Operating and installation guide for the digital control device m-Unit

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2.1 Duty Of Registration

The m-Unit does not have to be registered. The user has the responsibility that chosen settings for vehicles rear and brake light are conform to the country laws.

3 Technical Data And Functions

- **length / width / depth**: 101 / 61 / 28 mm
- **weight**: 180 g
- **threaded fastening bores**: 2 x M5, distance 84mm
- **standby current**: 1 mA
- **operating voltage**: 9 - 15 V
- **operating temperature**: - 20 - +80 °C
- **input circuits**: 8
- **output circuits**: 8
- **display**: via 15 internal LED
4 Safety Instructions

- PRIOR ELECTRICAL CONNECTION OF THE DEVICE AND GENERALLY PRIOR TO ANY WORK AT THE VEHICLES ELECTRICAL SYSTEM BATTERY MUST BE DISCONNECTED COMPLETELY. THEREFORE KEEP THIS ORDER: DISCONNECT AT FIRST THE NEGATIVE TERMINAL AND THEN THE POSITIVE TERMINAL. FOR THE RECONNECTION ACT IN THE REVERSE ORDER.

- USE OF M-UNIT TO VEHICLES WITH PLUS POLE TO VEHICLE FRAME (OLDER ENGLISH MOTORCYCLES) IS NOT POSSIBLE.

- INSTALLATION AND ELECTRICAL CONNECTION OF THE M-UNIT HAS TO BE CARRIED OUT BY A CERTIFIED MOTORCYCLE TECHNICIAN ONLY.

- ALL CABLE DIAMETERS MUST BE DIMENSIONED ACORDING THE CURRENT FLOW. THE CABLE DIAMETERS MUST NOT GO BELOW THE VALUES LISTED IN CHAPTER 7.4.

- CURRENT FLOW OF CONNECTED LOADS MUST NOT EXCEED THE VALUES LISTED IN CHAPTER 7.3

- THE CABLE ENDS TO M-UNIT’S CONNECTION TERMINAL MUST BE CRIMPED WITH CABLE END SLEVES. THEREFORE USE A SUITABLE CRIMPING TOOL.

- ALL ELECTRICAL CONNECTIONS IN THE WIRING LOOM AND AT THE CONNECTION TERMINALS HAVE TO BE CARRIED OUT IN A PROPER WAY. FAILURES AT CONNECTING JOINTS MAY CAUSE A CONTACT RESISTANCE AND MAY LEAD TO HEAT GENERATION DURING HIGH CURRENT FLOW. THERE IS A RISK OF SERIOUS OR LETHAL INJURIES.

5 Functions And Operation

The m-Unit is able act as central control unit in vehicle’s electrical system. It provides following features:

- complete digital push button control unit
- Complete replacement of all OEM fuses. Eight independent circuits are digitally supervised. A circuit will be shut down in case of interference. After removing the interference the circuit will be switched on automatically.
- Integrated, digital, load-independent flasher relay with programmable switch off feature
- Integrated digital brake-light modulator with programmable flashing sequence
- Integrated starter relay (up to 40A current flow)
- Intelligent control and shut-down of single loads; i.e. switch headlight off during cranking to use maximum battery power.
- Control of head light’s low beam and high beam with only one push button
- Integrated digital horn relay
- Integrated alarm system
- Integrated hazard light feature
- Internal LED provides the status of vehicles electrical system at a glance – easy trouble shooting.
- Easy setup by a temporary push button

The device is completely moulded and resistant against water, heat, cold and vibrations. Microprocessor operated and supervised circuits guaranty highest reliability. Current flow of each circuit is measured with high accuracy. In case of a failure like a short-circuit or overload the concerning loop will be shut down in a split second. All switching activities are carried out by state of the art semiconductor switches in a fast, wear-free and almost lossless way.
Therefore no other components like relays, boxes, fuses are necessary. A complete new wiring harness can be made with minimal time; materials and effort compared to conventional solutions only a fraction of space and cables is needed. State of the art technology like pulse width modulation afford new possibilities like connecting rear and brake light together with only one cable.

Hazard light
For starting the hazard light hold the push buttons for left and right turn signal for 2 seconds. If a turn light switch is used, the hazard light function can only be activated if a additional hazard light switch is activating both turn light inputs at the same time.

Light control
In order to save the vehicles battery power the head light is always switched off after key lock is switched on. The head light will be activated automatically after pressing the start button or (for kick start) after one short light switch operation.
If a push buttons is used for high/low beam control, a short push will toggle between high and low beam. Hold the button for 2s will switch off light completely. Press the button again will switch low beam on again. If a switch is used for light control it is only possible to toggle between high and low beam once the light is activated.
The m-units light circuits are suitable for standard H4 55/60W Halogen bulbs. It is not possible to connect bulbs with higher power output.

Kill switch
The running engine can be stopped in two different ways:

a) engine start button double click
Pressing the button again after engine stop will crank and start the engine in normal way.
b) Connecting a separate kill switch or push button at the "config" terminal. If a push button is used the engine is stopped if push button is shortly pressed. To release the kill function hold the button again for 2 seconds or switch ignition lock off and on again. If a kill switch is used wait for 2 seconds between switching engine off and release the kill switch.

The current status of each circuit is shown by an internal LED:

- LED off: input not active, output not powered
- LED on: input active, output powered – normal condition
- short flashing: output shutdown due short circuit or overload
- one short flash each 2s: alarm system active

(only at „lock“)

6 Mechanical Installation

6.1 General

Mount the device on a flat surface (metal base plate) free of tension using two M5 screws. No push or pull force should act to the device. Area of Installation must be protected from spray water and 30cm away from hot engine or exhaust parts. Maximum ambient temperature must not exceed +80°C or go below -20°C.
The m-Unit is connected to vehicle ground by the two mounting screws. Therefore one of the mounting screws must connected directly to battery minus terminal. The necessary cable cross section for this connection cable is 1.5mm².
6.2 Mounting direction
The m-unit’s alarm feature is triggered by an internal vibration switch. The sensitivity of this switch depends on the mounting orientation. Therefore it is not possible to use the alarm function on motorcycles with a center stand or with sidecars or automobiles.

The mounting position is in vertical direction. This means the output terminal shows to upside and the m-Units topside shows in direction side stand.

The alarm will be triggered if the motorcycle will be moved from the side stand in upright position.

7 Electrical Connection
7.1 General
The device is working in a voltage range between 9 to 15V. Use in vehicles without battery is not possible. Please ensure a correct voltage supply polarity. The power consumption in stand-by mode (ignition switch off) is approx 1.5mA. Therefore it is recommended in winter time or periods of non-use to disconnect the Battery from vehicles power system.

Make sure that the vehicle is equipped with interference suppressed spark plugs or ignition cables. The minimum distance between ignition coil or high tension cables and m-Unit must not be below 30 cm.

Starting the vehicle with jump-start may damage the m-unit and is not recommended.

7.2 Internal Safety Circuit
Reverse Polarity or Voltage above 18V will damage the m-Unit. Over voltage may occur if the voltage regulator is defective, during jump start or if the battery is defective (i.e. broken battery cable)

The internal indicator will show a damage caused by over voltage or reverse polarity.

A released indicator is displayed by a broken indication area on the m-unit top side.

A defective unit has to be replaced. All guarantee claims become invalid.
7.3 Cable Routing Recommendations

Cables used in vehicles must be suitable for this application. Cable insulation must have a adequate thickness and insulation material must have a resistance against fuel, oil, cold and heat. Please use only cables which are certified for use in vehicles. Not fused wires which lead from battery positive terminal to starter motor or to m-Unit must have the shortest length possible. It is very important to protect the insulation of these cables against damage by wearing. At contact points between cable and vehicle parts additional insulation protection is necessary. Before routing cables look for suitable cable paths. The cables should be as far away as possible from hot parts of the engine. Look for a suitable place for the respective cables to meet with their plugs and for the plugs to be connected with one another. This is usually in the headlight housing or somewhere below the gas tank. Make sure you take note of the required lengths of cables before cutting them for best fit. It is important here to consider the full lock of the handlebars as well as the front and rear wheel travel. All cables should be routed free of kinks and should not be subject to any tension.

In addition, the cables have to be properly isolated, especially in places where mechanical wear can take place. We recommend solder joints. For fastening the cables we recommend cable ties of synthetic material.

To prevent corrosion from the m-unit terminals you must apply terminal grease to the screws and into the cable inlets.

For preparing a cable for connection to a m-unit terminal; remove 10mm of cable insulation and put a cable end sleeve over the free cable end. Cut sleeve with inserted cable to approx. 6mm, put it into the dedicated cable inlet and tighten the terminal screw.

7.4 Wire Cross Sections

Wire diameters used in a circuit are dependant on the current flow that particular circuit. Following plan shows the minimum wire cross sections used in the single circuits of m-Unit. The installed wire cross sections must not go below the shown values.
7.5 Connecting Battery’s Positive Terminal

Cable connection has to be carried out as shown in the drawing at the right side.

The minimum wire cross section must not go below 10mm².

The cable end has to be supplied with an eyelet and will be mounted with a M5 Screw to the m-Unit.

The maximum torque applied to the M5 fastening screws must not exceed 4 Nm. Screw adhesive medium strength must be applied to the screw prior installation.

MAKE SURE THE EYELET IS INSULATED IN A PROPER WAY AND CANNOT GET IN CONTACT TO OTHER VEHICLE PARTS.

7.6 Handle Bar Controls

Three different types of handle bar controls are compatible with m-Unit. The particular type which will be used with m-unit must set in the setup menu.

Configuration A) – Push Button Controls
- turn lights left - push button
- turn lights right - push button
- low beam / high beam - push button
- start - push button
- horn - push button

Configuration B) – Harley Davidson and BMW controls
- turn lights left - push button
- turn light right - push button
- low beam / high beam - switch
- start - push button
- horn - push button

Configuration C) – most Japanese and European motorcycles
- turn lights left / right - 3 way switch
- low beam / high beam - switch
- start - push button
- horn - push button

Configuration D) – new Ducati models
- turn lights left / right - 3 way switch
- low beam / high beam - push button
- start - push button
- horn - push button

In case of using the OEM handle bar controls together with m-Unit; head light flashing push button is not applicable. There is also no possibility to switch the parking light by the m-Unit.

Additional safety switches like side stand switch have to be connected as shown in chapter 7.9.
7.7 Connecting Load Circuits

The m-Unit provides 8 independent circuits which are permanently supervised. At all connected loads were the positive terminal switched, that means, from m-Unit’s output terminal lead one cable to the load which is connected to vehicles earth. At the particular output only the intended load must be connected. The connection scheme is shown on next page. If control lamps will be used; these have to be connected in parallel to the load as shown in chapter 7.8.

7.7.1 Important Notes

M-Unit’s Starter Motor Output „start“

Starter motors which coming with solenoid and a solenoid current consumption of maximum 30A (like Valeo, Bosch, Harley Davidson) can be connected directly to the m-Unit’s „start“ output. In this case a cable diameter of 2,5mm² has to be applied. All starter motors with external relay (like Japanese Motorcycles) have to be still powered via the OEM relay. In this case m-Unit’s output „start“ is connected with the relay which switches the actual cranking current (>100A). Some Motorcycles have an additional relay to switch the start relay; this second relay is not needed.

One – Wire – Taillight

In conventional way is the output „brake“ is connected to the brake light and the output „AUX“ connected to the rear light. If you like to route only one wire for tail light and brake light together; you have to adjust the right setting in the setup menu (chapter 8). Furthermore the rear light and brake light will be connected in parallel and one terminal to m-Unit output “brake” and the other terminal to earth. Observe polarity if an LED light is applied.
Auxiliary Output
Output AUX (auxiliary) powers the ignition system. The ignition system must be connected only with this output. All further loads which are not listed in the drawing below (like heat grips, radio) will be also powered only by this output circuit.

Ignition Lock
If m-Lock from motogadget will be applied instead of a conventional ignition lock the m-lock switching output (brown cable) can be connected directly to the m-Unit input „lock“. The delivered m-Lock relay is not applicable.

7.8 Connecting Indicator Lights

7.9 Connecting The Ignition System
8 Setup

8.1 Layout

Device setup is structured in 7 menus (1-7) with particular options (A-F) as follows:

**Menu 1 – Brake light configuration**
- A) standard (continuous light) > default setting
- B) fade in and fade out
- C) flashing
- D) 8 times flashing and continuous light
- E) 2 times flashing; 1s continuous light and start again
- F) 3s continuous light and flashing

**Menu 2 – Rear light configuration**
- A) standard (brake light connected to „brak“ and rear light to „AUX“) > default setting
- B) one wire rear light / brake light for LED
- C) one wire rear light / brake light for light bulbs

**Menu 3 – Turn lights configuration**
- A) standard (no automatic shut down) > default setting
- B) shut down after 10s
- C) shut down after 20s
- D) shut down after 30s
- E) shut down after 40s
- F) shut down after 50s

**Menu 4 – Alarm configuration**
- A) alarm deactivate > default setting
- B) alarm on after 5s ignition switched off
- C) alarm on after 15s ignition switched off
- D) alarm on after 30s ignition switched off
- E) alarm on after 60s ignition switched off

**Menu 5 – Handle bar control configuration (see chapter 7.6)**
- A) configuration A (push button control) > default setting
- B) configuration B (HD and BMW)
- C) configuration C (Japanese and European motorcycles)

**Menu 6 – Turn lights as position lights**
- A) function deactivate > default setting
- B) brightness 10%
- C) brightness 20%
- D) brightness 30%
- E) brightness 40%
- F) brightness 50%

**Menu 7 – m-Wave (smooth turn signal)**
- A) function deactivate > default setting
- B) function activated
8.2 Navigation Through Setup Menu
All LED at input side represent menu 1 - 7. All LED at the output side represent option A - F. Flashing LED shows the actual chosen menu or option. A short push button operation (less than 1 second) changes to the next menu or option. A long push button operation (2s) change between menu and options. The following drawing shows all menus and option at a glance.

8.3 Starting The Setup
The "Config" input can be used for a kill switch as well for the configuration of the m-unit as follows:
- if no kill push button is used, connect a temporary push button between earth and input "config". (provisional: inch with a cable to earth)
- Switch vehicle power on
- Press instantly after the running light is starting the push button and hold the button for 2 seconds. If the button is activated before or after the running light, setup will not be activated - right timing is important.
- Release the push button - if the LED at "Turn R in" is blinking, the setup has started

8.4 Exit From Setup
Hold the push button until the device changes back to normal operation mode.

8.5 Example
The following example is demonstrating the operation in setup mode. Alarm is deactivated. Here is shown how it will be activated with a delay time of 30s.
Starting the setup as described in chapter 8.3
9 Trouble shooting

9.1 After Installation

- Make sure the battery voltage is minimum 12.6V.
- Do not use a battery charger to test the device.
- Check for a perfect electrical connection between both mounting bolts at m-Unit base and battery negative terminal.
- Check all cables, for correct polarities and short-circuits.
- Check all cables, for adequate connection and contact at connection joints.
- Check if the safety circuit indicator area on the top side is damaged; if yes the unit has to be replaced.

<table>
<thead>
<tr>
<th>Failure</th>
<th>Reason</th>
<th>Relief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm is not working</td>
<td>wrong fitting position</td>
<td>follow instructions in chapter 6.2</td>
</tr>
<tr>
<td></td>
<td>alarm is not activated</td>
<td>adjust setup menu 4 to option B-E</td>
</tr>
<tr>
<td>m-Unit is re starting (running light) if starter is activated</td>
<td>battery breaks down</td>
<td>load or replace battery</td>
</tr>
<tr>
<td></td>
<td>bad electrical connection between ground and m-Unit connection bolts</td>
<td>install a separate cable from battery minus to one of the connection bolts</td>
</tr>
<tr>
<td></td>
<td>current flow through starter or OEM starter relais is to high</td>
<td>use a separate starter relay</td>
</tr>
<tr>
<td></td>
<td>bad electrical connection from battery to vehicle power system</td>
<td>make a suitable connection and use proper ground cable</td>
</tr>
<tr>
<td>start output is shut off when start is activated (blinking LED)</td>
<td>bad electrical connection between ground and m-Unit connection bolts</td>
<td>install a separate cable from battery minus to one of the connection bolts</td>
</tr>
<tr>
<td></td>
<td>bad electrical connection at m-Units terminal</td>
<td>use core cable ends, consider cable width, tighten terminal screw</td>
</tr>
<tr>
<td></td>
<td>current flow is to high</td>
<td>load must within the specifications (light bulbs max. 60W)</td>
</tr>
<tr>
<td></td>
<td>short circuit</td>
<td>remove the sort circuit</td>
</tr>
<tr>
<td>load circuit is shut off (blinking LED)</td>
<td>position light feature is activated</td>
<td>adjust setup menu 6 to option A</td>
</tr>
<tr>
<td>All turn signals are glowing</td>
<td>position light feature is activated</td>
<td>adjust setup menu 6 to option A</td>
</tr>
</tbody>
</table>

9.2 Return And Complains

If you like to return a defective instrument for repair or change please observes following issues:

- Make sure again there is no connection failure. If doubt use a different voltage source to recheck.
- Not prepaid shipments will be rejected.
- The Shipment to motogadget is carried out by your own risk you are responsible for a sufficient insurance.
- Make sure the packaging is adequate.
- Attach the invoice and a failure description with Motorcycle model and year.
- Attach you name, address, email and telephone number
- If you are located outside the EU, you have to declare “repair item” and value 1 Euro in shipment custom declaration.

The motogadget team wishes you pleasant and safe riding, and lots of fun with your new m-Unit.