0      | 10    | 2     | 2       |
| 35 | P35  | 4161    | Digital input 4 Timer | sec  | 0,0    | 20,0  | 3,0   | 3,0     |
| 36 | P36  | 4162    | Digital Input 5       |      | 0      | 10    | 1     | 1       |
| 37 | P37  | 4163    | Digital input 5 Timer | sec  | 0,0    | 20,0  | 10,0  | 10,0    |

The table headings are as follows:

- **ParamID:** Utility software identifier for the individual parameter
- **LCDNumber:** Parameter number on the CGC 200 LCD display
- **Text:** Parameter short description
- **Unit:** Unit of the parameter
- **MinValue:** Minimum adjustable value
- **MaxValue:** Maximum adjustable value
- **Value:** Current parameter value in the utility software\*
- **Default:** Default value for the parameter
- **Address:** Modbus address for the parameter

\*The utility software may have a different parameter value from that in the controller. For example, you may have made a change and did not write the new value to the controller. The change will not be updated in the controller until you write it to the controller. Alternatively, the parameter value may have been changed using the controller front panel. This change will not be updated in the utility software unless the parameters are read from the controller.

To select a parameter as a favourite parameter:

1. Double click on the parameter line in the table.
2. Click the Favorite icon (  ) in the dialogue box and click **OK**.

The Favorite icon (  ) on the toolbar toggles between showing all parameters and only showing favourite parameters.

 You must be in List view to set favourite parameters and write individual parameters.

#### 4.2.4 Other Utility Software pages

The other Utility Software pages are not relevant to designing the system. See the **Operator's manual** for more information about these pages.

### 4.3 Using the Utility Software

#### 4.3.1 Using the Utility Software for system design

You can use the Utility Software to set the parameters and configure the inputs and outputs for the CGC 200. You can save this information and then use it later to configure the CGC 200. You can reuse the same information to configure a number of additional CGC 200s.

#### 4.3.2 Changing parameters

To change parameters, do the following:

1. Open the **Parameters** page in either tree or list view.
2. Find the parameter you want to change.
3. If the parameter selects an **option**:
  - In **Tree** view, change the parameter by selecting the option you want from the drop-down list.
  - In **List** view, double click the parameter line you want to change. A dialogue box containing the drop-down list opens. Select the option you want.
4. If the parameter selects a **value**:
  - In **Tree** view, change the parameter by changing the value using the slider. Alternatively, type the value in the box.
  - In **List** view, double click the parameter line you want to change. A dialogue box containing the value and a slider opens. Change the value using the slider.



Alternatively, click the value. A dialogue box opens where you can type in the value and click **OK**.

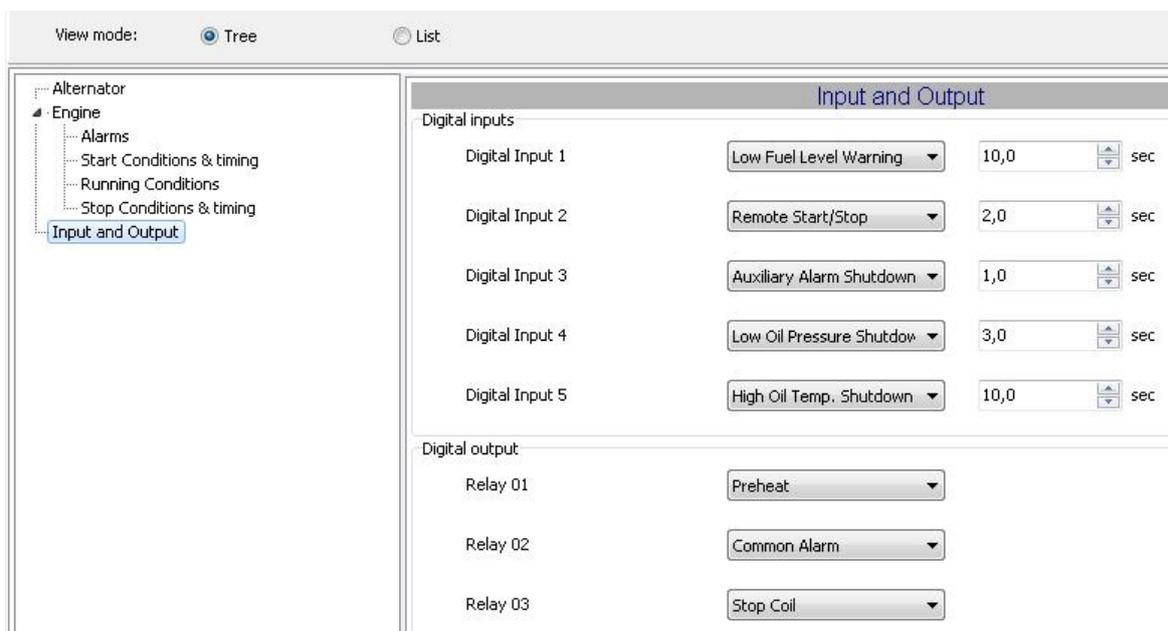


5. See **Writing to the controller** for information about how to write the changed values to the CGC 200.

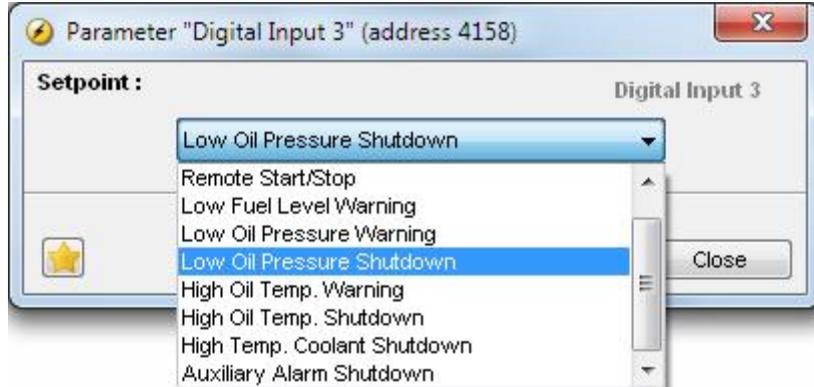
### 4.3.3 Configuring inputs and outputs

Digital inputs and outputs can be configured in either **Tree** or **List** view.

In **Tree** view, select the input or output you want to assign from the drop-down list.



In **List** view, double click the parameter line for the input or output you want to change. Select the input or output you want from the drop-down list in the dialogue box.



### 4.3.4 Reading from the controller

Parameters, logs and the input and output configuration are stored in the CGC 200. This information can also be stored in a file on the PC.

You can read from the controller by:

- Connecting to the controller: the utility software automatically reads the information in the CGC 200 after connection.
- Reading all the parameters from the controller. Select **Parameters**, then **Read** (  ). When you are on the **Parameters** page, the read icon (  ) is also available on the toolbar.
- Reading information using the batch read function (  ) (described below): this reads all the information from the controller, then writes it to a .usw file on the PC.
- Backing up the controller: this writes the controller information to a .bak file on the PC.

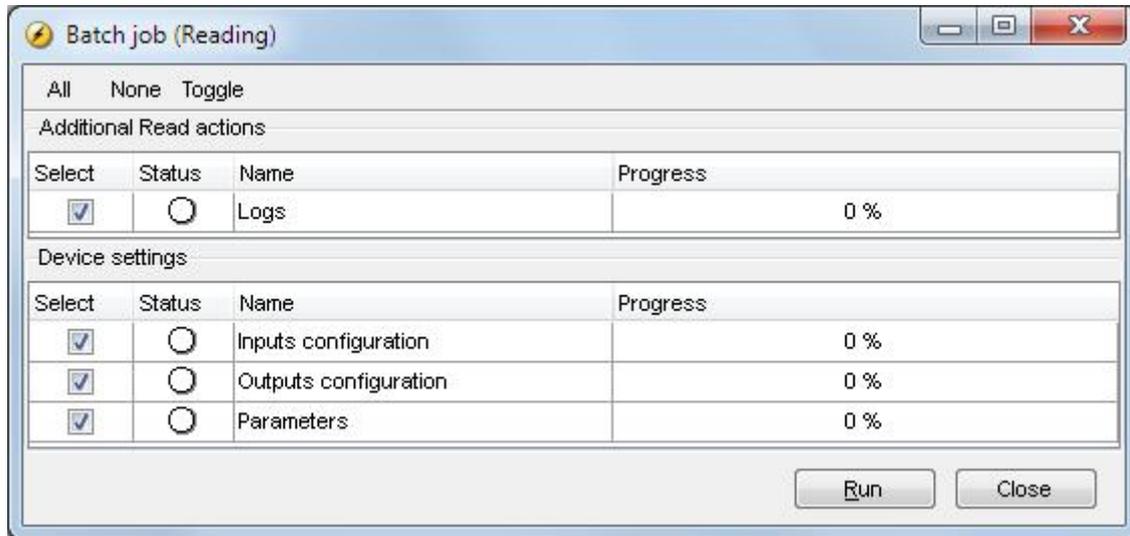
#### Batch read function

The controller logs, input and output configuration, and parameter settings can be read and saved in a file on the PC. To use the batch read function:

1. Click the batch read and write icon (  ) on the toolbar and select **Read from device**.



2. The Batch job (Reading) dialogue box opens. Select the information that you would like to read using the check boxes and click **Run**.



3. A window opens. Browse to the location where you would like to save the file, type in the name, and click **Save**
4. The parameters and input and output configuration may be changed, and written to the CGC 200. Alternatively, the parameters can be saved to a file on the PC. See **Writing to the controller** for more information.

### 4.3.5 Writing to the controller

You can write to the controller by:

- Writing the parameter and input and output values as you change them. To do this, open the **Parameter** page in **List** view. Double click on a parameter to open it. Change the parameter and click **Write** in the parameter dialogue box.
- Writing all the parameters in the utility software. Select **Parameters**, then **Write** (  ). When you are on the **Parameters** page, the write icon (  ) is also available on the toolbar.
- Writing information using the batch write function (  ) (described below).
- Restoring the controller information from a .bak file, using **Restore Device**.

#### Batch write function

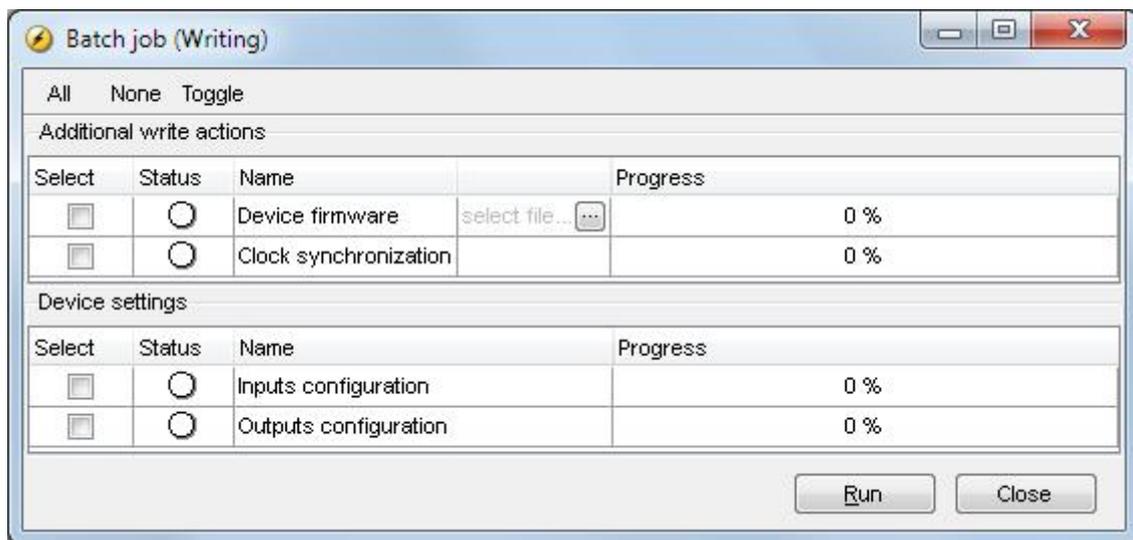
If a CGC 200 file has been saved on the PC, it can be opened, edited and then written to one or more CGC 200s. To use the batch write function:

1. Click the batch read and write icon (  ) on the toolbar.

2. Select **Write to device**.



3. The Batch job (Writing) dialogue box opens.



Select the information that you would like to write and click **Run**.

### 4.3.6 Firmware upgrade

You can use the utility software to upgrade the firmware on the CGC 200.

To upgrade the firmware:

1. Click the firmware upgrade icon (  ) on the toolbar. A window will open.
2. Browse to the firmware file you want to use.
3. Click **Open**.



**Do not disconnect the power supply or the USB cable during the firmware upgrade. Interrupting a firmware upgrade can make the controller unusable.**

## 5. Glossary

### 5.1 Abbreviations, terms and units

#### 5.1.1 Abbreviations

**ac**

Alternating Current

**CE**

Conformité Européenne

Indicates that the product meets the legal requirements described in the applicable directive(s). All products with CE marking have free access to markets in the European Economic Area (EEA).

**CGC**

Compact Genset Controller

**dc**

Direct Current

**EN**

European Norm

Standards issued by the European Committee for Standardisation (also known as Comité Européen de Normalisation).

**GB**

Generator breaker

**GOST**

Regional standards maintained by the Euro-Asian Council for Standardization, Metrology and Certification.

**IEC**

International Electrotechnical Commission

**IP**

Ingress Protection Rating, or International Protection Rating

The degree of protection against solids and water provided by mechanical casings and electrical enclosures.

**ISO**

International Organization for Standardization

**L1**

Line 1

The main power line for one phase of the genset.

**LCD**

Liquid Crystal Display

The part of the front panel that displays icons and values. The icons and values displayed vary, depending on the CGC 200 mode and the operation of the equipment.

**LED**

Light Emitting Diode

The controller front panel LEDs are used to show the genset status and alarms.

**MPU**

Magnetic Pick Up

Used to measure the genset speed.

**MTBF**

Mean Time Between Failures

**MTTF**

Mean Time To Failure

**N**

Neutral

The neutral line for the genset.

**NEMA**

National Electrical Manufacturers Association

**OP**

Oil Pressure

**PC**

Personal Computer

The DEIF software must be run on a Windows PC, for example, a laptop computer.

**rms**

Root mean squared

Refers to the average value of a sinusoidal wave. For example,  $V_{rms}$  refers to the average AC voltage.

**t**

Time

**U**

Voltage

U is typically used as an abbreviation for voltage in Europe. In other countries, V may be used instead.

**U<sub>nom</sub>**

Nominal voltage

U is typically used as an abbreviation for voltage in Europe. In other countries, V may be used instead.

**USB**

Universal Serial Bus

**USW**

Utility Software

## 5.1.2 Terms

**Firmware**

Software that is installed in the controller. This software enables the controller to, for example, process inputs and outputs, display operating data, and keep track of the genset status.

**Parameter**

A value, or set point, used to determine the controller's operation. Parameters include alarm settings, and the configuration options for configurable inputs and outputs. The same set of parameters can be uploaded to several controllers.

### 5.1.3 Units

The table below lists the units used in the documentation.

| Unit            | Name                       | Measures                      |
|-----------------|----------------------------|-------------------------------|
| A               | ampere                     | Current                       |
| °C              | degrees Celsius            | Temperature                   |
| g               | gram                       | Mass                          |
| H               | hour                       | Time                          |
| kPa             | kilopascal                 | Pressure                      |
| m               | metre                      | Distance                      |
| mm              | millimetre                 | Distance                      |
| ms              | millisecond                | Time                          |
| RPM             | revolutions per minute     | Speed                         |
| s               | second                     | Time                          |
| V               | volt                       | Voltage                       |
| V <sub>ac</sub> | volt (alternating current) | Voltage (alternating current) |
| V <sub>dc</sub> | volt (direct current)      | Voltage (direct current)      |
| W               | watt                       | Power                         |
| Ω               | ohm                        | Resistance                    |