

## 5 Functional description

### 5.1 Operating and display elements



Fig. 2: Operating and display elements

No.	Description
1	Operation LED (green)
2	LED charge control "D+" (red)
3	LED engine oil pressure (red)
4	LED engine temperature (red)
5	LED diverse/pre-glowing (red)
6	Ignition switch
7	Operating hours counter

### 5.2 Self-test

After turning the ignition key to position 1, the controller performs a self-test. All LEDs light up 3 times.

### 5.3 Ignition switch

The ignition switch is provided with a mechanical restart lock.

#### Function of the ignition switch

Position	Meaning
0	Device is switched off
1	Ignition switched on. Pre-glowing function starts Operating magnet is switched on
2	Start with mechanical restart lock

Tab. 16: Ignition switch function

### 5.4 Starter protection function

The controller has a mechanical restart lock in the ignition switch. After inserting the ignition key, it can be turned in all positions. After turning to position 2, the ignition key reverts to position 1. Position 2 is then mechanically locked and can only be reached again when the ignition key has been turned to position 0.

### 5.5 Start optimisation

1. Switch on ignition by turning the ignition key to position 1. The self-test is performed.
2. When the pre-glowing function is active, the green Operation LED flashes or the Diverse LED lights up depending on the software version. During this time, the output for the lifting magnet / solenoid valve is also active. If the engine is not started during this time, then the output is deactivated again to reduce the power consumption.
3. After the engine starts, the Operation LED continually lights up and the states of all inputs are displayed with the other LEDs. If a fault is detected, the Operation LED goes out. The engine can be started at any time by turning the ignition key to position 2.

### 5.6 Pre-glowing function

- The pre-glowing function is displayed by the flashing green LED or an illuminated Diverse LED depending on the software version.
- Normally the MC 704 V3 is programmed with a software-specific fixed pre-glowing time that is activated independent of the external temperature when switched on.
- If the green LED lights up continually or the Diverse LED goes out, the pre-glowing procedure is completed and start-up can proceed.
- If start-up proceeds during the pre-glowing function, the pre-glowing output is engaged, interrupted or completely cancelled at the start for 300 ms depending on the software version. Afterwards the pre-glowing function is continued with the start procedure until it ends or the after-glowing function follows.
- The after-glowing time is also programmed with a fixed time specific to the software. The after-glowing function starts after the falling edge at input terminal 50.

**Optional: Temperature-dependent pre-glowing for item number ehb 5467 and ehb 5084-E, optional with additional board PMT-3**

- The pre-glowing time is 20 seconds between 0°C and -30°C.
- The pre-glowing time is 90 seconds below -30°C.
- The after-glowing time is half of the pre-glowing time.

**5.7 Operating hours counter**

Operating hours are counted when a running engine has been detected above the oil pressure and input generator terminal “D+”.

**5.8 Engine monitoring with fault shutdown**

If fault switches are monitored, then they are switched to ground at the inputs of the device. The monitoring of the switches starts 7 seconds after the engine starts. The state of the switches is displayed by the LEDs.

If a switch changes its state during operation for 3 seconds, the engine is automatically stopped or a warning is given depending on the software version. Faults that are present for less than 3 seconds are summed and saved. If the saved value exceeds 3 seconds, then the engine is also stopped. If no more fault occurs for 10 seconds, then the memory is deleted.

The first fault to occur is saved and the other inputs are locked so that it can always be properly determined which fault caused shutdown even when the input has adopted its normal state in the meantime.

**5.9 Cable start detection**

The manual start of combustion engines with cable start equipment or hand cranks is detected by the cable start detection function. When a cable start has been detected, the MC704 automatically starts monitoring inputs PIN 1-4 for oil pressure, temperature, charge control and diverse even when terminal 50 for the starter was not switched.

Monitoring of the engine functions starts when the inputs for oil pressure and generator D+ are not connected to ground.

**Caution:** For devices with inverted input for generator D+, a cable start is detected when an open contact is present at input Pin 1 oil pressure and input Pin 2 generator D+ is connected to ground.