

# MIC100 – Ignition Controller

## Operating Manual



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Original instructions

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# 1 General Information

Read through this operating manual carefully before use and become familiar with the product. Installation and start-up should not be carried out before reading and understanding this document. Keep this manual readily available so that you can reference it as needed.

## 1.1 What Is the Purpose of this Operating Manual?

This manual serves as an aid for the installation and operation of the product and supports the technical staff with all operating and maintenance tasks to be performed. Furthermore, this manual is aimed at preventing dangers to life and health of the user and third parties.

## 1.2 Who Is this Operating Manual Targeted to?

The operating manual provides a code of conduct for personnel tasked with the setup, operation, maintenance, and repair of gas engines. A certain level of technical knowledge with respect to the operation of gas engines and basic knowledge of electronic ignition systems are necessary. Persons who are only authorized to operate the gas engine shall be trained by the operating company and shall be expressly instructed concerning potential hazards.

## 1.3 Which Symbols Are Used in the Operating Manual?

The following symbols are used in this manual and must be observed:



### Example

This symbol indicates examples, which point out necessary handling steps and techniques. In addition, you receive additional information from the examples, which will increase your knowledge.



### Notice

This symbol indicates important notices for the user. Follow these. In addition, this symbol is used for overviews that give you a summary of the necessary work steps.



### Warning

This symbol indicates warnings for possible risks of property damage or risks to health. Read these warning notices carefully and take the mentioned precautionary measures.

# 1 General Information



## Danger

This symbol indicates warnings for danger to life, especially due to high voltage. Read these warning notices carefully and take the mentioned precautionary measures.

## 1.4 Which Abbreviations/Acronyms Are Used in the Operating Manual?

In the manual or the user interface, the following abbreviations/acronyms are used.

Abb.	Term	Description	Explanation
ADV	Advance	Advanced with respect to top dead center	Indicates the direction for timing
ASO	Auxiliary Synchronization Output		Output for synchronizing the MIC100 and other controllers
ATDC	After Top Dead Center		
BTDC	Before Top Dead Center		
CAN bus	Controller Area Network bus	Bus for control devices/networks	Asynchronous serial connection system for linking control units
CE	Conformité Européenne	Conformity with EU directives	Mark based on EU legislation for certain products in conjunction with product safety
CPU	Central Processing Unit		
°crankshaft	Degree crankshaft		Unit for the rotation angle of the crankshaft
CSA	Canadian Standards Association		Organization that defines standards, inspects products for safety compliance, and issues pertinent certifications.
DC	Direct Current		
DetCon	Detonation Control System		Serves to prevent major engine damage that can be caused by knocking combustion.

Abb.	Term	Description	Explanation
EMI	Electromagnetic Interference		
EMC	Electromagnetic Compatibility		Compatibility of electrical or electronic equipment items with their surroundings
HV	High Voltage		
ISO	International Organization for Standardization		
LED	Light Emitting Diode		Light emitting electronic semiconductor
MIC	MOTORTECH Ignition Controller		
MICT	MOTORTECH Integrated Configuration Tool		Software for the configuration of the MIC100
PG	Panzergewinde	Panzer Screw Thread	Screw thread type for cable screw connections
RET	Retard	Retarded with respect to the top dead center	Indicates the direction for timing
RS485/ TIA485	Recommended Standard 485/ Telecommunications Industry Association 485		Industrial standard for a physical interface for asynchronous serial data transfer
TDC	Top Dead Center		
USB	Universal Serial Bus		Serial connection system to link a computer to external devices

## 2 Safety Instructions

### 2.1 General Safety Instructions

The following safety instructions must be followed in the area in which the device is operated:



#### High voltage! Danger to life!

While the engine is running, the area around the ignition system especially holds the risk of danger due to high voltage. The following parts should therefore not be touched or removed unless explicitly stated otherwise:

- Ignition coils and caps
- Wires of the high voltage circuit
- In- and output wiring of the ignition controller
- Pickups and their wiring



#### Danger to persons with pacemakers!

Electromagnetic impulses in the wiring of the ignition system may exceed the permissible limits of pacemakers. Persons with pacemakers must therefore not be present in the vicinity of the ignition system being operated. Mark the operating location of the ignition system with the corresponding standardized warning symbol.

MOTORTECH equipment is manufactured as state of the art and therefore safe and reliable to operate. Nevertheless the equipment can cause risks or damage can occur, if the following instructions are not complied with:

- The gas engine must only be operated by trained and authorized personnel.
- Observe all safety instructions of the system and all safety instructions of the system operator.
- Operate the equipment only within the parameters specified in the technical data.
- Use the equipment correctly and for its intended use only.
- Never apply force.
- For all work such as installation, conversion, adaptation, maintenance, and repair, all equipment must be disconnected from the mains and secured against unintentional reactivation.
- Perform only such maintenance and repair work as is described in this operating manual, and follow the instructions given while working.
- Only use spare parts supplied by MOTORTECH for the maintenance of the device.
- Further work must only be performed by personnel authorized by MOTORTECH. Non-compliance with the instructions will void any warranties for the proper function of the equipment as well as the responsibility for the validity of the certifications.

## 2 Safety Instructions



- Safety devices must not be dismantled or disabled.
- Avoid all activities that can impair the function of the equipment.
- Operate the equipment only while it is in proper condition.
- Investigate all changes detected while operating the gas engine or ignition system.
- Ensure compliance with all laws, directives, and regulations applicable to the operation of your system, including such not expressly stated herein.
- If the system is not entirely tight and sealed, gas may escape and result in explosion hazard. The inhalation of gas can also lead to death or severe health damages. Therefore, upon completion of all assembly works, always check the system's tightness.
- Always ensure adequate ventilation of the engine compartment.
- Ensure a safe position at the gas engine.
- There is a risk of burning on hot surfaces. Allow the engine to cool down before starting any work.
- Personal protective equipment (PPE), e.g. safety shoes and gloves, must be worn during all work on the engine.
- Noise from the system can cause permanent or temporary damage to your hearing. Wear suitable hearing protection at the system.
- Your behavior can reduce possible residual risks to a minimum. Observe responsible handling of the gas engine and the gas-carrying system.

### 2.2 Electrostatic Discharge Hazards

Electronic equipment is sensitive to static electricity. To protect these components from damage caused by static electricity, special precautions must be taken to minimize or prevent electrostatic discharge.

Observe these safety precautions while you work with the equipment or in its vicinity.

- Before performing maintenance or repair work, ensure that the static electricity inherent to your body is discharged.
- Do not wear clothing made from synthetic materials to prevent static electricity from building up. Your clothing should therefore be made of cotton or cotton mix materials.
- Keep plastics such as vinyl and Styrofoam materials as far away from the equipment as possible.
- Do not remove the circuit boards from the housing of the device.

## 2 Safety Instructions

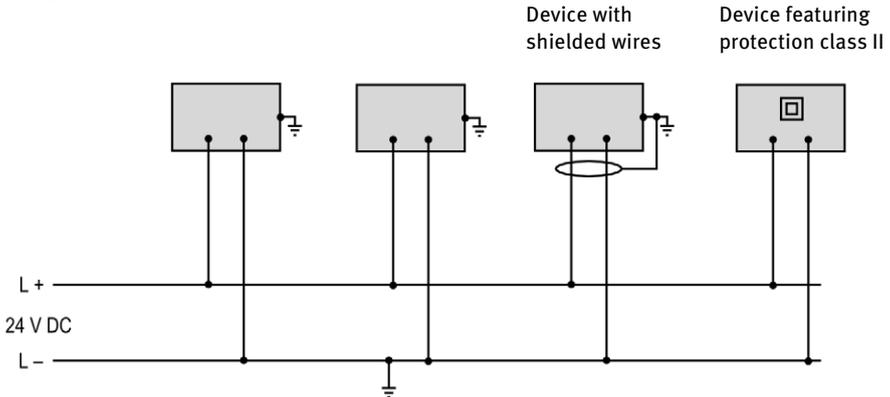
### 2.3 Information on Electric Isolation

If ground and earth potential are not properly isolated, the following problems as well as others can occur:

- Electromagnetic interferences (e.g. ground loops)
- Signal corruption (e.g. of the analog voltage signal)
- Unwanted leakage currents

Therefore, earth potential and the negative pole of the power supply of all devices in the electric assembly that provide the option, should be connected separately. If possible, the negative pole of the power supply should only be connected to earth potential at one point in the entire system.

#### Wiring Example

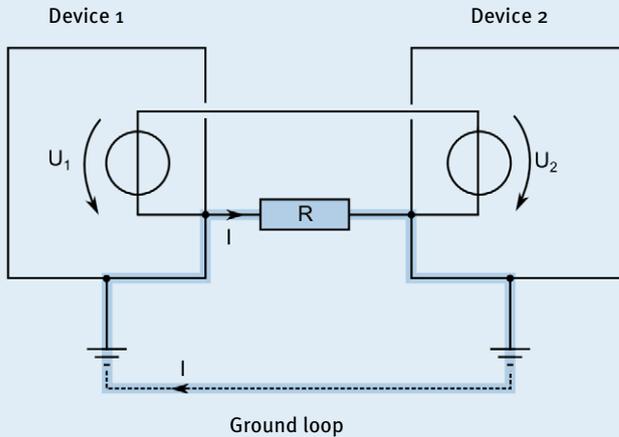




### Occurrence of ground loops

The devices shown in the following image do not feature the possibility to connect the earth potential and the negative pole of the power supply separated from each other. How ground loops are created.

A ground loop is a ground connection of an electric wiring assembly that is closed as a loop. Due to impedance (resistance  $R > 0$ ) of the loop, low-frequency interference currents can lead to an unwanted voltage drop in the signal path.



### 2.4 Special Safety Instructions for the Device



#### Danger to life! Hazardous residual voltage!

After stopping the ignition, there is dangerous residual voltage for up to three minutes in the ignition system. Do not touch any components of the ignition kit during this time.



#### Explosion hazard!

If the system is located in a hazardous area, never open the device (e.g. by opening the service screw). There is a risk of explosion.

## 2 Safety Instructions



### **Explosion hazard!**

Do not disconnect any connectors while the system is live. If the system is located in a hazardous area, there is a risk of explosion.



### **Explosion hazard!**

Never remove the equipment while the unit is connected to a power source. If the system is located in a hazardous area, there is a risk of explosion.



### **Explosion hazard!**

Do not remove or replace the fuse while the equipment is live.



### **Risk of burning!**

The surfaces of the system may heat up to high temperatures.



### **Operational safety!**

All connector screws and screw joints must be adequately tightened.



### **Operational safety!**

The proper functioning of the device is only guaranteed if the device is operated within the permissible supply voltage range. Therefore, use a power supply in accordance with the specifications in the operating manual.



### **Risk of destruction!**

Magnetic fields and heat occur when welding, which may damage or destroy the MIC100. Therefore, pay attention to the following when welding:

- Disconnect all electrical connections to the MIC100 prior to welding.
- Protect the MIC100 against direct contact with the welding unit and magnetic fields, sparks and liquid metal.



### **Danger of interference with radio reception!**

The device is not intended for use in residential areas and cannot ensure adequate protection of radio reception in such environments.

## 2.5 Proper Disposal

After the expiration of its service life, MOTORTECH equipment can be disposed of with other commercial waste, or it may be returned to MOTORTECH. We will ensure its environmentally friendly disposal.

## 3 Intended Use

### 3.1 Functional Description

The devices of the MIC100 series are microprocessor controlled ignition systems, each consisting of a board with a 32 bit main processor (CPU).

Please note that the manufacturer is not generally required to implement configurations of the ignition controller for specific engines, and that devices may be delivered without pertinent configuration.

The ignition controllers of the MIC100 series use information supplied by the pickup to precisely determine the correct timing for the respective outputs. The ignition timing is influenced by various inputs. This can be implemented using analog input signal, a speed characteristic, or using a serial interface (CAN bus).

By checking the information received, the ignition controllers continuously monitor the system status of the installed pickup and the correct operation of the primary ignition circuit during operation.

Depending on the severity of an error that is detected, the device will shut down immediately or warn the operator. A corresponding message can be viewed on a connected computer.

To protect the engine, the ignition controllers additionally have an adjustable overspeed shut-off.

### 3.2 Applications

The ignition controllers of the MIC100 series are designed for specific 2- or 4-stroke gas engines. From 1 to max. 8 ignition outputs are available.

The ignition controllers supply the energy required for the corresponding ignition coils of the gas engines and can supply signals for peripheral equipment.

Any use other than the one described in the operating manual shall be considered improper use and will result in the voiding of all warranties.

## 4 Product Description



### 4.1 Technical Data

#### 4.1.1 Certifications

The ignition controllers of the MIC100 series are certified as per the following directives/regulations:

##### CE

EMC Directive 2014/30/EU

- EN 61326-1:2013 – Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements
- EN 61000-6-2:2005 + AC:2005 – Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments
- EN 61000-6-4:2007 + A1:2011 – Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments
- EN 55011:2009 + A1:2010 – Industrial, scientific and medical equipment. Radio-frequency disturbance characteristics. Limits and methods of measurement
  - Group1, Class A

Low Voltage Directive 2014/35/EU

- EN 61010-1:2010 – Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements
- EN 60529:1991 + A1:2000 + A2:2013 + AC:2016-12 + AC:2019-02 – Degrees of protection provided by enclosures (IP Code)

RoHS Directive 2011/65/EU

## 4 Product Description

### 4.1.2 Mechanical Data

The MIC100 has the following mechanical characteristics.

Feature	Value
Dimensions	232 mm x 190 mm x 55.5 mm (9.1" x 7.5" x 2.2") (length x width x height)
Weight	1.6 kg ( 3.5 lbs)
Shape of device	See chapter <i>Overview Drawings</i> on page 24
Mechanical environmental conditions	<p>The housing is resistant to general atmospheric contaminations.</p> <p>Resistant to gas engine lubricants and cooling water.</p> <p>Protection class: I Protection: IP69k</p> <p>The specified protection classes and types are only guaranteed if all external wiring connections are made in accordance with the connector specification, all covers and seals are installed as intended and the following tightening torques are observed:</p> <ul style="list-style-type: none"><li>– Service screw: 2.5 Nm to 3 Nm (1.9 lb-ft to 2.2 lb-ft)</li></ul> <p>The device must not be opened except via the service screw.</p>
Climatic environmental conditions	<p>Housing surface temperature: –40 °C to +70 °C (–40 °F to +158 °F)</p> <p>Max. 85 % humidity without condensation up to 3,000 m (9,842') above sea level</p>
Permissible vibration conditions	<ul style="list-style-type: none"><li>– 2 Hz to 20.85 Hz with a maximum vibration displacement of 1.6 mm (0.06")</li><li>– 20.85 Hz to 1,000 Hz with a constant acceleration of 4g</li></ul>

## 4 Product Description

### 4.1.3 Warning Notices on the Device



#### Validity of warning notices on device

The warning notices on the device are valid for the MIC100 and all components connected to it.

Warning notice on the device	German translation	French translation
<b>WARNING!</b> Read and understand the installation and operating manual prior to installing or making any adjustments.	<b>WARNUNG!</b> Lesen und verstehen Sie die Installations- und Betriebsanleitung vor der Installation und bevor Einstellungen vorgenommen werden.	<b>ATTENTION!</b> Avant d'installer ou d'effectuer une modification, lisez et comprenez le manuel d'utilisation et d'installation.
<b>EXPLOSION HAZARD!</b> Do not disconnect while circuit is live unless area is known to be non-hazardous. For wiring details refer to the operating manual.	<b>EXPLOSIONSGEFAHR!</b> Keine Verbindungen lösen, solange der Stromkreis aktiv ist, außer das Umfeld wird als nicht explosionsgefährdet eingestuft. Hinweise zur Verkabelung finden Sie in der Betriebsanleitung.	<b>RISQUE D'EXPLOSION!</b> Ne débranchez pas lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereuse. Pour plus de détails de câblage, veuillez consulter le manuel d'utilisation.
<b>CAUTION!</b> Do not pressure wash this ignition pressure. Damage to electronic components may result.	<b>ACHTUNG!</b> Die Zündsteuerungseinheit nicht mit Hochdruck reinigen. Es könnte zu Schäden an den elektronischen Bauteilen führen.	<b>ATTENTION!</b> Ne pas laver cette boîte de contrôle en utilisant un jet sous pression. Les composants électriques peuvent être endommagés.

#### Warning Symbol on Device



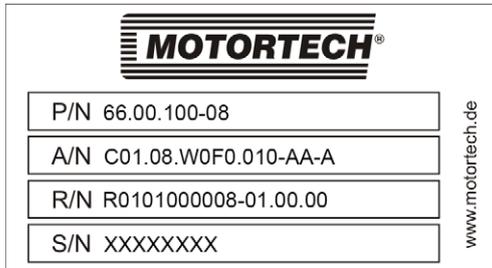
Warning of hot surface

## 4 Product Description

### 4.1.4 Product Identification – Labeling on the Device

The necessary numbers for unique product identification are on the device:

- Part number of the ignition controller (P/N)
- Arrangement number of the ignition controller (A/N)
- Revision number of the ignition controller indicating its precise construction status (R/N)
- Serial number of the ignition controller (S/N)



## 4 Product Description



### 4.1.5 Electrical Data

The MIC100 has the following electrical characteristics.

Feature	Value
Power consumption	Max. 40 W at 24 V
Power supply	Nominal voltage: 24 V DC Operating voltage: 16.8 V DC to 32 V DC
Required current	Max. current 2.0 A. An estimation of the power requirements can be found after this table.
Number of outputs	4, 6 or 8 outputs
Firing angle	The size of the firing angle depends on the max. overspeed. The smallest ignition angle can be calculated using the following formula: $\text{Ignition Angle} = \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times 360^\circ \times 1 \text{ ms}$
Ignition frequency	With full energy output (all 8 ignition outputs with 130 mJ), an ignition frequency of 120 Hz as continuous load is possible. With less ignition energy or in case of a brief overload, 133 Hz is possible. The maximum output load of 18 W must not be exceeded. 2-stroke engine: $\text{Ignition Frequency} = \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times \text{Number of Ignition Outputs}$ 4-stroke engine: $\text{Ignition Frequency} = \frac{1}{2} \times \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times \text{Number of Ignition Outputs}$

### Estimation of Current Requirements

These current values are based on a nominal speed of 1800 rpm and 130 mJ energy.

Outputs	Voltage	Required current
8	24 V	1.5 A

## 4 Product Description

### Electrical Data for Inputs and Outputs

The inputs and outputs of the ignition controller have the following electrical data:

Inputs and outputs	Values
Analog current input	Current range: 0 mA to 20 mA (adjustable in MICT) Input impedance: $10\ \Omega \parallel 1\ \mu\text{F}$
Binary input (Start/Stop)	Wiring Input current: max. 20 mA Ignition stop: 0 V to 1 V (low level) Ignition release: 4.5 V to 32 V (high level)
Go/NoGo output	Implementation as bipolar power transistor Maximum switching voltage: 32 V DC Peak/steady current: max. 100 mA DC Output power: max. 2.5 W Internal resistance: $58\ \Omega$ to $60\ \Omega$ Activation delay: 0.5 ms / max. 100 mA load Deactivation delay: 0.2 ms / max. 100 mA load If a short is found at the output, a safety circuit, which makes the output highly resistive, is found at the output, so that the current sets itself at 50 mA to 60 mA.
LED	Three LEDs are used as status indicators.
ASO output	TTL level (5 V) max. current: $\pm 10\ \text{mA}$
Pickup input	Impedance: 10 k $\Omega$ Power supply 8 V or 15 V (configurable in MICT) Max. frequency for the pickup: 15 kHz The formula for determining the frequency of the pickups can be found in the note following this table. For a pickup output impedance of $120\ \Omega$ to 10 k $\Omega$ , the pickups connected to the MIC100 may not have a higher voltage than $\pm 40\ \text{V}$ and the connected power may not exceed 1 W.
Ignition coil outputs	Output voltage: max. 250 V Output energy in normal operation mode: 130 mJ



### Frequency of the pickups

The frequency of the pickup is calculated as per the following formula.

$$\text{Frequency} = \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times \text{Number of Pickup Events per Revolution}$$

### 4.1.6 Interfaces

Depending on the device version, the following interfaces are available:

#### Service Interface

- Compatible with MOTORTECH USB adaptor cable type1
- The MOTORTECH USB adaptor cable type1 is only suitable for servicing and not for operation on the engine.
- Max. wire length 5 m (16.4')

#### CAN Bus Interface (optional)

- Classical Extended Frame Format (CAN 2.0B)
- As per ISO 11898 standard, 50 kbit/s to 1 Mbit/s
- Protected against transients (automotive classification)
- Max. 110 participants
- Max. wire length 250 m (820') depending on the transfer rate



### Pay attention to the wiring diagrams

Depending on the device version, certain signals or interfaces described in these instructions may not be available. You are also always to pay attention to the wiring diagrams enclosed with the input and output cable harnesses.

### 4.1.7 Requirements for External Equipment

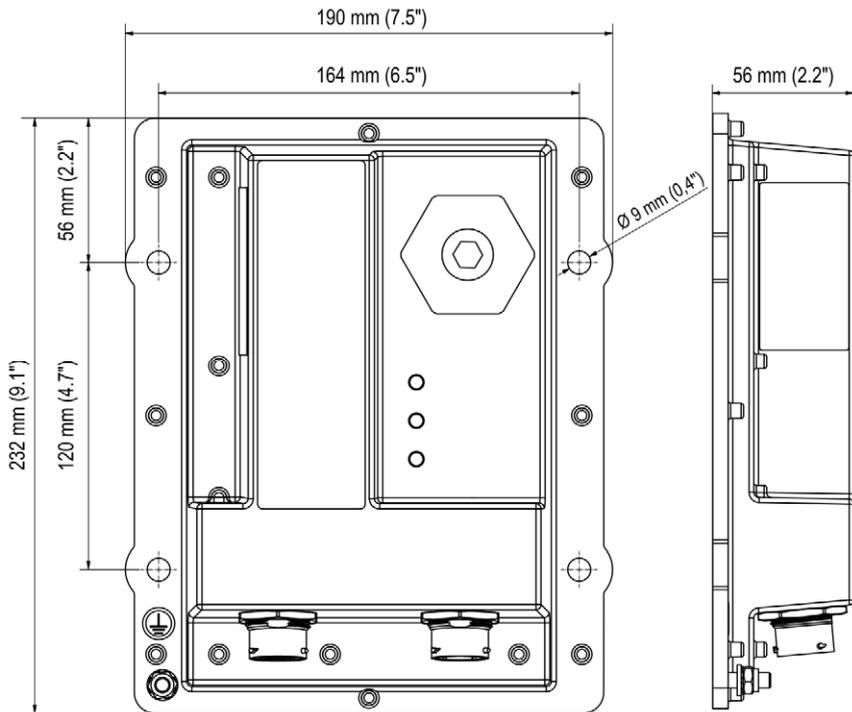
External equipment shall fulfill the input and output specifications of the MIC100.

## 4 Product Description

### 4.1.8 Overview Drawings

#### Standard Version

The connectors shown correspond to the standard version. Other device versions may be equipped with different connectors.



#### Service Interface

Below the service screw is the service connection, which can connect the MIC100 to a computer. For this purpose the special MOTORTECH USB adaptor cable type1 must be used.

### 4.1.9 LED Functions

- Status
- Firing
- Pickup

Labeling	Function
Status	LED flashes green if the device is running with no errors. The LED flashes red if an error has occurred. For details, refer to the following overview.
Firing	LED lights up when the ignition is active.
Pickup	Flashing LED indicates activity of the pickups.

#### Indication via the Status LED

The flashing sequences shown below are repeated until the device has left the respective state again. However, the flashing sequences are always executed to the end and are not interrupted accordingly.

The status LED flashes green:

- **Waiting for sufficient supply voltage**  
Fast flashing green/off 100 ms
- **Synchronization/ Firing active**  
Flashing one time green 250 ms on, 750 ms off
- **Ready for operation**  
slow flashing green/off 500 ms
- **Bootloader – connection to computer started/ update mode**  
Flashing one time green 2,000 ms on, 250 ms off

## 4 Product Description

- **Firing locked**

3 flashes green/off 250 ms, 750 ms off



- **Configuration/Wait for o RPM**

6 flashes green/off 250 ms, 750 ms off



The status LED flashes red:

- **Critical error/ Assertion**

fast flashing red/off 100 ms



- **Operating error – general/ System error**

slow flashing red/off 500 ms



- **Bootloader – faulty firmware**

Flashing one time red 2,000 ms on, 250 ms off



- **Operational error – pickup**

2 flashes red/off 250 ms, 750 ms off



- **Operational error – overspeed**

4 flashes red/off 250 ms, 750 ms off



- **Operational error – insufficient supply voltage**

5 flashes red/off 250 ms, 750 ms off



## ■ 4 Product Description



The status LED flashes orange:

- **Selftest**  
Flashing one time orange 250 ms on, 750 ms off



## 5 Installation Instructions

### 5.1 Unpacking

Unpack the equipment, taking care not to damage it, and ensure that the operating manual is always stored with the ignition controller and is easily accessible. Check the contents for completeness and verify that the device type meets your application requirements.

#### Scope of Supply

The scope of supply of the MIC100 ignition controller consists of the following components:

- Ignition controller of the MIC100 series
- Mounting kit
- Ground strap

#### Accessory

- MOTORTECH USB adaptor cable type1 for connecting the ignition controller to a computer
- Operating manual
- Software for the configuration of the ignition controller

### 5.2 Installation of the Ignition Controller

The installation of the MIC100 ignition controller is generally implemented on a fixed bracket e. g. on a wall near the engine. Use the supplied installation material and the ground strap. The installation location of the controller must be selected so that the distance to the pickup installed on the engine ensures a reliable signal transmission to the ignition controller, and so that there is adequate space for maintenance and repair work. The mechanical specifications must always be complied with (refer to *Mechanical Data* on page 18).

The ground strap serves to ground the ignition controller and must be used accordingly. Ensure a flawless electrical connection for this purpose.

Installation locations where strong vibrations or extreme ambient temperatures are present are not permissible and result in the warranty being voided. The permissible temperature range is:

-40 °C (-40 °F) to +70 °C (+158 °F)



#### **Risk of destruction!**

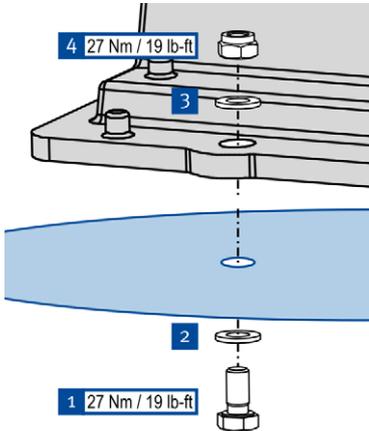
The device may only be installed directly to or on the engine if the permissible vibrations and temperatures are not exceeded, otherwise electronic components may be destroyed. Refer to the section *Mechanical Data* on page 18.

If vibrations are outside the permissible range, the use of rubber vibration dampers can have a positive effect. In case of questions, please contact your MOTORTECH contact person.

## 5 Installation Instructions

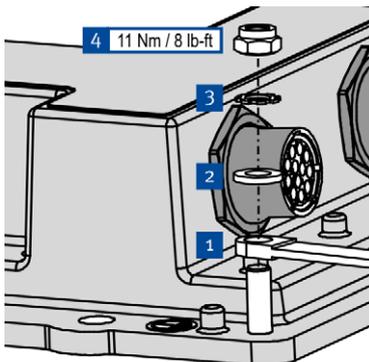
### 5.2.1 Installation of the Ignition Controller

Use the supplied installation material to mount the MIC100 on a suitable bracket. The hole patterns can be found in section *Overview Drawings* on page 24.



1. Fasten the ignition controller to the selected installation location. Use one bolt M8x35 **1** and one washer M8 **2** for each fixing point.
2. Insert one washer (28 mm x 3mm/1.1" x 0.12") **3** between the bracket and the device to create the necessary distance.
3. Secure each screw with one lock washer M8 **4** and one polystop nut M8 **5**.
  - ▶ Fasten the ground strap to the ground pin (see *Installation of the Ground Strap* on page 29).

### 5.2.2 Installation of the Ground Strap



1. Fasten the ground strap **1** to the MIC100 ground pin. To do so, use one washer M6 **2**, one tooth lock washer A6 **3** and one poly lock nut M6 **4**.
2. Connect the ground strap to one of the sides suitable for grounding.
  - ▶ You can wire the ignition controller as described in section *Wiring of the Device* on page 31.

## ■ 5 Installation Instructions

### 5.3 Determine the Installation Location of the Pickup

Set the position of the pickup depending on engine type and application. All angle reference information is based on:

*TDC 1st cylinder / compression cycle*

The installation location for the pickup must have adequate mechanical strength and must not exceed the specified temperature ranges. The pickup is designed for its appropriate use only. Multiple use of the pickup signal is not permissible. Ensure good accessibility to facilitate the calibration of the sensor. Comply with the pertinent regulations for the wire routing.

For the exact positioning of the pickup, refer to the examples given in the drawings (see section *Input Wiring – Pickup* on page 35).

## 6 Wiring of the Device

### 6.1 Input and Output Wiring on the Controller



#### **Operational safety!**

All connector screws and screw joints must be adequately tightened.



#### **Assignment of the wire colors**

Take the assignment of the wire colors of the wiring harness for the input and output wiring from the wiring diagram enclosed with the wiring harness.

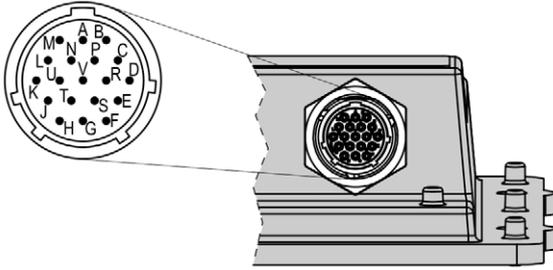


#### **Pay attention to the wiring diagrams**

Depending on the device version, certain signals or interfaces described in these instructions may not be available. You are also always to pay attention to the wiring diagrams enclosed with the input and output cable harnesses.

## 6 Wiring of the Device

### 19-Pole Connector for Input and Output Wiring (Standard Version)



### Assignment of the Connections

Pin	Assignment	Description
A	L +	Power supply
B	L -	
C	Pickup Power	Pickup
D	Pickup Signal	
E	Pickup GND	
F	Pickup Shield	
G	Go/NoGo +	Binary outputs
H	Go/NoGo -	
J	ASO +	Binary input
K	ASO -	
L	Start/Stop +	
M	Start/Stop -	
N	Timing I in+	Analog input
P	Timing I in -	
R	Shield	Shield
S	CAN Hi	CAN interface
T	CAN Lo	
U	CAN Com	
V	Not assigned	-

### 6.1.1 Input Wiring – Power Supply



#### **Operational safety!**

The proper functioning of the device is only guaranteed if the device is operated within the permissible supply voltage range. Therefore, use a power supply in accordance with the specifications in the operating manual.



#### **Design of power supply**

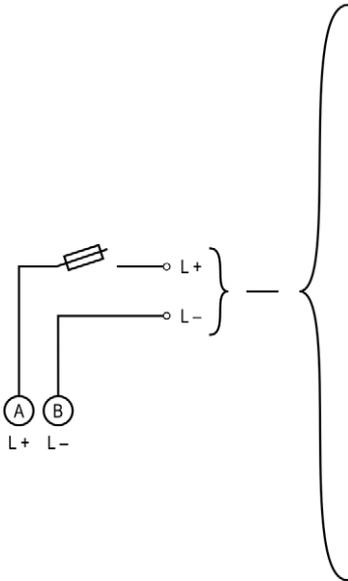
For the power supply, an overcurrent protection mechanism must be set up with a circuit breaker (6 A DC with tripping characteristic B), which allows switching off. When selecting the circuit breaker, the conditions of the installation site and the ambient temperature must be considered. The circuit breaker must be easy for the user to access and marked as a disconnecting device for the ignition controller.

If the power is supplied via a power supply unit, the following specifications must be observed additionally:

- Voltage: 24 V DC; Current: at least 12 A
- Wiring: at least 1 mm<sup>2</sup> cross-section

# 6 Wiring of the Device

L  $\triangleq$  24 V DC (nominal voltage)

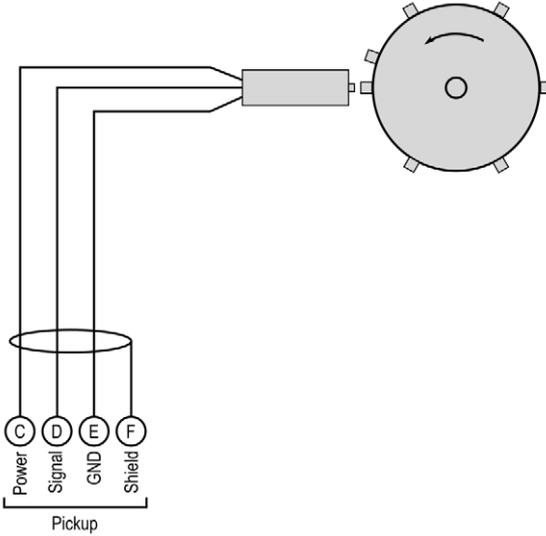


Variations			
1	Battery	Generator	Control unit
<p>A diagram showing a battery (rectangle with '+' and '-' terminals), a generator (circle with a curved arrow), and a control unit (rectangle) connected in series between the L+ and L- terminals.</p>			
2	Power supply		
<p>A diagram showing a power supply unit (rectangle with '+' and '-' terminals) connected between the L+ and L- terminals. The power supply has two AC output terminals on the right, indicated by a tilde symbol.</p>			
3	Battery	Charger	
<p>A diagram showing a battery (rectangle with '+' and '-' terminals) and a charger (rectangle) connected in series between the L+ and L- terminals. The charger has two AC output terminals on the right, indicated by a tilde symbol.</p>			

## 6 Wiring of the Device

### 6.1.2 Input Wiring – Pickup

Example Configuration: 6+1 Trigger Disc, Active Pickup on the Camshaft



The recommended distance to the triggering is 0.75 mm to 1 mm (0.03" to 0.04") for MOTORTECH pickups. Please note that additional fine-tuning is required for every pickup position due to the different conditions of the engines.

One revolution of the pickup changes the distance as follows:

Thread	Change in distance
M12x1	1 revolution $\triangleq$ 1 mm (0.04")
5/8"-18 UNF	1 revolution $\triangleq$ 1.41 mm (0.05")
3/4"-16 UNF	1 revolution $\triangleq$ 1.59 mm (0.06")

## 6 Wiring of the Device

### Allocation of the Wire Colors (Example Configuration)

#### Camshaft

PIN	Designation	Wire color
C	Pickup Power	Brown
D	Pickup Signal	Black
E	Pickup GND	Blue
F	Pickup Shield	Shield

For problems with the pickup signals, refer to the section *Pickup Input Errors* on page 108.



#### Adjusting the pickup sensitivity

Depending on the type of impulse source (interference), it may be necessary to increase the pickup sensitivity to ensure that the resultant signal strength is sufficient for reliable operation. You can make these adjustments in the MICT. Refer to the section *Engine – Pickups – Inputs* on page 77.



#### Requirement for auxiliary supply voltage

The auxiliary supply voltage of the pickup can be set via the MICT to 8 V or 15 V (see *Engine – Pickups – General* on page 75). When an auxiliary supply voltage of 15 V is required, the supply voltage of the ignition controller has to be at least 16 V.

### 6.1.3 Input Wiring – Timing and Safety Devices



#### Shared auxiliary supply voltage

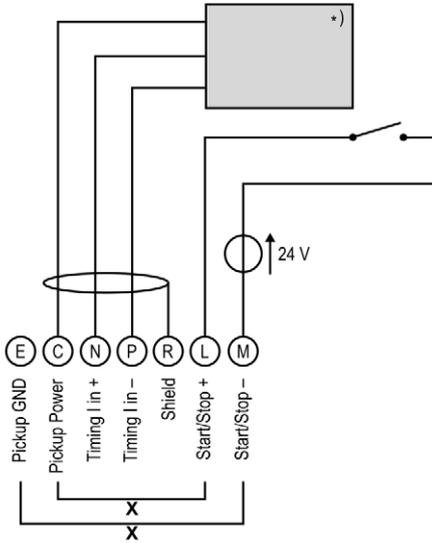
Devices of the MIC100 series do not have a separate auxiliary supply voltage for the analog current input. For devices requiring such a voltage, the auxiliary supply voltage of the pickup can also be used for the current input.



#### Requirement for auxiliary supply voltage

The auxiliary supply voltage of the pickup can be set via the MICT to 8 V or 15 V (see *Engine – Pickups – General* on page 75). When an auxiliary supply voltage of 15 V is required, the supply voltage of the ignition controller has to be at least 16 V.

## 6 Wiring of the Device



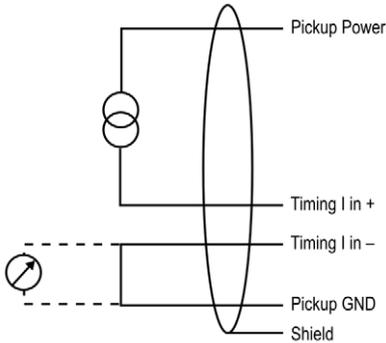
\*) See subsequent drawings for details

**X** = bridge for permanent authorization (must be removed for external ignition authorization)

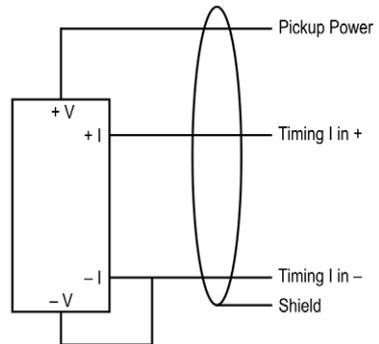
### Switch Start/Stop

open	Ignition – OFF
closed	Ignition – ON

### Two-Wire Transmitter



### Four-Wire Transmitter

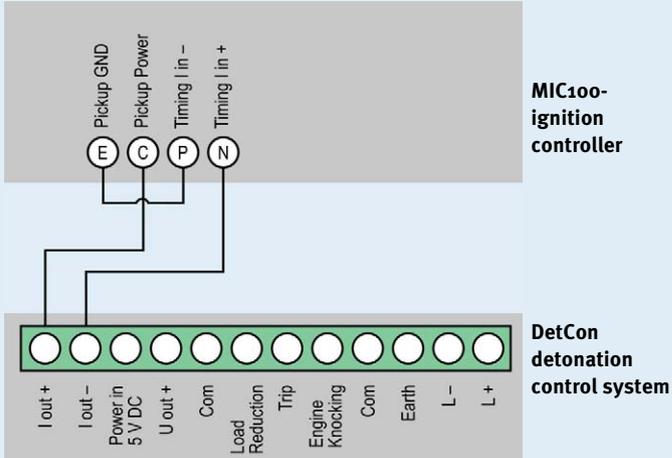


## 6 Wiring of the Device



### Wiring MIC100 ignition controller and DetCon detonation control system

The following diagram shows an example of the wiring of a MIC100 ignition controller with a DetCon detonation control system in cases where the analog current signal (4-20 mA) is to be used for the ignition timing adjustment.



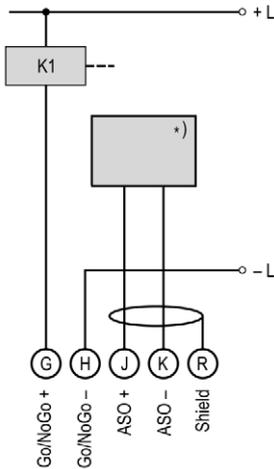
Furthermore, the limits of the analog current input will need to be set at 4 mA to 20 mA in the MICT. Refer to the section *Timing – Analog Inputs* on page 80.

The timing is transmitted by MIC100 via the auxiliary synchronization output (ASO) to the DetCon, and will need to be wired and configured accordingly. Refer to the section *Output Wiring – Binary Outputs (Go/NoGo, ASO)* on page 39.

## 6 Wiring of the Device

### 6.1.4 Output Wiring – Binary Outputs (Go/NoGo, ASO)

#### Example Configuration

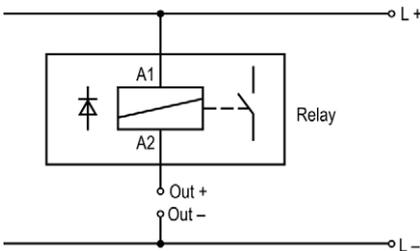


\*) DetCon or other external device (for wiring of the DetCon, see following example)

K1 = Go/NoGo relay

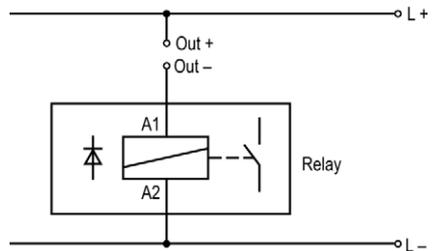
L  $\cong$  24 V DC

#### Binary output as low-side switch



(L  $\cong$  24 V DC)

#### Binary output as high-side switch

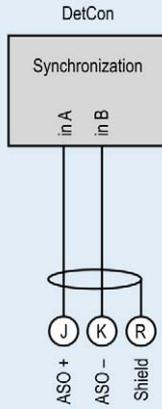


## 6 Wiring of the Device



### DetCon connection

Connect the ASO output on the DetCon to the connections *in A* and *in B* on connector *Synchronization*.

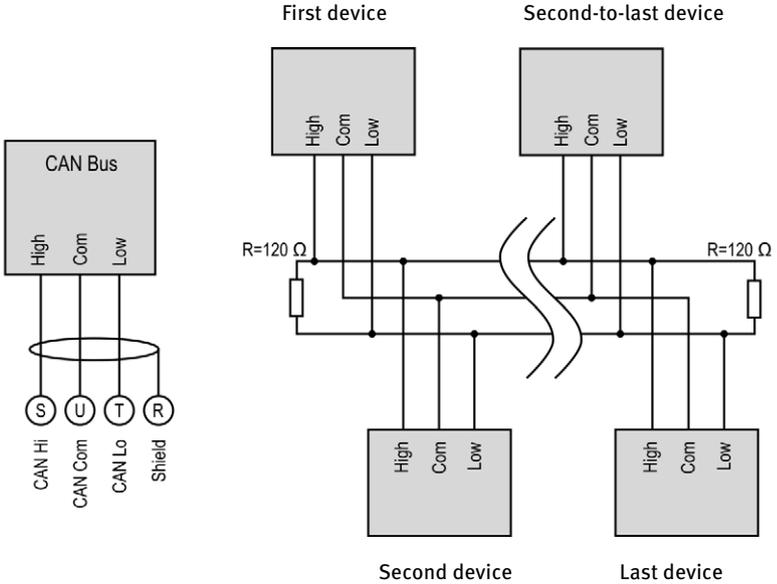


## 6 Wiring of the Device



### 6.1.5 Output Wiring – CAN Bus Interface

The product must be connected to a CAN bus as follows:



#### Information on protocols

Please contact your MOTORTECH contact person if you require more information on the CANopen® and J1939 protocols.

## 6 Wiring of the Device



### CAN bus wiring

Note the following when connecting the CAN bus:

- Each bus end must be fitted with a terminating resistor of  $120\ \Omega$  (see drawing).
- The maximum wire length depends on the bit rate:

Bit rate	Maximum wire length	Maximum length of a stub	Maximum length of all stubs
1 Mbit/s	25 m (82')	1.5 m (5')	7.5 m (25')
800 kbit/s	50 m (164')	2.5 m (8')	12.5 m (41')
500 kbit/s	100 m (328')	5.5 m (18')	27.5 m (90')
250 kbit/s	250 m (820')	11 m (36')	55 m (180')
125 kbit/s	500 m (1,640')	22 m (72')	110 m (360')
50 kbit/s	1,000 m (3,280')	55 m (180')	275 m (902')

- Only use cables that are specified by the manufacturer for use in the CAN bus.

### 6.2 Ignition Coil Wiring



#### Protection when using wiring rails

Every wiring rail on the engine block should be grounded to avoid disruptions in the device caused by secondary current in the ignition coils.



#### Ignition coil wiring

In the MICT there are two types of wiring with predefined output configuration supported in the engine database for many engines:

- Wired in straight order
- Wired in firing order

For information on straight order wiring refer to *Straight Order Wiring of the Ignition Outputs* on page 45 and *Engine – Parameters* on page 69.

For wiring in firing order, the first cylinder in the firing order is connected to the A1 output, the second to A2, etc.

If a different wiring was implemented, the output configuration in the MICT must be adapted accordingly. Please note that the wiring cannot be checked by the software (see section *Engine – Parameters* on page 69).

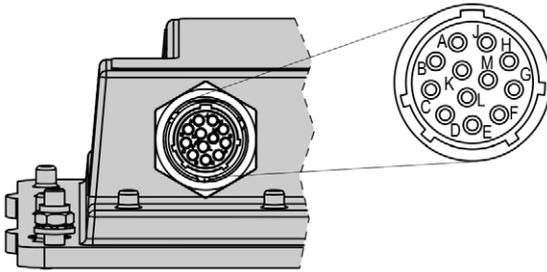


#### Conductor cross-section for primary wiring

If you do not use a harness manufactured by MOTORTECH, the primary wiring must have a conductor cross-section of 1.5 mm<sup>2</sup>.

## 6 Wiring of the Device

### 12-Pole Output Connector



### Assignment of the Connections (Version with 8 Outputs)

Pole	Assignment
A	Output 1
B	Output 2
C	Output 3
D	Output 4
E	Output 5
F	Output 6
G	Output 7
H	Output 8
J	Not assigned
K	Not assigned
L	Not assigned
M	Ground

For device versions with less ignition outputs, correspondingly less connections are assigned. The assignment of the connections to the existing outputs is identical.

### 6.2.1 Straight Order Wiring of the Ignition Outputs



#### Risk of damage to engine

If you use MOTORTECH wiring rails for straight order wiring, it is absolutely necessary that they are correctly selected and installed for the respective engine. Even a rotated installation can cause serious damage to the engine, for example.

Straight order wiring, along with wiring in firing order, is supported by the MICT for many engines with predefined output configurations in the engine database. That means that if the wiring is carried out accordingly and the option *Wired in Straight Order* is selected in the MICT, no other adaptation of the output configuration is necessary.

You can use straight order wiring, if:

- Wiring takes place via a corresponding MOTORTECH wiring harness and a MOTORTECH wiring rail. The harness is marked with the following information: *PLEASE NOTE! The firing order needs to be configured directly in the ignition controller.* The ignition coils on the wiring rail are identified with *Connector Pin 1* to *Connector Pin X*.
- Make the wiring of the ignition controller corresponding to the instructions in the following sections (for example with an open wiring harness or via a junction box).

Execution of straight order wiring is dependent on the following factors:

- One or two output banks in the ignition controller
- The type of engine (in-line or V-engine)
- Alignment of the wiring rail(s)

## 6 Wiring of the Device

### 6.2.2 Straight Order Wiring of the Ignition Outputs – Overview

The table contains the allocation of the MIC100 outputs to the cylinders.

Version with 8 outputs

Pole	8 outputs	In-line engine		V-engine	
		Connector*	Coil**	Connector*	Coil**
A	Output A1	1	1	1	1
B	Output A2	1	2	2	1
C	Output A3	1	3	1	2
D	Output A4	1	4	2	2
E	Output A5	1	5	1	3
F	Output A6	1	6	2	3
G	Output A7	1	7	1	4
H	Output A8	1	8	2	4

Connector\* = connector on the wiring rail

Coil\*\* = ignition coil with the corresponding number on the wiring rail

For device versions with less ignition outputs, correspondingly less connections are assigned. The assignment of the outputs to the connectors and coils is identical.

The ignition controllers of the MIC100 series include safety and auxiliary functions that, amongst others, can shut down the engine in case of fault.



### Angle indications in the operating manual

All angles in this operating manual are given in °crankshaft. Exceptions are clearly identified.

### 7.1 Pickup Sensitivity

To increase the signal interference distance, the sensitivity of the pickup signal input can be changed for suitable pickup signal. For this purpose, a pre-trigger voltage can be set below which signals are interpreted as interference and are therefore not analyzed. A pre-trigger voltage set to a high level will thus result in a low pickup sensitivity level.

You can enter the settings for the pickup sensitivity with the MICT. For passive pickups, you can set the pre-trigger voltage so that it depends on the speed. Refer to the section *Engine – Pickups – Inputs* on page 77.

### 7.2 Monitoring of Pickup Signals

The pickup signal is checked by the MIC100. Any other errors are displayed in the MICT. For more information on the errors, please refer to the overview in the section entitled *Pickup Input Errors* on page 108.

In addition, the error is indicated on the device by the status LED flashing twice (2 times red/off 250 ms, 750 ms off). Refer to the section *LED Functions* on page 25.

### 7.3 Go/NoGo

The binary Go/NoGo output has zero potential. It is closed during firing and opens when the ignition switches off. The max. switching current is 100 mA. The output can drive an external relay that e.g. opens a gas valve.

The following errors can cause the ignition outputs to shut down:

- Overspeed
- Pickup error
- Overload-/temperature shut-down
- Insufficient supply voltage (Low Power)

## 7 Functions



### Use master control

The outputs of the MIC100 are not SIL compliant. Therefore, always use an additional master control for safety-critical applications.

### 7.4 Ignition Timing Adjustment

The ignition controller has several functions for the timing correction.



### Influences on ignition timing

Be aware that the actual ignition timing of the engine can also be influenced by external signals (e. g. analog current signal).

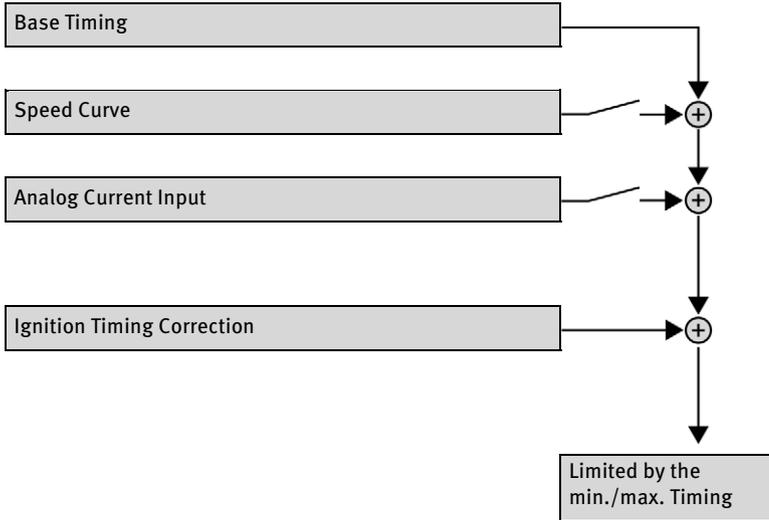


### Operational safety!

The MIC100 ignition controller must first be correctly configured for the engine being used before you can start the engine.

An incorrect configuration can result in damage to the engine.

The figure below gives you an overview of the different functions of the timing correction, which will be explained in more detail in the subsequent sections. Functions that can be activated/disabled via the MICT are marked by a switch symbol. Depending on the device version, some functions might not be available.



## 7.4.1 Analog Current Input

The timing point control can be adjusted with a linear current signal. This signal can be supplied, for example, by a potentiometer, a pressure sensor for charging pressure, or a detonation controller.

With the analog process signal (current loop signal) at the analog current input, the timing point can be offset in the advanced or retarded direction within a defined range.

The level of the analog current input can be set in the range from 0 mA to 20 mA. You can make this configuration with the MICT. Refer to the section *Timing – Analog Inputs* on page 80.

## 7 Functions



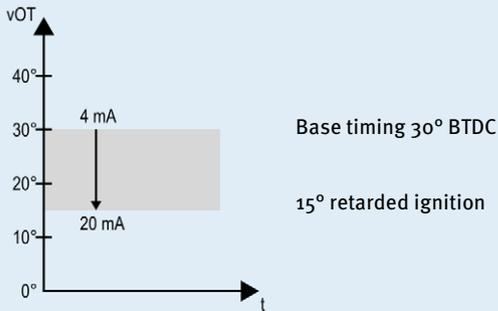
### Configuration examples

In this example the analog current input is configured in the *Timing – Analog Inputs* window as follows:

- Lower Limit: 4 mA
- Upper Limit: 20 mA

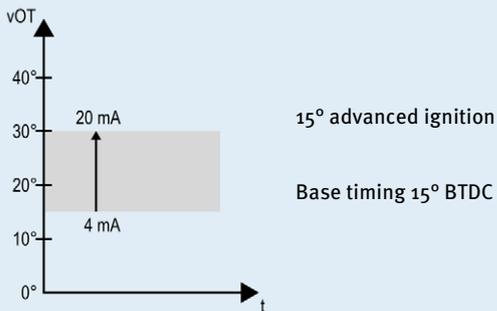
Setting for the analog current input in the window *Timing – Schedule A – General*:

- At Lower Limit (4.0 mA): 0° RET
- At Upper Limit (20.0 mA): 15° RET



Setting for the analog current input in the window *Timing – Schedule A – General*:

- At Lower Limit (4.0 mA): 0° ADV
- At Upper Limit (20.0 mA): 15° ADV



### 7.4.2 Speed Curve

To optimize the ignition, for example, during the start phase of the engine, a speed curve can be defined for the MIC100 ignition controllers. To create this curve, up to eight adjustable speed points are available.

You can configure the speed curve with the MICT. Refer to the section *Timing – Schedule A – General* on page 81.

### 7.4.3 Ignition Timing Correction

Via the ignition timing correction, the global ignition timing, limited by the timing limits of the current schedule, can be adjusted. Refer to the section *Runtime Adjustments – Timing* on page 96.

### 7.5 Firing Angles

The min. distance between two ignition angles depends on the overspeed. The smallest ignition spacing can be calculated using the following formula:

$$\text{Ignition Angle} = \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times 360^\circ \times 1 \text{ ms}$$

### 7.6 Output Monitoring

Electronic switches are used for the ignition outputs of the MIC100 ignition controller. If one of these switches is defective, this would lead to a primary short or a primary open output. This can cause problems when operating the engine or can damage the engine. The function of the outputs is therefore monitored and errors that occur are displayed in the runtime data in the MICT.

### 7.7 ASO: Auxiliary Synchronization Output

The ASO is an output of the MIC100 for synchronizing the MIC100 ignition controller and a connected control unit. The possible applications include detonation control, valve control, and fuel injection control.

The first cylinder in firing order is marked with a pulse of 140 µs length.

### 7.8 Ignition Energy

The ignition energy provided can be limited. You can configure the ignition energy with the MICT. Please refer to the section *Timing – Schedule A – Energy* on page 82. In addition, the energy limit can be adjusted during operation. Refer to the section *Runtime Adjustments – Energy Limit* on page 96.

## 7 Functions

### 7.9 Access Control

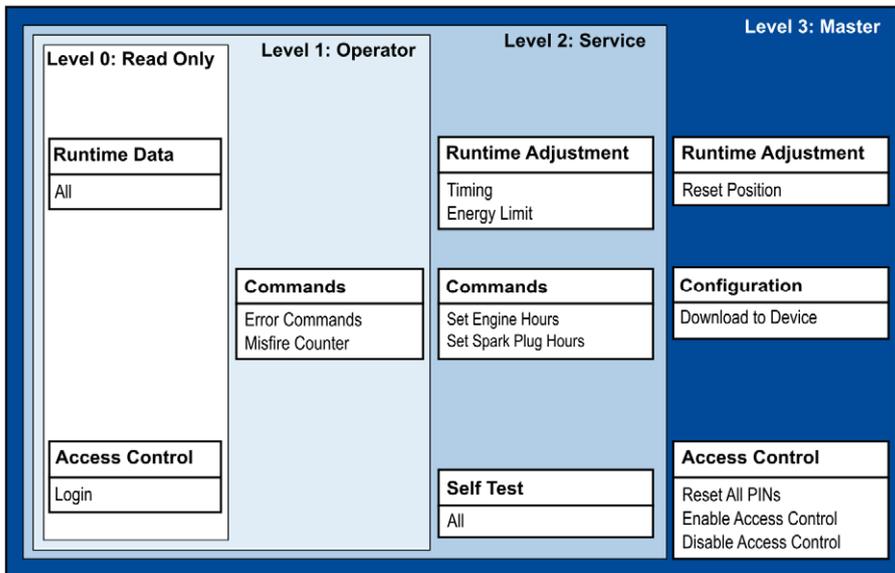
The MIC100 has four operating levels, three of which can be secured with different PINs. As a default setting, the access control is not activated. If the access control for the MIC100 is activated, it is independent from the access levels that control authorizations within the MICT.



#### Access control in the MICT and on MIC100

A user is logged in to the *Advanced Service* access level on the MICT. He changes a configuration and would like to download the change to the MIC100. Although he has the full authorization set in the MICT, he is prompted to log in with the PIN for the *Level 3 (Master)* on the MIC100.

A variety of functions are at your disposal in the four operating levels of the MIC100 . The figure below illustrates this:



The following functions are available on the different levels:

- **Level 0 (Read Only)**  
Enables read-only access for all users.
- **Level 1 (Operator)**  
The user can operate the Error Commands and the Misfire Counter on this level.

## 7 Functions



- **Level 2 (Service)**  
Only the Service level has access to modifications of the runtime adjustments for Timing and Energy Limit and the commands Set Engine Hours, Set Spark Plug Hours. The self-test can also be carried out at this operating level.
- **Level 3 (Master)**  
On this level, the Master can, in addition to the other adjustments, modify the Reset Position and Reset All PINs and Enable/Disable Access Control. This authorization is also needed to transfer a configuration to an ignition controller.

For information on the access levels in the MICT, refer to the section *Access Levels in the MICT* on page 55.

## 8 Settings via the MICT

MICT is an abbreviation for *MOTORTECH Integrated Configuration Tool*. With the MICT, you can configure your ignition controller, and you can view and adjust the operating data of your engine. When working with the MICT, you can press the F1 key at any time to access context-sensitive help.

If you are using a different version of the MICT than shown in the following sections, the scope of functions may differ.

### 8.1 MICT System Requirements

For the installation of the MICT, the following minimum requirements must be fulfilled:

- x86-compatible computer, at least performance class Intel Pentium 4 with 2 GHz
- 128 MB free RAM
- 250 MB free disk space
- USB interface 1.1 or higher
- Display with a resolution of at least 1440 x 900 pixels (WXGA+)
- Microsoft® Windows 7, Windows 10

### 8.2 MICT Installation

The program is included on the storage device enclosed with USB adaptor cable type1. The adaptor cable is necessary to connect the device to a computer. In addition, you will also find all necessary information on the Internet at [www.motortech.de](http://www.motortech.de).



#### Installing the drivers

Before you connect a computer with a MIC100 for the first time, it is necessary to install or update all necessary drivers. This driver installation is carried out via the *MOTORTECH Driver Installer* and it only needs to be performed once per computer:

Install the drivers as follows:

1. Install the drivers via the menu or directly from the storage device.
  - via the menu:  
*Software -> MOTORTECH Driver Installer -> Start MOTORTECH Driver Installer*
  - Directly from the storage device:  
Start the exe file in subdirectory *Drivers*(e.g. *MOTORTECH-DriverInstaller\_w32.exe*).
2. Install the program.  
Follow the instructions of the installation routine.

## 8 Settings via the MICT

To install the MICT, proceed as follows:

1. Start the installation:
  - Via the menu:  
Start the file *Start.exe* on the storage device. Start the installation routine of the MICT via *Software -> Install MICT*.
  - Directly from the storage device:  
Start the installation routine of the MICT directly. It is on the storage device in the subdirectory *Installation* and for example named as follows: *MICT-2.40.0-setup.exe*.
2. Run the installation.

Follow the instructions of the installation routine. Note that the license agreement terms must be accepted before using the MICT.

  - ▶ The MICT is set up. You can connect your PC to the ignition controller via the USB interface.

### 8.3 Access Levels in the MICT

You can open the MICT on your computer via *Start -> Programs -> MOTORTECH -> MICT 2.x.x -> MICT 2.x.x*.

After opening the MICT, select the access level for which you have clearance. The access level controls the options you have at your disposal in the MICT. The password required for access can be obtained from your MOTORTECH contact person (refer to *Customer Service Information* on page 108).



The following access levels are available:

- **Read Only**  
On this level, the user can open a configuration and transfer it to the device. However, he cannot make changes to the configuration. The user has read-only access to all other settings.
- **Customer**  
This level enables the configuration of the basic functions required for operation in addition to the read-only function.

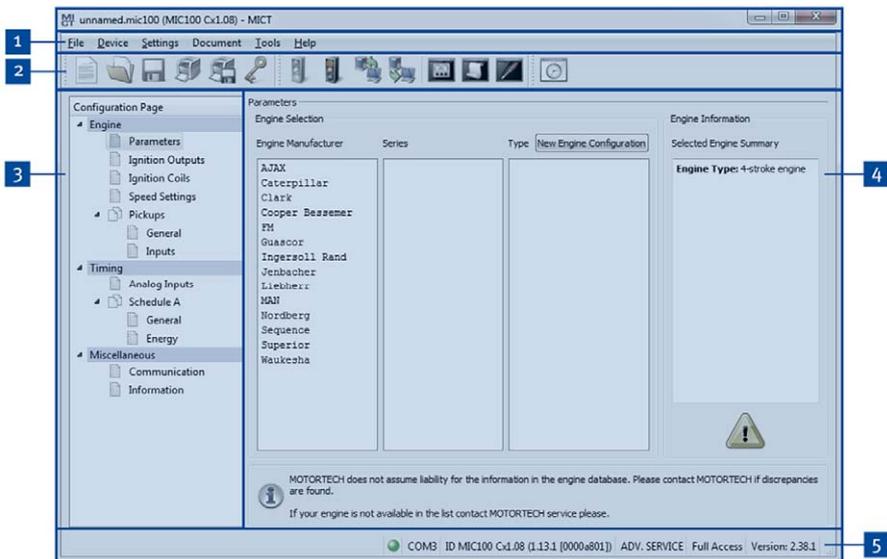
## 8 Settings via the MICT

- **Service**  
This level contains all functions for a standard installation.
- **Advanced Service**  
This level offers full access to all functions of the MICT and is enabled and accessible for specially trained personnel only.

The following sections describe the options at your disposal with the *Advanced Service* access level. If you have registered for a different level, you cannot execute all functions shown.

### 8.4 Configuration Pages (Overview)

The configuration pages are divided into the following sections:



Pos.	Area
1	Menu bar
2	Toolbar
3	Navigation bar
4	Configuration section
5	Status bar

## 8 Settings via the MICT

The functions in the menu bar, navigation bar and the toolbar as well as the configuration section will be described in the following.

The status bar provides you with the following information (from left to right):

- Status display  
Indicates whether a connection is established with the device:
  - Green: Connection established
  - Red: The connection was interrupted and is being restored
  - Gray: The connection is not established and is not being restored
- Indication of the interface being used for the connection to the device
- Indication of the device ID
- Indication of the access level of the user in the MICT
- Indication of the operating level for the MIC100 if access control has been activated and the user has logged on with a PIN.
- Indication of the MICT program version

### 8.5 Menu Bar and Toolbar

The following functions are available to you via the symbols on the toolbar and the entries in the menu bar:

Symbol	Menu	Function
	<i>File -&gt; New</i>	Creates a new configuration.
	<i>File -&gt; Open</i>	Opens an existing configuration.
	<i>File -&gt; Save / File -&gt; Save As</i>	Saves the current configuration.
	<i>File -&gt; Recent Documents</i>	The last five configuration files used are offered for selection.
	<i>File -&gt; Close</i>	Closes the current configuration.
	<i>File -&gt; Open trace</i>	Opens a runtime data record (trace file). Refer to the section <i>Runtime Data</i> on page 85.
	<i>File -&gt; Open pickup trace</i>	Opens a saved record of pickup signals (putrace file).

## 8 Settings via the MICT

Symbol	Menu	Function
	<i>File -&gt; Change Access Level</i>	Changes the MICT access level for accessing the configuration data and functions.
	<i>File -&gt; Print</i>	Prints the current configuration.
	<i>File -&gt; Print To PDF File</i>	Prints the configuration to a PDF file.
	<i>File -&gt; Print Preview</i>	Opens a print preview of the configuration.
	<i>File -&gt; Quit</i>	Exits the MICT.
	<i>Device -&gt; Connect</i>	Connects to the device.
	<i>Device -&gt; Disconnect</i>	Cuts the connection to the device.
	<i>Device -&gt; Download to device</i>	Downloads configuration data from the computer to the device. Refer to <i>Working with Configurations</i> on page 64.
	<i>Device-&gt; Upload from device</i>	Uploads configuration data from the device to the computer. Refer to <i>Working with Configurations</i> on page 64.
	<i>Device -&gt; Runtime data</i>	Opens the window <i>Runtime Data</i> . Refer to the section <i>Runtime Data</i> on page 85.
	<i>Device -&gt; Log</i>	Opens the window <i>Log (Advanced Service only)</i> . Refer to the section <i>Log</i> on page 94.
	<i>Device -&gt; Runtime adjustments</i>	Opens the window <i>Runtime Adjustments (Service and Advanced Service only)</i> . Please refer to the section <i>Runtime Adjustments</i> on page 95.
	<i>Device -&gt; Self test</i>	Opens the window <i>Self Test (Service and Advanced Service only)</i> . For this refer to section <i>Self Test</i> on page 61.
	<i>Device-&gt; Set spark plug operating hours</i>	Opens the window <i>Set spark plug operating hours</i> .

## 8 Settings via the MICT



Symbol	Menu	Function
	<i>Device -&gt; Set engine operating hours</i>	Opens the window <i>Set Engine Operating Hours</i> .
	<i>Device -&gt; Send command -&gt; Reset misfire counters</i>	The misfire counters of all ignition controller outputs are reset and restarted. Misfires that previously occurred at the outputs are no longer displayed.
	<i>Device -&gt; Send command -&gt; Acknowledge operational error</i> (Keyboard shortcut: <i>Strg+R</i> )	All operational errors are acknowledged. This can only be implemented while the engine is not running.
	<i>Device -&gt; Access Control</i>	The setup for the access control to the MIC100 is described in a separate section. Please read the section <i>Access Control for MIC100</i> on page 62.
	<i>Device -&gt; Temperature Extremes</i>	Opens the window <i>Temperature Extremes</i> in which the minimum and maximum temperatures of the controller and output boards are displayed.
	<i>Settings -&gt; Language</i>	Opens the window <i>Select Language</i> in which you can change the interface language of the MICT.
	<i>Settings -&gt; Online update settings</i>	Opens the window <i>Online Update Settings</i> . Refer to the section <i>Online Update Settings</i> on page 60.
	<i>Settings -&gt; Database settings</i>	Opens the window <i>Database Settings</i> in which various databases can be assigned as source for the MICT.
	<i>Settings -&gt; Temperature scale</i>	Opens the window <i>Select Temperature Scale</i> , in which you can change the unit for the temperatures shown in the MICT.
	<i>Settings -&gt; Display by cylinders</i>	Not currently used.
	<i>Document -&gt; Schedule Curve</i>	Opens the window <i>Schedule</i> . Please refer to the chapter <i>Schedule Curve</i> on page 97.
	<i>Tools -&gt; Coils</i>	Opens a database with information on MOTORTECH ignition coils.
	<i>Help -&gt; Help</i>	Opens the online help function.
	<i>Help -&gt; About MICT</i>	Opens detailed information on the MICT.

# 8 Settings via the MICT

## 8.6 Online Update Settings

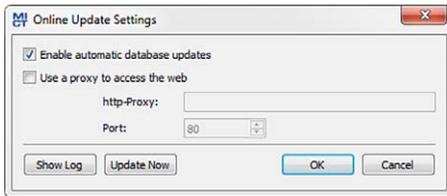


### Perform regular online updates

MOTORTECH is constantly expanding its databases. Perform regular online updates to make optimal use of the opportunities that the MIC100 provides.

The MICT uses data from an engine database and a coil database for the configuration. Such data can be updated with automatic online updates. The settings for the update can be entered with the following entry in the menu bar:

*Settings -> Online update settings*



You have the following options:

- **Enable automatic database updates**  
Using the check box, you can enable and disable automatic online updates. As the default setting, the online update is activated and is executed daily (if an internet connection is established) at first start-up of the MICT.
- **Use a proxy to access the web**  
Use the checkbox to activate settings for internet access via a proxy server, which you can then set up by entering *http-Proxy* and *Port*.
- **Show Log**  
With this button, you can open a window in which the online updates performed are logged.
- **Update Now**  
With this button, you manually start an online update.

### 8.7 Self Test



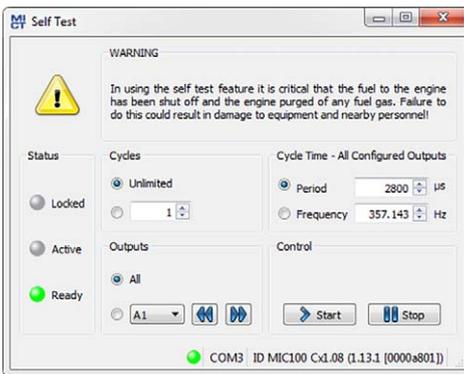
#### Operational safety!

If you carry out a self test, it is essential for the gas supply to be switched off and no more residual gas is left in the combustion chamber. Non-compliance can result in damage to equipment or injury to persons.

You can run the self test via the MICT to check the order of the wiring and the connection between the ignition controller outputs and the spark plugs.

Proceed in the MICT as follows:

*Device -> Self test*



The following information is provided:

#### Status

The status displays indicate whether the ignition controller is ready for the self test.

- **Locked**  
The ignition controller is in a state in which no self test can be done. For example, there is an error or a configuration is currently being downloaded into the device.
- **Active**  
The self test is running.
- **Ready**  
The ignition controller is ready and the self test can be started.

## 8 Settings via the MICT

You have the following options:

- **Cycles**  
Determine whether the self test should run *unlimited* or be terminated after a defined number of cycles.
- **Outputs**  
Define whether *all* outputs or only a defined output should be fired during the self test.
- **Cycle Time - All Configured Outputs**  
Specify the cycle time either as a *period* or *frequency*. The value entered always refers to a complete cycle. That means that all outputs that are configured are fired once per cycle. If you only set one output for the self test, this would still only fire once per cycle.
- **Control**  
Start or stop a self test using the corresponding buttons.

### 8.8 Access Control for MIC100

If the access control to the MIC100 is activated, access to the following areas is possible with a PIN only:

- **Runtime Adjustment** (Reset, timing and energy limit)
- **Commands** (Error commands, set engine/spark plug operating hours and self test).
- **Configuration** (Transferring a configuration to the MIC100)

The access control regulates the accesses to the device via the MICT. For explanations concerning access control of the MIC100 and the delimitation of the access levels in the MICT, refer to section *Access Control* on page 52.

The access control functions can be accessed in the menu bar via:

*Device -> Access Control*

#### 8.8.1 Enable/Disable Access Control



##### Enable/Disable access control

As a default setting, the access control is not activated, and all PINs are set to 0000. Once the access control has been activated, and the PINs were changed, these PINs will continue to be used. To activate the access control again, you will need the PIN for level 3 (*Master*). It is therefore recommended to reset all PINs before disabling.

If that was not done, or a system must be unlocked for another reason, a request key can be issued in the MICT. Refer to the section *Reset all PINs* on page 64.

## ■ 8 Settings via the MICT



To enable or disable the access control, proceed as follows:

1. Open the input dialog via *Device -> Access Control -> Enable or Disable access control*.
2. Enter the PIN for the level *Master (Level 3)*.
3. Confirm the input with OK.

### 8.8.2 Login/Logout

If the access control is activated, you are prompted to log in if you want to execute functions that are allocated to a specific operating level. In addition, you can log in specifically to an operating level via the menu bar.

To log into a specific operating level, proceed as follows:

1. Open the input dialog via *Device-> Access Control -> Login*.
2. First select the level you wish to log on to.
3. Enter the PIN for the desired level.
4. Confirm the input with OK.
  - ▶ You are now logged into the corresponding level and can execute all functions that are allocated to this operating level without having to log in again.

After completing the log-in, you can log out again as follows:

*Device -> Access Control -> Logout*

### 8.8.3 Changing the PIN

To change the PIN for a specific operating level, proceed as follows:

1. Open the input dialog via *Device -> Access Control -> Change PIN*.
2. First select the level for which you wish to change the PIN.
3. Enter the current PIN for the desired level.
4. Enter the new PIN in the two subsequent fields.
5. Confirm the input with OK.
  - ▶ The PIN for this operating level has now been changed.

## 8 Settings via the MICT

### 8.8.4 Reset all PINs

To reset all PINs, proceed as follows:

1. Open the input dialog via *Device -> Access Control -> Reset all PINs*.
2. If you are not yet logged into the *Master (level 3)* level, you will be prompted to log in with the relevant PIN.
3. Confirm the input with *OK*.
4. To reset all PINs, you will be prompted again to enter the PIN for the level *Master (Level 3)*.
5. Confirm the input with *OK*.
  - ▶ All PINs are now reset to the value *0000*.

To reset all PINs, you need the PIN for the level *Master (level 3)*. To be able to unlock a system in case of emergency that was locked in this way, you have the following option:

1. In the menu bar, select the entry *Device -> Access Control -> Get reset all PINs request key* to open a window with the same name.
2. Send the request key with the serial number to your service contact person at MOTORTECH (refer to *Customer Service Information* on page 108). This key is valid only for the respective controller and only for a certain amount of time.
  - ▶ Your information will be verified, and you will receive an authorization key from your contact person.
3. From the menu bar, select the entry *Device -> Access Control -> Set reset all PINs authorization key* to open a window with this name.
4. Enter the authorization key received in the input field.
5. Confirm the input with *OK*.
  - ▶ If the input was correct, all PINs are reset to the default value *0000*.

### 8.9 Working with Configurations

To ensure that the MIC100 correctly interprets incoming data and correctly controls the ignition system, it requires information about the engine and the ignition system. This information is stored in the MIC100 as configuration data.

You can use the MICT to perform the following for these configurations:

- Create
- Open
- Edit
- Save as a file
- Download to the MIC100
- Upload from the MIC100



## 8 Settings via the MICT

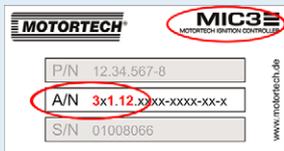
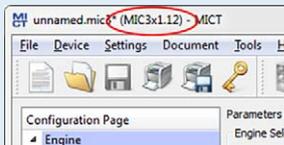


### Compatibility of the configuration files

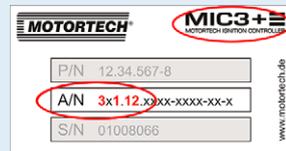
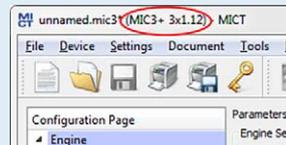
Configuration files are only compatible for the respective device type, even if the file extension is identical. For example, files created for a MIC3 cannot be downloaded to a MIC3+ and vice versa.

To use a configuration for another device, the series and the first four digits of the arrangement number must match. This information can be found in the title bar of the configuration and on the respective device:

#### MIC3



#### MIC3+



If, for example, a system is to be changed from a MIC3 to a MIC3+, the configuration of the MIC3 can be saved as a PDF file. Then a new configuration file must be created for the MIC3+ and the values from the PDF file must be entered. Alternatively, the MICT can be opened twice and the values transferred to a newly created configuration file.

### 8.9.2 Upload, Download



Click the symbol to upload the current configuration from the MIC100 to the MICT. If applicable, the MICT first establishes a connection to the MIC100 connected.



Click on the symbol to download the configuration set in the MICT to the MIC100. This function can only be executed while the ignition is not active. This action overwrites the existing configuration on the device. If applicable, the MICT first establishes a connection to the MIC100 connected.



### Existing configuration is cleared!

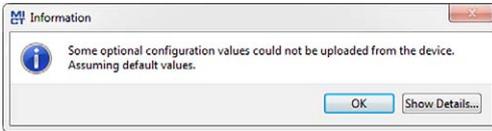
If you download a configuration to a MIC100, the previous configuration is deleted and the new settings are immediately implemented.



### Runtime adjustments

If you change a configuration stored in the MIC100 via runtime adjustments, the configuration must be re-uploaded from the device so that the changes are displayed in the MICT's configuration views.

### 8.9.3 Compatibility Information



If you upload a configuration from the MIC100 to the MICT that does not correspond to the status of your MICT, or if you open this type of configuration in the MICT, the following situations may occur:

- No values are present in the configuration for certain MICT functions. The MICT assumes the standard values for these functions.
- The configuration contains function values that are not support by the MICT.

The following situations can occur if you download a configuration from the MICT to a MIC100 whose firmware does not correspond to the status of your MICT:

- No values are present in the configuration for certain firmware functions. The firmware continues to use the preset values for these functions.
- The configuration contains function values that are not support by the firmware.

If you download a configuration into the MIC100 and are notified of functions that are not supported by the MICT, you should check the MIC100 settings. Re-upload the configuration from the MIC100 to the MICT. You can then see which settings are not transmitted to the MICT.

Perform a firmware update, if necessary, and/or update your MICT so that you can use all the MIC100 functions without restriction.

## 8 Settings via the MICT

### 8.10 Configuration

The window opens after you select the device type for a new configuration or an existing configuration or have uploaded one from the ignition controller. You can make changes to the configuration by selecting an entry from the navigation bar. The corresponding configuration data are then displayed in the configuration section and can be processed. The following sections will describe the settings and adjustments you can implement in the different areas.



#### Indication of invalid entries

An invalid selection or invalid input values are highlighted by pulsating warning signs on the configuration pages of the MICT. Additional information is provided in the status bar.

Example:

The screenshot displays the 'Ignition Outputs' configuration page for 'Output Bank A'. The 'Nr. of Outputs' is set to 6. The table below shows the configuration for 8 outputs, with outputs 1 through 6 highlighted in yellow and marked with pulsating warning signs in the 'Angle [°]' column.

Output	Angle [°]
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0

The status bar at the bottom of the window displays the following information: **Timing Angle: 0.0 - 720.0, Default = 0.0, min. distance limited by overspeed (inv)** COM n/a ID n/a ADV. SERVICE n/a Version: 2.38.1

## 8 Settings via the MICT



### 8.10.1 Engine – Parameters

unnamed.mic100\* (MIC100 Cx1.08) - MICT

File Device Settings Document Tools Help

Configuration Page

- Engine
  - Parameters
  - Ignition Outputs
  - Ignition Coils
  - Speed Settings
  - Pickups
    - General
    - Inputs
  - Timing
    - Analog Inputs
    - Schedule A
      - General
      - Energy
  - Miscellaneous
    - Communication
    - Information

Parameters

Engine Selection

Engine Manufacturer	Series	Type
AJAX	E 08 Series	E 2848 LE322
Caterpillar	E 26 Series	E 2876 E302
Clark	E 28 Series	E 2876 E312
Cooper Bessemer	E 32 Series	E 2876 LE202
EM		E 2876 LE212
Guasco		E 2876 IE302
Ingersoll Rand		E 2876 TE302
Jenbacher		
Liebherr		
MAN		
Nordberg		
Sequence		
Superior		
Waukesha		

New Engine Configuration

Engine Information

Selected Engine Summary

**MAN - E 2876 LE212**

Engine Type: 6 cylinder 4-stroke inline engine

**Firing Angles**

0.0
120.0
240.0
360.0
480.0
600.0
0.0

MOTORTECH does not assume liability for the information in the engine database. Please contact MOTORTECH if discrepancies are found.

If your engine is not available in the list contact MOTORTECH service please.

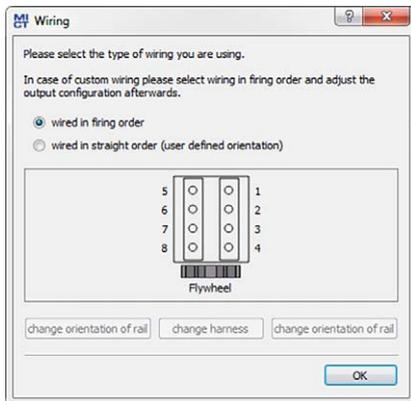
COM3 ID MIC100 Cx1.08 (1.13.1 [0000a801]) ADV. SERVICE Full Access Version: 2.38.1

#### Engine Selection

The MICT holds an engine database with data from various manufacturers and model series. Select the desired engine manufacturer, series, and type by clicking on the corresponding fields.

## 8 Settings via the MICT

Wiring in firing order is assumed as standard. If straight order wiring is supported for the selected engine, the *Wiring* dialog opens and you have the opportunity to adapt the output configuration.



You can use straight order wiring, if:

- Wiring takes place via a corresponding MOTORTECH wiring harness and a MOTORTECH wiring rail. The harness is marked with the following information: *PLEASE NOTE! The firing order needs to be configured directly in the ignition controller.* The ignition coils on the wiring rail are marked with *Connector Pin 1 to Connector Pin X*. The position of coil1 on the wiring rail is marked in the view *Wiring*.
- Wiring of the ignition controller is done corresponding to the instructions in section *Straight Order Wiring of the Ignition Outputs* on page 45 (for example with an open wiring harness or via a junction box).

The configuration of the ignition outputs is automatically adapted corresponding to your selection. If you want to use a different wiring, these settings must be adapted appropriately.

If the pertinent engine is not available in the database, settings can also be entered by selecting the corresponding sequence. For this purpose, click on the entry *Sequence* in the column *Engine Manufacturer* and select the firing stroke in the column *Series*, then the number of cylinders, and the ignition offset of the engine as needed. After making your selections, the right hand section *Engine Information* will display a summary of the parameters selected.

The summarized data are transferred to the subsequent configuration page *Ignition Outputs*. The values displayed there can only be changed by users with authorization to access the *Advanced Service* level.

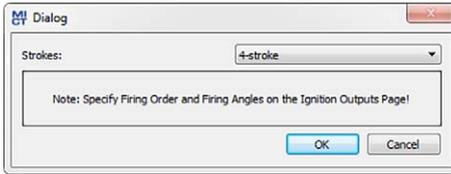


### Engine database

MOTORTECH does not assume liability for the information in the engine database. Please contact MOTORTECH if discrepancies are found.

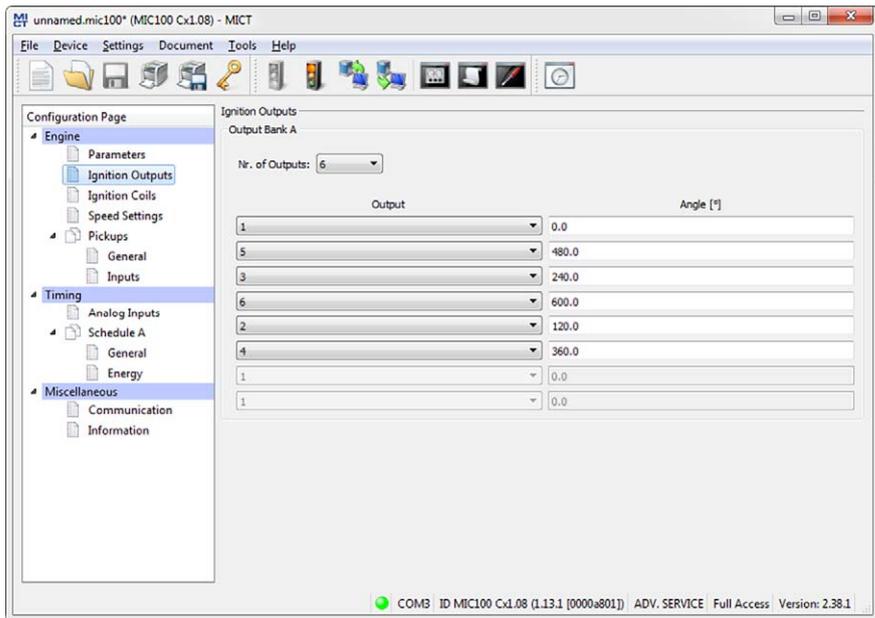
### New Engine Configuration

Staff with the authorization for the *Advanced Service* level additionally has the option for entering the engine data manually, i.e., without selecting entries from the engine database. For this purpose, click on the button *New Engine Configuration* and select the number of cycles in the dialog box opening up. Additional information can be entered on the configuration page *Ignition Outputs*.



## 8 Settings via the MICT

### 8.10.2 Engine – Ignition Outputs



Make adjustments to the following settings as needed:

- **Number of Outputs**  
Select the number of outputs for the respective output board.
- **Column: Output**  
Select the number of the respective output.
- **Column: Angle**  
Enter the firing angle for each output.

#### Default Application

If you select from the engine database, the data stored for the selected configuration are displayed. These data can only be changed by personnel with access to the *Advanced Service* level.

#### New Engine Configuration

Selecting the *Nr. of Outputs* enables access to the fields for the configuration of the outputs. By default, the ignition outputs are distributed so that cylinder 1 of the ignition sequence is always allocated an ignition angle of 0°. The ignition angle for each output results from the addition of the ignition spacing to the respective previous output.

## 8 Settings via the MICT



### Operational safety!

Never connect more than one output to each ignition coil, as the output board can otherwise be damaged.

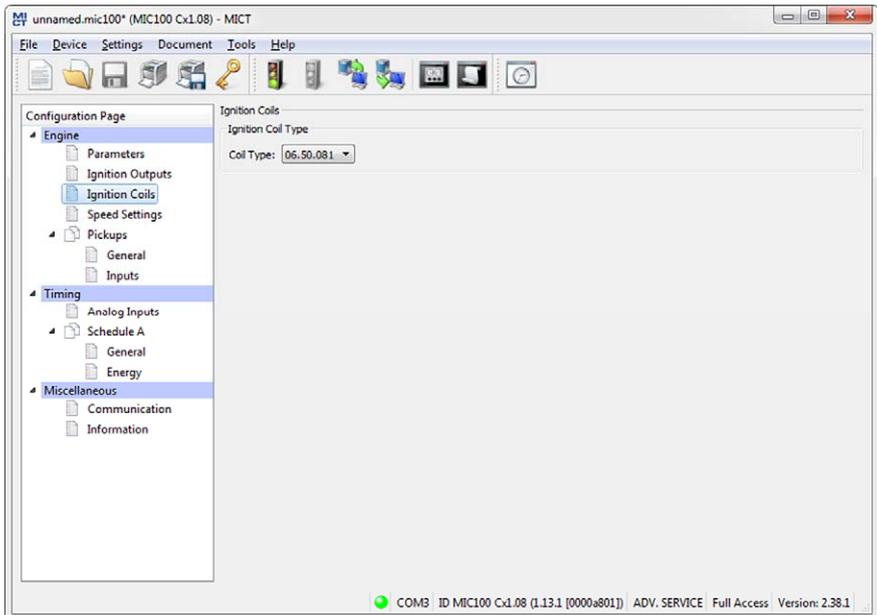
The allocation of outputs on the output banks to contacts of the output connector of the device and the cylinders is determined by the wiring. The user must take the wiring into account during the configuration; it cannot be checked by the software.



### Interval between two ignitions

The interval between two ignitions must be at least 1 ms. During the check, the configured overspeed is used in the calculation.

### 8.10.3 Engine – Ignition Coils



## 8 Settings via the MICT

### Ignition Coil Type

Select the ignition coil type from the drop-down list. (Without this selection the configuration cannot be downloaded to the MIC100.)

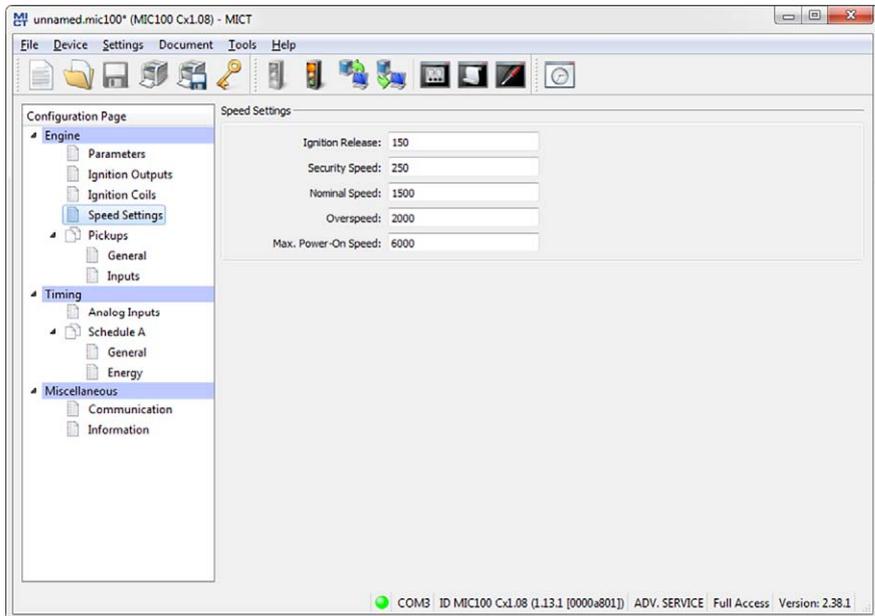


#### Only use measured ignition coils

To operate the MIC100, only ignition coil types measured by MOTORTECH may be used. All ignition coils used must correspond to the part number selected in the drop-down list. Different coil types must not be mixed and also no equivalent or replacement types may be used.

If a coil type used is not in the drop-down list, then the MIC100 is currently not used.

### 8.10.4 Engine – Speed Settings



#### Ignition Release

Enter the release speed for the ignition at which the first ignition is to fire. The value shall not exceed  $1/7$  of the nominal speed.

## 8 Settings via the MICT



### Security Speed

Enter the security speed (max. half the nominal speed). Below the value entered, the ignition can be switched on and off as desired. If the ignition is deactivated during operation above the set speed, the ignition cannot be immediately reactivated. Only when the ignition no longer reads a speed, i.e., the engine has come to a standstill, can the ignition be reactivated.

### Nominal Speed

Enter the nominal speed at which your engine is to be operated. With engines that are to be operated with variable speeds, the max. speed of the operating range must be entered.

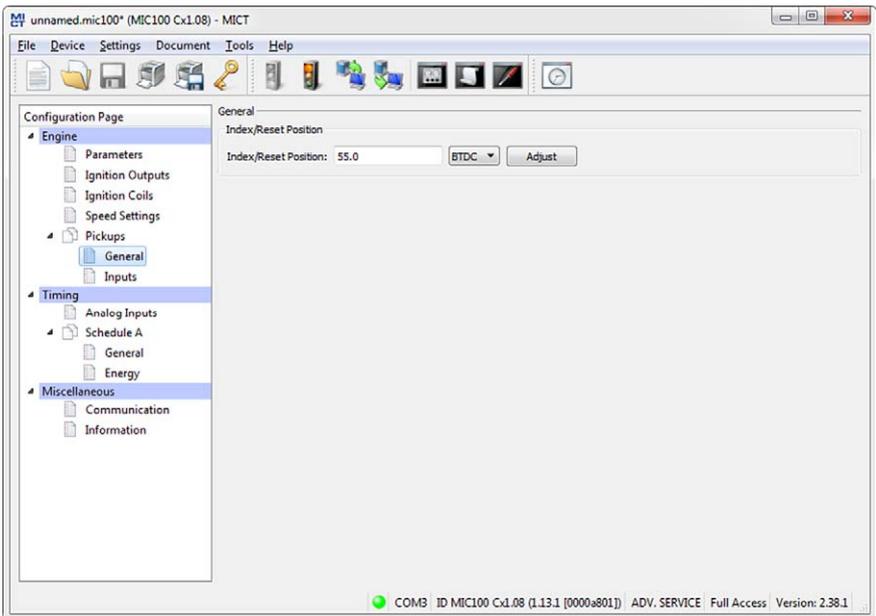
### Overspeed

Enter the speed at which the ignition is to be shut off as overspeed protection. With engines that are to be operated with variable speeds, a speed above the operating range must be entered.

### Max. Power-on Speed

Enter the maximum permitted start speed at which the MIC100 starts sending ignition pulses. A value of *6000 rpm* is set as the default value: The MIC100 can be activated at the starter speed and immediately send ignition pulses. For a value of *0 rpm* the MIC100 can only start sending ignition pulses once it has registered that the engine is at a standstill.

## 8.10.5 Engine – Pickups – General



## 8 Settings via the MICT



### Active pickups

Check when using active pickups that the auxiliary supply voltage is configured for your application.

### Index/Reset Position

Enter the distance between the first event after the set index/ reset marking and top dead center. With the button *Adjust*, you can enter the measured firing angle for a given nominal value. The system calculates the difference from these values, which is added to or subtracted from the index/reset position.

### Aux. Pickup Supply Voltage

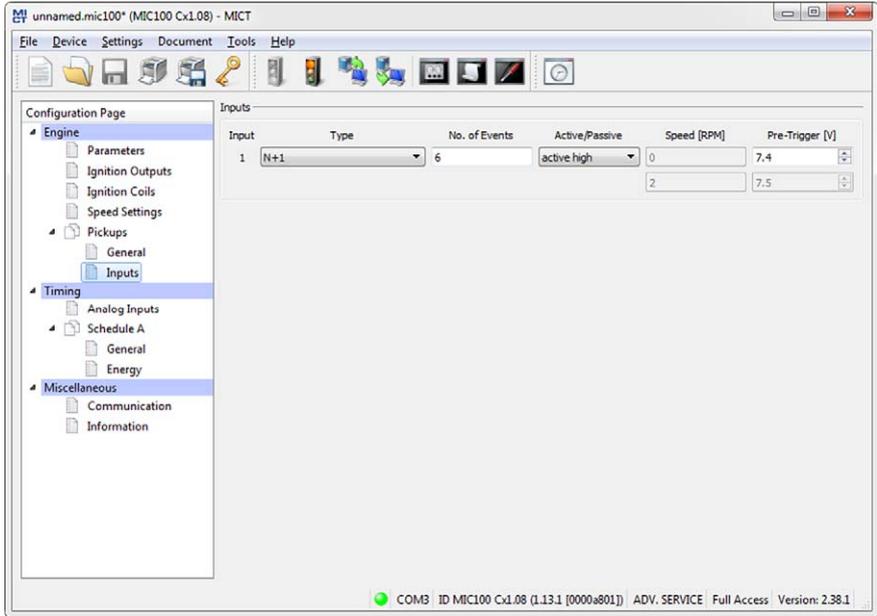
Select the supply voltage with which the active pickup is to be operated. 8 V or 15 V are possible. When an auxiliary supply voltage of 15 V is required, the supply voltage of the ignition controller has to be at least 16 V.



### Shared auxiliary supply voltage

Devices of the MIC100 series do not have a separate auxiliary supply voltage for the analog current input. For devices requiring such a voltage, the auxiliary supply voltage of the pickup can also be used for the current input.

## 8.10.6 Engine – Pickups – Inputs



### Type

You can select the type of events that will occur on this input for each pickup input. Type and number of events are defined by the discs or ring gears used. If you decide not to use a pickup input, select the entry *None* from the list. The following types can be set:

- **N+1**  
Disc of type *N* with one additional event, e.g. a disc with 6 teeth and one additional tooth for the index signal ( $N=6$ ).
- **N+1 Extended Index Range**  
Disc of type *N* with one additional event, e.g. a disc with 6 teeth and one additional tooth for the index signal ( $N=6$ ). The permitted range for the index signal is expanded to 75 % of the tooth period. An incorrect direction of rotation of the engine cannot be detected by this setting.
- **N-1**  
Disc of type *N* where one event is missing, e.g. a ring gear with 160 teeth on which one tooth was removed ( $N=160$ ). This missing event is used to determine the index signal.
- **N-2**  
Disc of type *N*, where two consecutive events are missing, e.g. a ring gear with 160 teeth on which two teeth located next to each other were removed ( $N=160$ ). These missing events are used to determine the index signal.

## 8 Settings via the MICT

### Number of Events

Enter the number of events that occur on the pickup if more than one event is expected. Enter the value for N and not the total number of events for the selected pickup type.

The number of events depends on the selected pickup type.

- *N+1* and *N+1 extended index range*: Values between two and eight
- *N-1* and *N-2*: Values between 30 and 240

### Active/Passive

Select the pickup to be used from the pre-defined pick list:

- **Passive**  
passive pickup
- **Active (low)**  
active pickup with high level as quiescent level
- **Active (high)**  
active pickup with low level as quiescent level

### Speed

For passive pickups, you can set the pre-trigger voltage so that it depends on the speed. See also the following example.

### Pre-Trigger

Enter a value between 0.5 V and 7.5 V for each pickup to set the pickup sensitivity level. Signals that fall short of the set voltage will not be analyzed. A low pre-set value therefore results in a high sensitivity level, a high value results in a low sensitivity level.



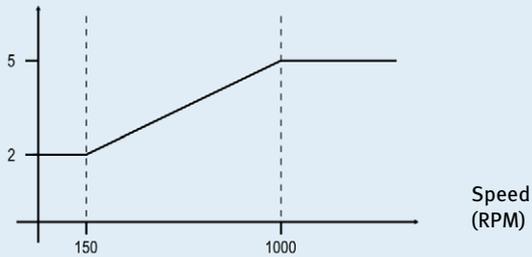
### Speed-dependent pre-trigger voltage

For a passive pickup, the pre-trigger voltage is defined as follows:

- Speed1: 150 RPM; Pre-trigger voltage1: 2 V
- Speed2: 1000 RPM; Pre-trigger voltage2: 5 V

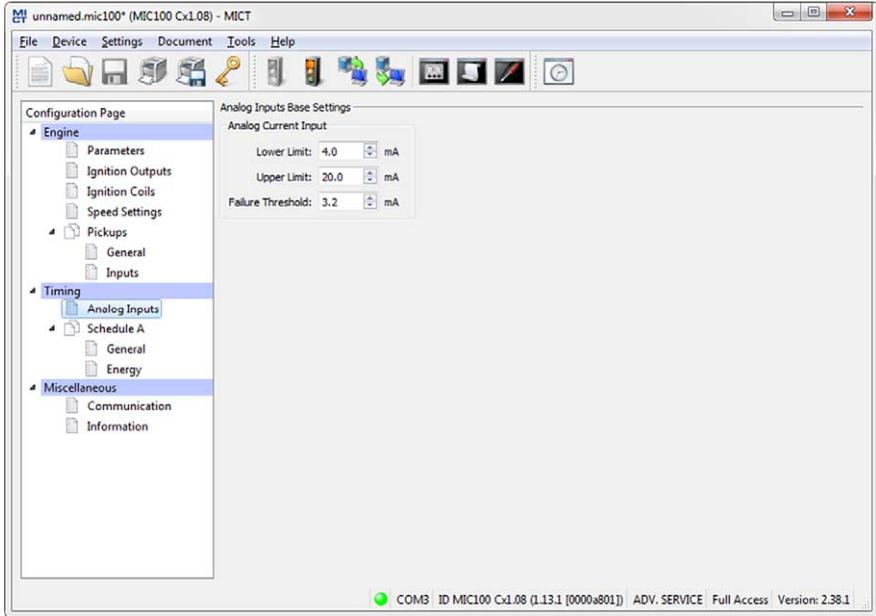
The result is the following curve:

Pre-trigger voltage  
(V)



## 8 Settings via the MICT

### 8.10.7 Timing – Analog Inputs



#### Analog Inputs Base Settings

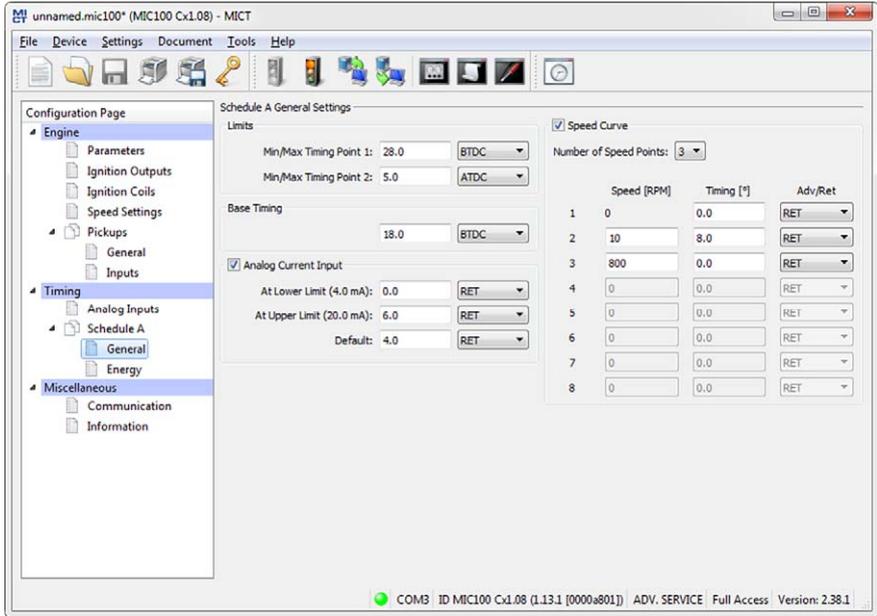
The ignition timing can be adjusted via an analog current signal, which can be set within the limits of 0 mA to 20 mA.

Set the *Upper Limit* and *Lower Limit* of the signals corresponding to your connected device. Also, you have the option to enter a *Failure Threshold*. If the signal does not reach this value, it is classified by the ignition controller as failure (e.g. wire break). The *error value* configured in the schedule was set for the affected input. To reset the error state, a threshold will need to be exceeded. This threshold value is calculated as follows:

Threshold to reset the error state  $\geq 0.5 \times (\text{Lower Limit} - \text{Failure Threshold}) + \text{Failure Threshold}$

In the schedule you define which ignition timing adjustment results from the analog signal. Refer to the section *Timing – Schedule A – General* on page 81.

## 8.10.8 Timing – Schedule A – General



### Limits

Enter the limits of the timing point at which the ignition can fire. The timing points of the outputs will be limited to this range relative to the respective top dead center of the pertinent cylinder. The global timing can then not be shifted beyond this range by any adjustments.

### Base Timing

Enter the timing specified by the engine manufacturer. This point must be within the limits entered and is a static portion of the global timing.

### Analog Current Input

The analog current input can be enabled and disabled by clicking. Enter the values by which the adjustment is to be implemented for the corresponding input signal. An *error value* can be entered for the signals if a *failure threshold* has been defined for the corresponding input in the window *Timing – Analog Inputs*. If the signal is below the failure threshold, the timing is offset by the error value. The adjustment remains until the signal again exceeds the threshold to reset the error state (see *Timing – Analog Inputs* on page 80).

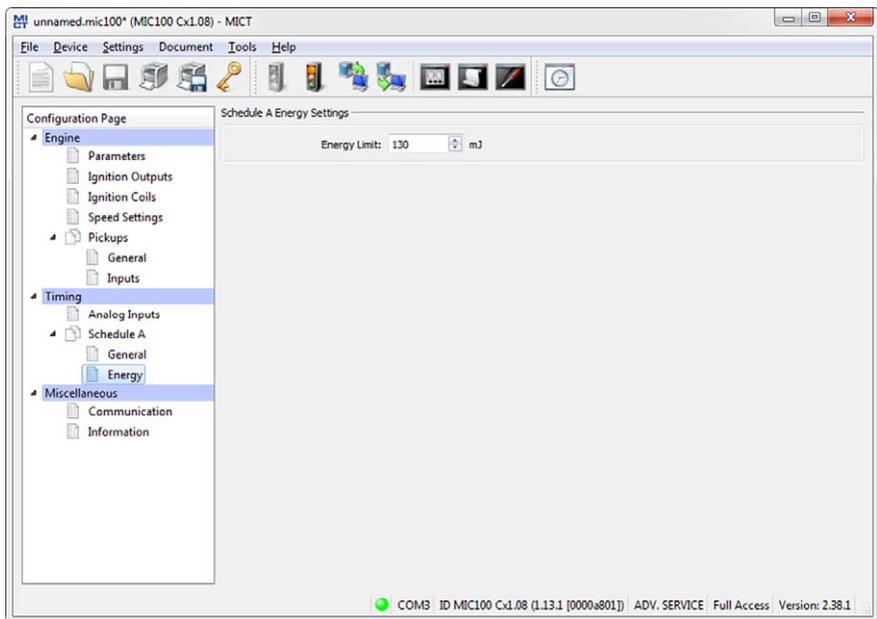
## 8 Settings via the MICT

### Speed Curve

The speed curve can be activated and disabled by mouse click and offsets the timing depending on the speed. A max. of eight speed points are available. If you select a number of points from the list, the corresponding number of fields is activated for input.

The first speed point is always set to 0 RPM. All other timing points are assigned with the value by which the signal is to be offset when the respective speed is reached. For the last speed point, the timing of the nominal speed should be entered. Please note that the speed points must always be entered in ascending order.

### 8.10.9 Timing – Schedule A – Energy



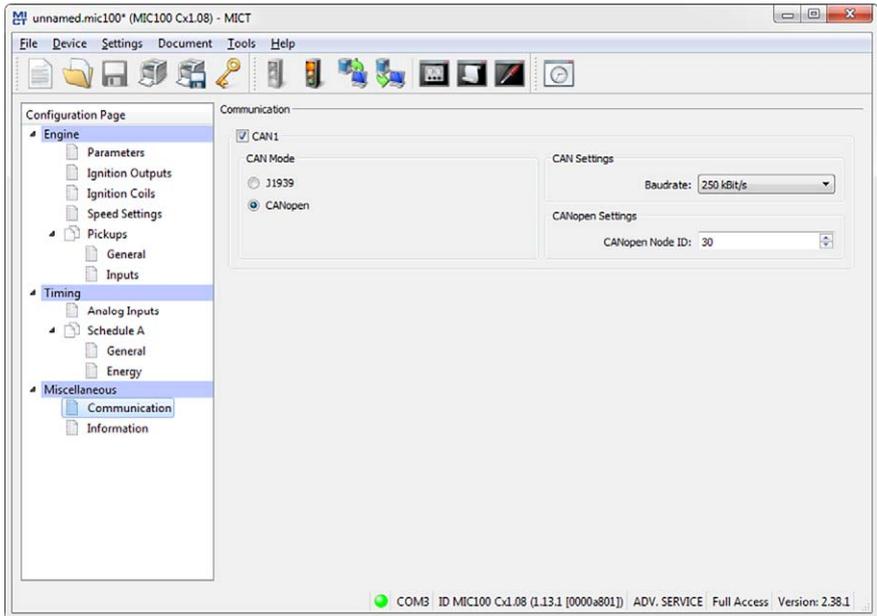
### Energy Limit

You can use the field *Energy Limit* to limit the output energy made available by the ignition controller. The energy limit is adjustable from 80 mJ to 130 mJ.

## 8 Settings via the MICT



### 8.10.10 Miscellaneous – Communication



#### CAN1

Clicking on the checkbox *CAN1* enables or disables the CAN interface on the device.

- **J1939/CANopen**  
Select the desired protocol depending on the device you want to communicate with. For the ALL-IN-ONE gas communication use *J1939*.
- **J1939 Settings**  
The *J1939* source address can be assigned between 0 and 253. Note that IDs cannot be assigned more than once.
- **CANopen Settings**  
The CANopen node ID can be assigned between 1 and 127. Note that IDs cannot be assigned more than once.
- **Baudrate**  
Select the desired data transfer rate from the list. The baud rate can be defined between 50 kbit/s and 1 Mbit/s, the recommended value being 250 kbit/s.

## 8 Settings via the MICT



### Setting the transfer rate

Please note that all devices connected with a bus must be set to the same transfer rate.

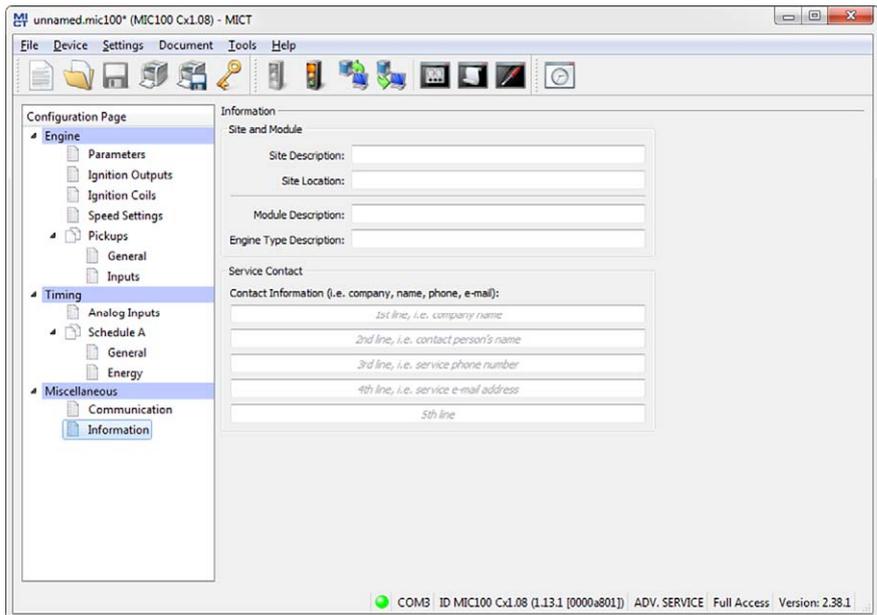


### Information on protocols

Please contact your MOTORTECH contact person if you require more information on the CANopen® and J1939 protocols.

### 8.10.11 Miscellaneous – Information

This configuration page can be viewed by all users, but changes can only be made with authorization for the *Service* access level.



## 8 Settings via the MICT

### Site and Module

In this section, enter information on the system and the module for which the configuration will be used.

### Service Contact

In this section, individual contact data can be saved that can be called up and displayed via MICT.

### 8.11 Runtime Data



Click on the symbol to open the window *Runtime Data*. The following sections will give you an overview of the data you can view on the individual tabs.

You can print and record the runtime data. For this purpose, the following functions are at your disposal in the toolbar in the window:

Symbol	Function
	Prints the runtime data.
	Prints the runtime data to a PDF file.
	Opens the print preview.
	Starts the runtime data trace.
	Stops the runtime data trace.
	Acknowledges the operational errors. The symbol is grayed out if no acknowledged error is present.

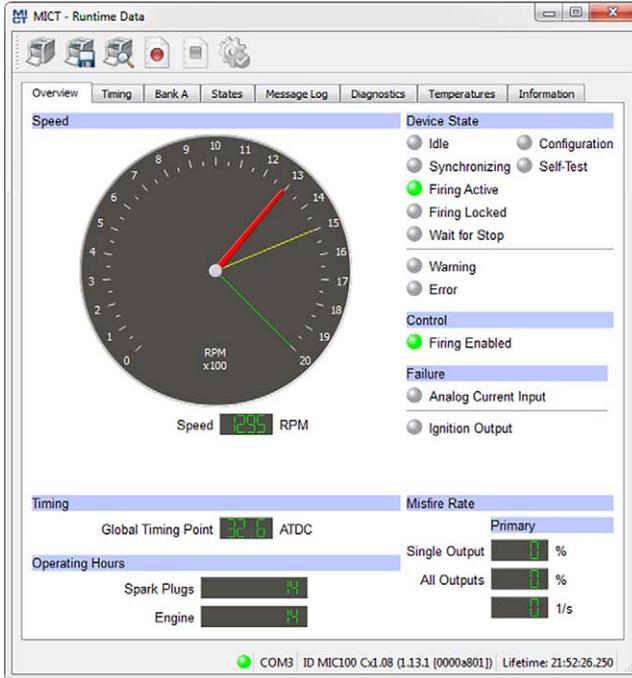


#### Save runtime data locally

You should always save runtime data on the local computer and not on a network drive or external storage device. Trace files can only be moved freely once the recording is stopped.

## 8 Settings via the MICT

### 8.11.1 Runtime Data – Overview



In this screen, you can find the following information:

- **Speed Indicator (analog)**
  - Red pointer  
Displays the current registered speed
  - Yellow pointer  
Displays the maximum registered speed since last starting the engine
  - Green pointer  
Display of set overspeed
- **Speed Indicator (digital)**  
Digitally displays the current speed
- **Global Timing Point**  
Digital indication of the current global timing

## 8 Settings via the MICT



- **Operating Hours**
  - **Spark Plugs**  
Indicates the current operating hours of the spark plugs
  - **Engine**  
Indication of current operating hours of the engine
- **Device State**  
The status of the device is shown by the following status displays:

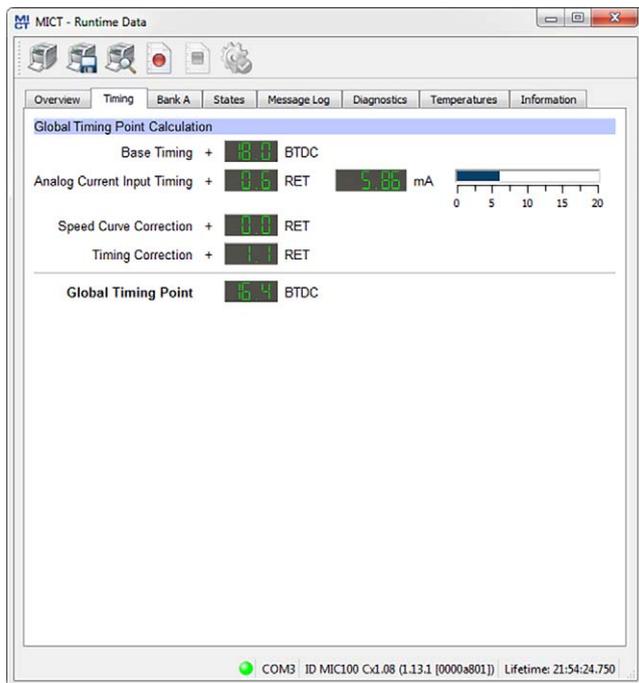
Device status	Description
Idle	The ignition is ready and waiting for pickup activity.
Synchronizing	Pickup signals are being received and analyzed.
Firing Active	The ignition is active.
Firing Locked	Pickup signals are being received and are valid, ignition is not released.
Wait for Stop	Pickup signals are being received, the ignition fired above the security speed, and the ignition release was retracted. The engine must now come to a standstill.
Configuration	The device is being configured.
Self Test	The self test is running (refer to <i>Self Test</i> on page 61).
Warning	A warning has occurred.
Error	An error has occurred.

- **Control**
  - **Firing Enabled**  
The green status display signals that the firing is active.
- **Errors**
  - **Analog Current Input**  
The red status display signals that the set failure threshold for the input has been reached. If the lower limit of the signal is reached again, the status display is again gray.
  - **Ignition Output**  
The red status display signals a current misfire on at least one output. With a yellow status display at least one misfire has occurred at one output since the last reset of the counter.
- **Misfire Rate**  
The misfire rate is displayed for the primary side.

## 8 Settings via the MICT

- **Single Output**  
Displays the misfire rate of the output for which the most misfires were registered during the last 32 cycles.
- **All Outputs**  
Displays the misfire rate for all the ignition outputs for the past 32 cycles.
- The number of misfires per second are calculated by the MIC100 as follows:  
2-stroke engine: Number of currently misfiring outputs x RPM / 60  
4-stroke engine: Number of currently misfiring outputs x RPM / 60 / 2

### 8.11.2 Runtime Data – Timing



In this view, the system displays all values and settings in the left hand section that influence the timing. In the right hand section, the value is additionally displayed and shown as a bar chart, which is measured at the analog current input and thus causes the change to the timing shown.

The value for the speed curve is shown by curve progression set in the configuration. Refer to the section *Timing – Schedule A – General* on page 81. The timing correction can be implemented for the runtime. Refer to the section *Runtime Adjustments – Timing* on page 96.

## 8 Settings via the MICT

### 8.11.3 Runtime Data – Bank A

Output	Angle [° Crank]	Min. Spark Duration [µs]	Energy Output [mJ]	Misfire		
				Primary		
				open	short	Rate [%]
A1	38.6	475.0	80.1	●	●	0
A2	158.6	475.0	86.6	●	●	0
A3	278.6	475.0	86.6	●	●	0
A4	398.6	475.0	87.1	●	●	0
A5	518.6	475.0	86.6	●	●	0
A6	638.6	475.0	86.6	●	●	0
A7	0.0	0.0	0	●	●	0
A8	0.0	0.0	0	●	●	0

COM3 ID MIC100 Cx1.08 (1.13.1 (0000a801)) Lifetime: 22:11:02.250

In this screen, you can find the following information:

- Column: **Output**  
Designation of the output
- Column: **Angle**  
Current output firing angle
- Column: **Min. Spark Duration**  
Minimum spark duration of the outputs
- Column: **Energy Output**  
Current energy release of the output

## ■ 8 Settings via the MICT

### – Columns: **Misfire**

Status display for the different types of misfires (primary, open, short circuit). In case of misfire, the respective status display turns red, otherwise it is gray. With a yellow status display misfires have occurred since the last reset of the counter.

If you hold the pointer over the status display, an overview of the misfire counter of the respective output is displayed for all types of misfires. A maximum up to 255 is counted per type of misfire. The counter manually resets using the menu item *Device-> Send command -> Reset misfire counters*. When starting the engine and starting the self test the counters are automatically reset.

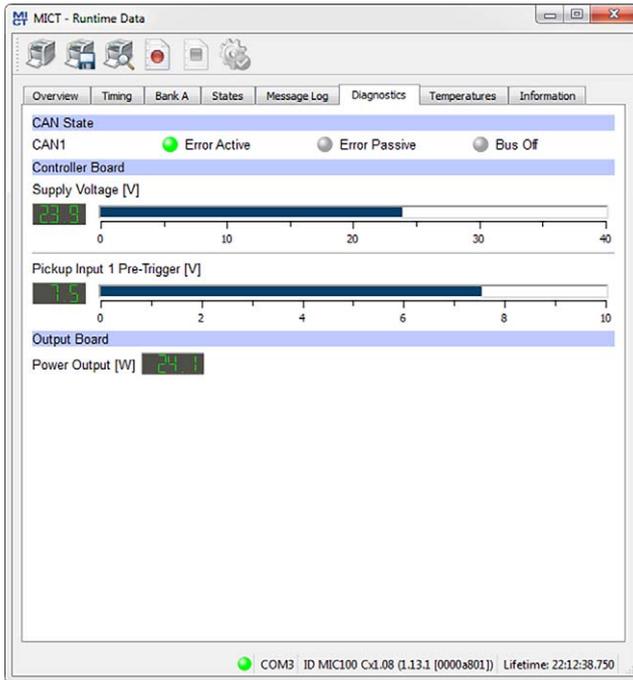
### **8.11.4 Runtime Data – States**

No states are currently displayed in the window.

### **8.11.5 Runtime Data – Message Log**

No messages are currently displayed in the window.

### 8.11.6 Runtime Data – Diagnostics



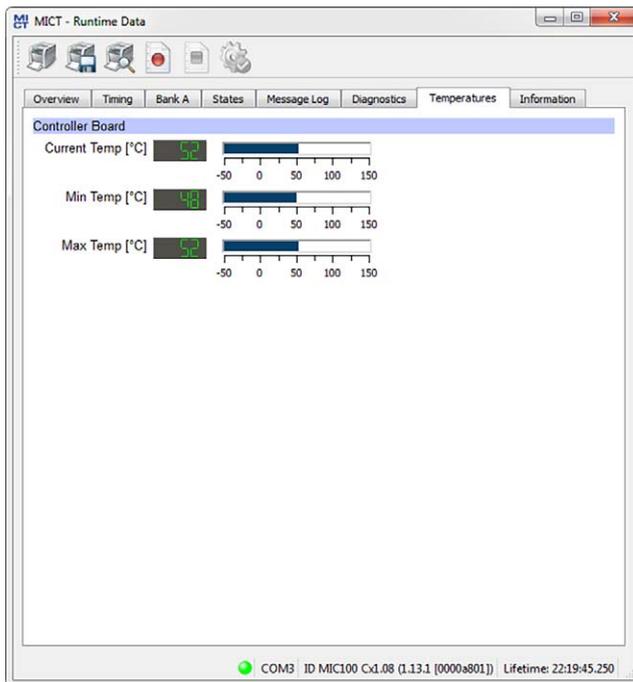
In this screen, you can find the following information:

- **CAN State**  
The status display indicates the current error handling status of the device for the CAN bus communication:
  - **Error Active**  
The device is in normal status of the bus communication. If an error occurs in the communication, the device sends an active error flag.
  - **Error Passive**  
After a defined number of errors in the bus communication, the device changes to the status *Error Passive*. If another error occurs, the device sends a passive error flag.
  - **Bus Off**  
The device is disconnected from the CAN bus due to error accumulations in the bus communication.

## 8 Settings via the MICT

- **Controller Board**
  - **Supply Voltage**  
Current voltage supply of the controller board.
  - **Pickup Input 1 Pre-Trigger Voltage**  
Current pre-trigger voltage for the pickup inputs (refer to *Engine – Pickups – Inputs* on page 77). During operation the pre-trigger voltage for passive pickups is increased depending on the speed, so that the ignition controller is less prone to interferences.
- **Output Board**
  - **Power Output**  
Current output of the output board

### 8.11.7 Runtime Data – Temperatures



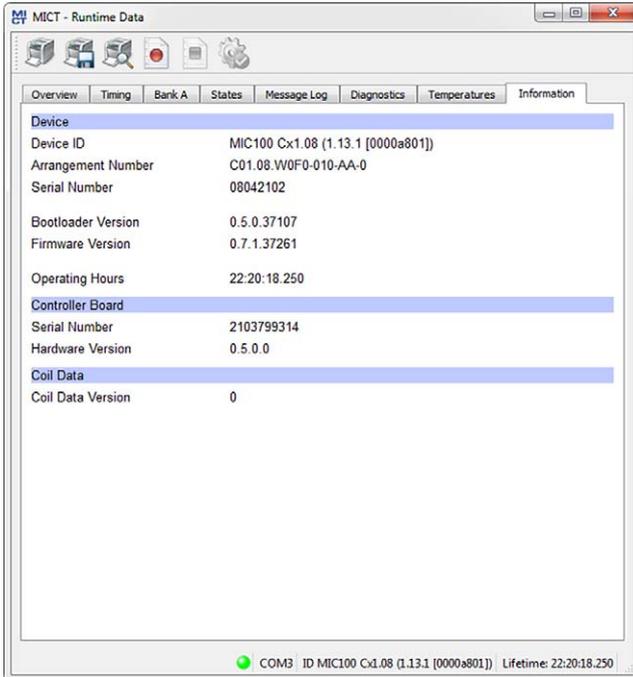
In the window you receive an overview of the temperatures of the controller board. The maximum and minimum values are reset at each new start of the ignition controller.

## 8 Settings via the MICT

The following information is provided:

- **Controller Board**
  - **Current Temp.**  
Current temperature of the controller board
  - **Min. Temp.**  
Minimum measured temperature of the controller board
  - **Max. Temp.**  
Maximum measured temperature of the controller board

### 8.11.8 Runtime Data – Information



The screenshot shows the 'MICT - Runtime Data' application window. The 'Information' tab is selected, displaying the following data:

Device	
Device ID	MIC100 Cx1.08 (1.13.1 [0000a801])
Arrangement Number	C01.08.W0F0-010-AA-0
Serial Number	08042102
Bootloader Version	0.5.0.37107
Firmware Version	0.7.1.37261
Operating Hours	22:20:18.250
Controller Board	
Serial Number	2103799314
Hardware Version	0.5.0.0
Coil Data	
Coil Data Version	0

At the bottom of the window, a status bar shows: ● COM3 ID MIC100 Cx1.08 (1.13.1 [0000a801]) Lifetime: 22:20:18.250

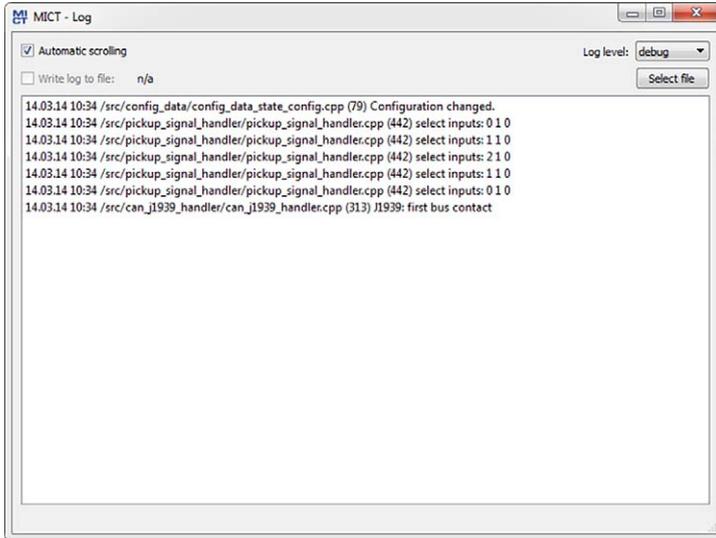
In this view, you can find an overview of the device and version data. If problems arise, you can print the current runtime data and send them to the MOTORTECH Service Department by fax or as a PDF file by email. For fast support, we will then immediately have all required information.

## 8 Settings via the MICT

### 8.12 Log



Click on the symbol to open the window *Log*. This window is only available to users with authorizations starting at the access level *Advanced Service*.



The window *Log* serves to support error diagnostics by MOTORTECH.

- **Automatic scrolling**  
If the function is active, the view panel focuses on the latest message.
- **Log level**  
The selection of the log level is specified by MOTORTECH if needed.
- **Write log to file**  
This checkbox activates or deactivates, respectively, the saving of the logged data in a selected file. If the function is disabled, the logged data are merely shown on the display.
- **Select file**  
With this button, you can select a file to which you want to save the logged data.

If you are prompted to create a log file in the case of a service request, proceed as follows:

1. Open the window *Log* via the toolbar or the menu bar.
2. Select a path with the *Select file* button and enter the file name for the log file.
  - ▶ If the file does not yet exist, it is automatically created with the extension *.log*.
3. Activate the checkbox *Write log to file*.

## 8 Settings via the MICT



4. Select the level specified by MOTORTECH from the list *Log level*.
5. Leave the window open.
  - ▶ The log messages are logged both in the window and in the selected file.

### 8.13 Runtime Adjustments



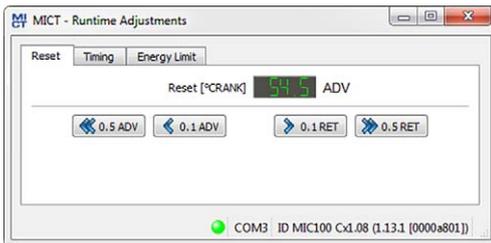
Click on the symbol to open the window *Runtime Adjustments*. This window is only available to users with authorizations starting with access level *Service*.



#### Runtime adjustments are implemented directly

All runtime adjustments are implemented directly without requiring the input to be confirmed.

#### 8.13.1 Runtime Adjustments – Reset



The index/reset position can be corrected by 5 °crankshaft (advanced/retarded) while the device is being operated. The correction is made with the buttons:

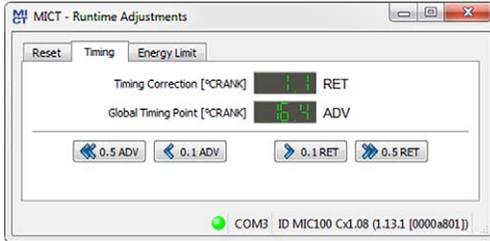
- 0.1 ADV/RET  
in 0.1° increments to advance or retard
- 0.5 ADV/RET  
in 0.5° increments to advance or retard

Changes are implemented immediately and stored in the configuration provided in the device.

If the correction range is not sufficient, the reset/index position must be adjusted in the configuration (refer to *Engine – Pickups – General* on page 75).

## 8 Settings via the MICT

### 8.13.2 Runtime Adjustments – Timing



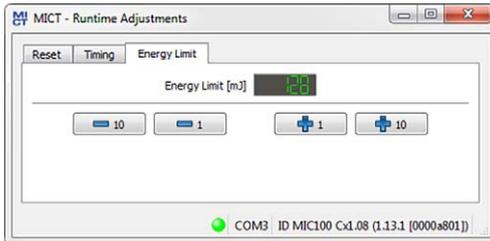
The global ignition timing position can be corrected by 50°crankshaft (advanced/retarded) while the device is being operated. The correction is made with the buttons:

- 0.1 ADV/RET  
in 0.1° increments to advance or retard
- 0.5 ADV/RET  
in 0.5° increments to advance or retard

The limit for the ignition timing set in the schedule (refer to *Timing – Schedule A – General* on page 81) cannot be exceeded or not reached with the runtime adjustment.

The correction of the global ignition timing is immediately implemented and also remains in place if the device is restarted. NOTICE: The configuration defined in the device is not changed.

### 8.13.3 Runtime Adjustments – Energy Limit



The energy limit can be adjusted in the range 80 mJ to 130 mJ during operation of the device. The adjustment is made with the buttons:

- /+ 1  
in 1 mJ steps
- /+ 10  
in 10 mJ steps

Changes are implemented immediately and stored in the configuration provided in the device.

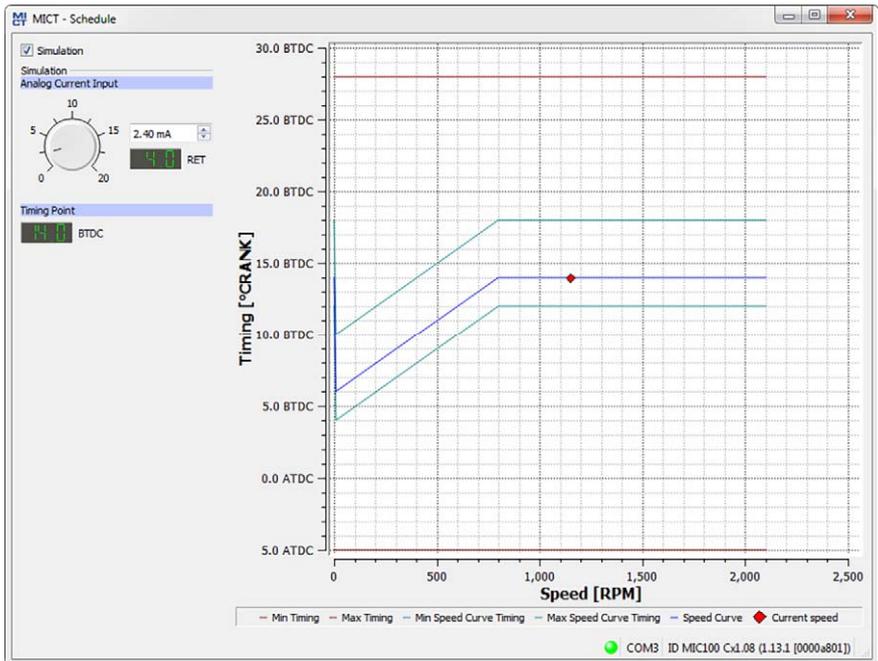
## 8 Settings via the MICT

### 8.14 Schedule Curve



Click on the symbol to open the window *Schedule*.

#### 8.14.1 Schedule Curve – Simulation



The schedule curve visualizes the configurations of the schedule and simulates the influence of the analog current input over the speed range. Changes made by turning the control button or entering the desired value are displayed simultaneously.

- **Simulation**  
The simulation is activated or disabled using the checkbox.
- **Analog Current Input**  
Simulation of the analog current input
  - Control button for adjustments between the configured values (e.g. 0 mA and 20 mA)
  - Field for manual input of the desired value in mA
  - Displays the value in °crankshaft by which the timing is offset

## 8 Settings via the MICT

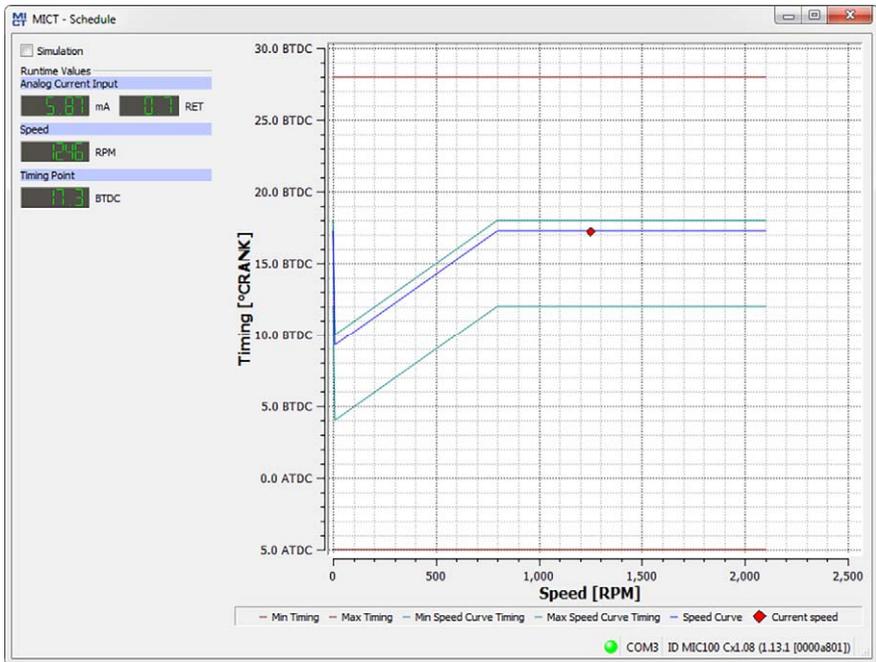
### – Timing Point

Displays the global ignition timing as it changes during the simulation.

While connected to the device, the ignition timing is simulated depending on the actual engine speed and marked as  in the diagram.

### 8.14.2 Schedule Curve – Runtime Values

If the checkbox *Simulation* is unchecked, the *Schedule curve* window switches to the current runtime data.



In this screen, you can find the following information:

### – Analog Current Input

Left column:

Display of the newly calculated adjustment value of the current input

Right column:

Display of the values of the current input supplied by the ignition control unit

## 8 Settings via the MICT

- **Speed**  
Display of the current speed
- **Timing Point**  
Displays the current global ignition timing.

### 8.15 Coils

The MICT has a database with technical information on MOTORTECH ignition coils. Open the database as follows:

*Tools -> Coils*

You have the option of storing and printing information on the ignition coils present in the database. For this purpose, the following functions are at your disposal in the toolbar in the *Coils* window.

Symbol	Function
	Stores the information on the selected ignition coil in a format that is appropriate for configuring the MIC100 via fieldbus.
	Prints the selected coil data set.
	Prints the selected coil data set as PDF file.
	Opens the print preview.

#### Coils

- **Device**  
Select an ignition controller.
- **Coil**  
Select an ignition coil.

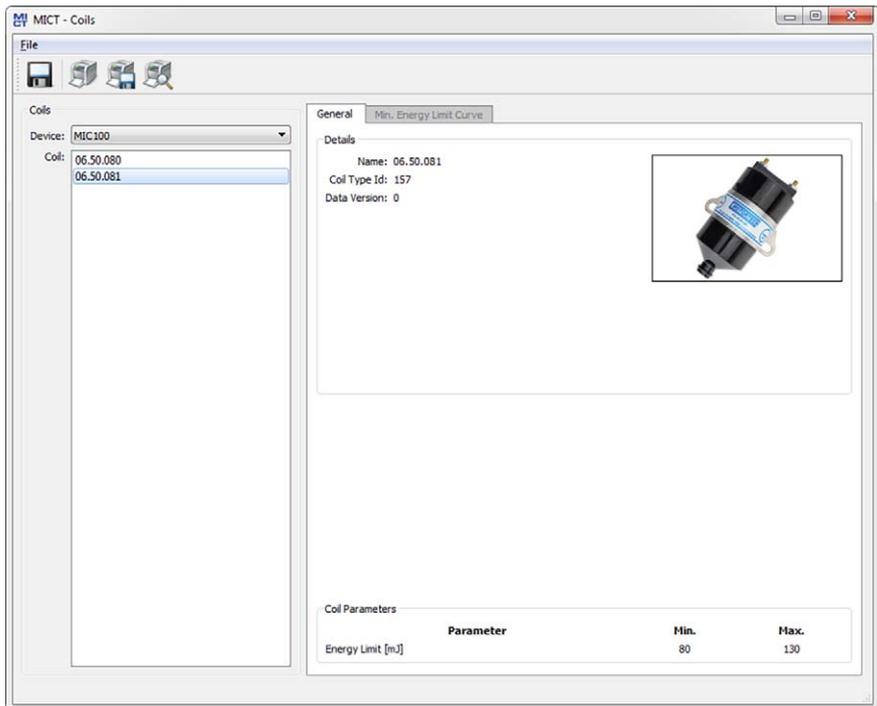


#### Select the correct ignition controller

The ignition coil data depends on the ignition controller used. Always select the ignition controller for which you are using the coils in order to obtain the correct data.

## 8 Settings via the MICT

### 8.15.1 General



#### Details

The following information is provided:

- **Name**  
Coil name
- **Coil Type ID**  
Used to clearly identify the ignition coil
- **Data Version**  
Shows data version of the ignition coil selected in the database. The data version of the ignition coil configured in the ignition controller is displayed in the runtime data in the view *Information* (refer to *Runtime Data – Information* on page 93). The Automatic Online Update should be activated to ensure that the coil database always has the latest data sets. Additional information on the online update is provided in the section *Online Update Settings* on page 60.
- Illustration of the ignition coil

## ■ 8 Settings via the MICT



### Coil Parameters

The following information is provided:

- **Energy Limit [mJ]**  
Displays the permitted value range for the energy limit in mJ. The energy limit is configured in the view *Timing – Schedule A – Energy* (refer to *Timing – Schedule A – Energy* on page 82).

## 9 Operation

### 9.1 Start-up

Before you start up the MIC100 ignition controller, take note of the following:

- Were the correct engine, ignition sequence, and output configuration selected? If you are unsure, contact MOTORTECH or the corresponding engine manufacturer.
- Ensure that the firing order of the engine and/or the wiring of the output cable harness are carried out correctly.
- Is the wiring of the pickup compliant with the drawings given in this operating manual?
- Is the distances of the pickup to trigger discs, reluctor pins, etc. correctly set (see chapter *Determine the Installation Location of the Pickup* on page 30)?
- Ensure that the data were transferred flawlessly to the controller.
- Check whether the start/stop input is set to *Firing Active*, or whether it works according to the control requirements of the master control.
- Close the service screw after completing the installation and configuration.
- Ensure that no gas is present in the inlet and exhaust systems before you start the engine.
- Ensure that the gas valve is closed.
- Perform the normal engine start-up process while the gas valve is closed (start only).
- Connect a stroboscope to the first firing cylinder (cylinder #1) and check whether the timing point set on the ignition controller coincides with the actual timing point on the crankshaft. If the ignition timing does not coincide exactly, change it (see chapter *Runtime Data* on page 85) until the optimal setting is reached.
- Check all other cylinders for correct ignition. If they are not correct, stop the engine, and recheck wiring and ignition sequence for correctness.

### 9.2 Shutdown

The ignition controller is shut down by disconnecting it from the power supply.

### 9.3 Firmware Update

Using the MOTORTECH Flash Tool, you can update the firmware of the ignition controller. The program is included on the storage device enclosed with USB adaptor cable type1. The adaptor cable is necessary to connect the device to a computer. In addition, you will also find all necessary information on the Internet at [www.motortech.de](http://www.motortech.de).

Basically, the same system requirements apply to the MOTORTECH Flash Tool as to the MICT. Refer to the section *MICT System Requirements* on page 54.

### Install MOTORTECH Flash Tool



#### Installing the drivers

Before you connect a computer with a MIC100 for the first time, it is necessary to install or update all necessary drivers. This driver installation is carried out via the *MOTORTECH Driver Installer* and it only needs to be performed once per computer:

Install the drivers as follows:

1. Install the drivers via the menu or directly from the storage device.
  - via the menu:  
*Software -> MOTORTECH Driver Installer -> Start MOTORTECH Driver Installer*
  - Directly from the storage device:  
Start the exe file in subdirectory *Drivers*(e.g. *MOTORTECH-DriverInstaller\_w32.exe*).
2. Install the program.  
Follow the instructions of the installation routine.

Install the MOTORTECH Flash Tool as follows:

1. Start the installation:
  - Via the menu:  
Start the file *Start.exe* on the storage device. Start the installation routine for the MOTORTECH Flash Tool via *Software -> MOTORTECH Flash Tool -> Install MOTORTECH Flash Tool*.
  - Directly from the storage device:  
Start the installation routine of the MOTORTECH Flash Tool directly. It is on the storage device in the subdirectory *Installation* and for example named as follows: *MOTORTECH-Flash-Tool-0.9.00003-setup.exe*.
2. Install the program.  
Follow the instructions of the installation routine. Note that the license agreement terms must be accepted before using the MOTORTECH Flash Tool.
  - ▶ The MOTORTECH Flash Tool is set up. You can now connect your computer to the ignition controller via the USB interface.

## 9 Operation

### Menu Bar and Toolbar

After launching the MOTORTECH Flash Tool, the following functions are available to you via the icons on the toolbar and the entries in the menu bar:

Symbol	Menu	Function
	<i>File -&gt; Open</i>	Opens a firmware file.
	<i>File -&gt; Quit</i>	Exits the program.
	<i>View -&gt; Extended file information view</i>	Fades in / out additional information of the firmware file.
	<i>View -&gt; Extended connection settings</i>	Fades in / out additional information and settings of the connection to the device.
	<i>View -&gt; Reload file</i>	Reloads the file information of the selected firmware file.
	<i>Device -&gt; Search devices</i>	Restarts the search for connected devices.
	<i>Device -&gt; Flash device</i>	Starts the update process or downgrade process.
	<i>Settings -&gt; Language</i>	Opens the window <i>Select Language</i> in which you can change the interface language of the program.
	<i>Help -&gt; Help</i>	Opens the online help function.
	<i>Help -&gt; About MOTORTECH Flash Tool</i>	Opens detailed information on the program.

### Start Firmware Update



#### Access control for firmware update

If you have activated the access control for the ignition controller, you need the PIN for the level *Master* for the firmware update. For more information read the section *Access Control for MIC100* on page 62.



### Backup the existing configuration

Your device's configuration may be lost if the firmware update is not performed properly. Always backup the existing configuration via the MICT prior to performing an update. For more information read the section *Working with Configurations* on page 64.

To start a firmware update, proceed as follows:

1. If an MICT is connected with the ignition controller, disconnect this connection.
2. Start the MOTORTECH Flash Tool via *Start -> Programs -> MOTORTECH -> MOTORTECH Flash Tool -> x.x.x (e.g. 0.9.00003) -> MOTORTECH Flash Tool.*
  - ▶ The MOTORTECH Flash Tool will now start.
  - ▶ The software automatically checks all USB ports for connected devices.
3. In the *Status* section under *Device*, check if your device has been recognized properly.
  - ▶ If the MOTORTECH Flash Tool was unable to detect a device even though it is connected to your computer via the USB interface and the USB drivers have been installed correctly, you can usually still update the firmware. To do so, observe the instructions in the information windows of the MOTORTECH Flash Tool for the following steps.
4. Select in area *File* using the *Select* button the desired update file.
5. By reading the displayed file information, ensure that the update file is correct for your device.
6. Start the update process using the *Flash* button or using the menu or toolbar.
  - ▶ The ignition controller is restarted automatically.
  - ▶ Now, a window opens informing you about the firmware version currently used on your ignition controller and also about the relevant update version.
7. Confirm with *Yes* to proceed with the update process.
  - ▶ Now the update will start.
  - ▶ If the firmware update was successful, you will see a relevant message.
8. After a successful firmware update, check all configuration data.



### Downgrade process

The process for a downgrade is largely the same as the update process. You will only be informed that a new firmware has been installed on the device.

## 9 Operation



### Help with connection problems

If a correctly connected device is not found during the automatic search, this can, for example, be because too many communication interfaces are assigned and must be checked. In this case, an interface from the drop-down list *Port* in the area *Connection* can be selected and thus specified.

If the desired port is not yet displayed in the list or if the problem should continue, an adjustment of the time-outs for the connection helps. The time-out settings are displayed in the main view by the following entry in the menu bar: *View -> Extended connection settings*

Enter the following settings:

- **Update Request Timeout**  
Adjustment range: 1,000 ms to 10,000 ms, standard value: 3,000 ms.  
An extension of the time-out can be an advantage, especially with connection problems that occur because the computer has many assigned ports.
- **Start Timeout**  
Adjustment range: 1,000 ms to 10,000 ms, standard value: 3,000 ms. A time-out change can be an advantage, especially with connection problems that occur because the communication between the computer and the device has been interrupted.

## 10.1 Possible Faults

The MIC100 ignition controllers include several safety functions that can shut down the engine in case of fault:

- Overspeed protection
- External shut-down contact (Start/Stop)
- Misfire detection (primary)
- Internal failure of the high voltage supply
- Output Error Detection
- Shut down in the case of a faulty pickup or faulty pickup signals.
- Faulty voltage supply
- External EMI signals
- Overtemperature shutdown

## 10.2 Causes of Faults

### 10.2.1 Overspeed

The engine speed has exceeded the set overspeed value. An operating error caused by overspeed is indicated on the device by the status LED flashing four times (4 times red/off 250 ms, 750 ms off). Refer to the section *LED Functions* on page 25.

#### Potential Causes

- Speed controller does not function properly
- Fuel supply to engine is not optimal.
- Faulty pickup signal

### 10.2.2 Output Error Detection

An internal failure of the high voltage supply or a defective output switch occurs.

#### Potential Causes

- Hardware fault on the MIC100
- Defect in the wiring (short circuit or open circuit)

## 10 Errors

### 10.2.3 Misfire Detection (Primary)

Misfiring due to an open circuit on the primary side was detected and displayed in the runtime data.

#### Potential Causes

- Defect in the output wiring
- Ignition coil defective

### 10.2.4 Pickup Input Errors

Faulty input signals from the pickup are detected. A pickup input error is indicated on the device by the status LED flashing twice (2 times red/off 250 ms, 750 ms off). Refer to the section *LED Functions* on page 25.

#### Potential Causes

- Number of events does not match the set number
- Damage to or uneven running of trigger disc
- Interference in the wiring of the pickup
- Wiring of the pickup incorrect
- Distance of the pickup incorrect
- Dirt on the pickup

### 10.2.5 Acknowledging Faults

While the engine is shut down, you have the following options for acknowledging operational errors:

- Use *Error Acknowledge* in the MICT
- By disconnecting the supply voltage
- Acknowledgement of the error via CAN-Bus

## 10.3 Customer Service Information

You can reach our customer service during business hours at the following phone and fax number, or by email:

Phone: +49 5141 93 99 0

Fax: +49 5141 93 99 99

Email: [service@motortech.de](mailto:service@motortech.de)

### 10.4 Returning Equipment for Repair/Inspection

To return the device for repair and inspection, obtain a return form and return number from MOTORTECH.

Fill out the return form completely. The completely filled out return form guarantees fast, uncomplicated processing of your repair order.

Send the device and the return form to one of the two addresses below or to the nearest MOTORTECH representative:

#### MOTORTECH GmbH

Hogrevestr. 21-23  
29223 Celle

Germany

Phone: +49 5141 93 99 0  
Fax: +49 5141 93 99 98

[www.motortech.de](http://www.motortech.de)  
[motortech@motortech.de](mailto:motortech@motortech.de)

#### MOTORTECH Americas, LLC

1400 Dealers Avenue, Suite A  
New Orleans, LA 70123

USA

Phone: +1 504 355 4212  
Fax: +1 504 355 4217

[www.motortechamericas.com](http://www.motortechamericas.com)  
[info@motortechamericas.com](mailto:info@motortechamericas.com)

### 10.5 Instructions for Packaging the Equipment

For return shipment, equipment should be packaged as follows:

- Use packaging material that does not damage the equipment surfaces.
- Wrap the equipment with sturdy materials and stabilize it inside the packaging.
- Use sturdy adhesive film to seal the packaging.

# 11 Maintenance

## 11.1 Maintenance Instructions

Please follow the following maintenance instructions:

- Do not use caustic liquids or steam cleaners for cleaning the device.
- Clean the passive pickup at regular intervals.
- Check the ignition wires at regular intervals.
- Replace the pickups at regular intervals if operating them under elevated temperature conditions ( $> +90\text{ }^{\circ}\text{C}$  /  $> +194\text{ }^{\circ}\text{F}$ ).
- Regularly inspect all wires of the ignition system for damage and replace the wires as needed.
- Check all plug-in connections for proper condition.
- Service the spark plugs as per the instructions of the spark plug and engine manufacturers.

## 11.2 Spare Parts and Accessories

For spare parts and accessories for MIC100 ignition systems, please refer to our current product guide, which is available for download on the Internet at [www.motortech.de](http://www.motortech.de).

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