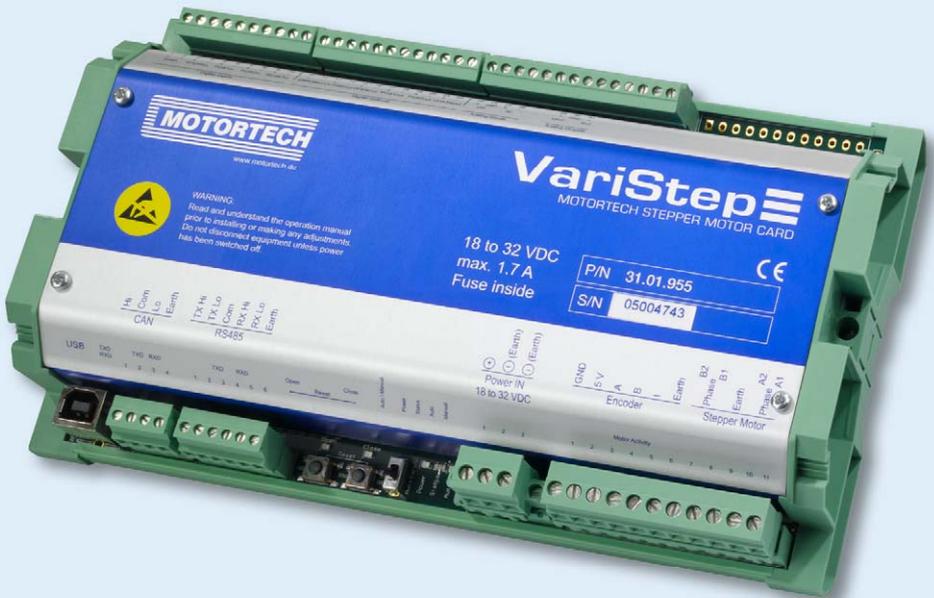


# VARISTEP – STEPPER MOTOR CARD

## OPERATING MANUAL



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# 1 GENERAL INFORMATION

Read through this operating manual carefully before use and become familiar with the machine. 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 set-up, 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.



### 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
CAN bus	Controller Area Network Bus	Bus for control devices/ networks	Asynchronous serial connection system for networking control devices
CE	Conformité Européenne	Conformity with EU directives	Mark based on EU legislation for certain products in conjunction with product safety
CPU	Central Processing Unit	Central processing unit	
DC	Direct Current	Direct Current	
EMC	Electromagnetic Compatibility		Compatibility of electrical or electronic equipment items with their surroundings
ESD	Electrostatic Discharge	Electrostatic Discharge	
ITB	Integrated Throttle Body	Throttle with integrated stepper motor card	
LED	Light Emitting Diode	Light emitting diode	Light emitting electronic semiconductor
MICT	MOTORTECH Integrated Configuration Tool		Configuration software for MOTORTECH control units
TG	Throttle Gear	Throttle gear	
USB	Universal Serial Bus		Serial wiring system to connect a computer to external equipment

## 2 SAFETY INSTRUCTIONS

### 2.1 General Safety Instructions

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

- The gas engine must only be operated by trained and authorized personnel.
- 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 power supply and secured against unintentional restarting.
- Perform only such maintenance and repair work as is described in this operating manual, and follow the instructions given while working. For maintenance of the equipment, only use spare parts supplied by MOTORTECH. 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.
- 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 lead to an explosion hazard. 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.

## 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 control system, the modules, and the work environment as possible.
- Do not remove the circuit boards from the housing of the device.

## 2.3 Special Safety Instructions for the Device



### Explosion hazard!

When the system is powered up, do not remove any connectors unless the system is not located in a potentially explosive atmosphere.



### Explosion hazard!

If the system is not entirely tight and sealed, gas may escape and lead to an explosion hazard. Upon completion of all assembly works, always check the system's tightness. Also ensure that the gauge port on the VariFuel2 is closed.

All works involving gas-carrying parts must be executed by trained personnel only.



### Operational safety!

All screws of the connectors must be adequately tightened.

## 2 SAFETY INSTRUCTIONS



### **Risk of destruction due to electrostatic discharge!**

The VariStep stepper motor card may only be installed by specialized personnel who has been trained in handling ESD sensitive components and with due regard to relevant ESD standards. It must be installed into a control cabinet, and it is necessary to comply with the ESD standard DIN EN 61340-5-1; VDE 0300-5-1:2008-07.

Damages caused by electrostatic discharge are not covered by the guarantee.



### **Risk of burning!**

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



### **Risk of damage!**

The stepper motor of the VariFuel2 is not suitable for carrying or lifting a gas mixer. There is a danger that the stepper motor could break, and if the gas mixer were to fall, it could result in injury or property damage.

Always carry or lift the gas mixer by its exterior housing.

### **2.4 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 VariStep stepper motor card drives the stepper motor of a VariFuel2 gas mixer or throttle. This stepper motor carries out position changes:

- In the VariFuel2 gas mixer the stepper motor changes the openings of the fuel ring and thereby adjusts the composition of the gas-air mix.
- In the throttles the stepper motor changes the opening angle of the throttle and thereby controls the supply of the gas-air mix.

Control can be manual or automatic. Manual adjustments can be made using buttons on the stepper motor card or via a connected PC. In automatic mode, digital or analog input signals, such as those provided by a master control, are analyzed. In addition, connection to the aggregate control ALL-IN-ONE via CAN bus is possible.

The stepper motor card is configured using a connected PC. The software used for this purpose is also used to display current system data and error messages.

### 3.2 Applications

The VariStep stepper motor card can be used for the following MOTORTECH devices.

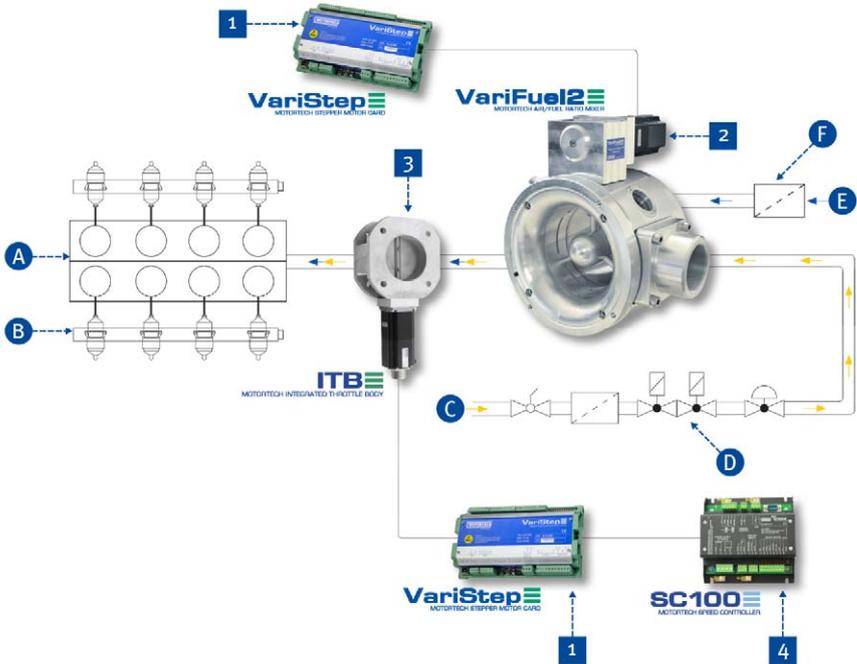
- VariFuel2 gas mixer with stepper motor
- ITB throttles with integrated stepper motor
- TG throttle gears

If several devices which are to be controlled via the VariStep stepper motor card are to be used in one system, several stepper motor cards are needed. An additional splitter is not necessary.

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.

## 3 INTENDED USE

### System Overview (Example)



- 1 VariStep stepper motor cards
- 2 VariFuel2 gas mixer
- 3 ITB throttle with integrated stepper motor
- 4 SC100 speed control

- A Engine
- B Wiring rail (ignition)
- C Gas supply
- D Gas train
- E Air supply
- F Air filter

## 4 PRODUCT DESCRIPTION

### 4.1 Technical Data

#### 4.1.1 Certifications

The stepper motor card is certified in accordance with the following standards:

##### CE

- EMC Directive 2004/108/EC
  - Emission standard for industrial environments as per DIN EN 61000-6-4:2007
  - Immunity for industrial environments as per DIN EN 61000-6-2:2006

## 4 PRODUCT DESCRIPTION

### CE DECLARATION OF CONFORMITY

The company: **MOTORTECH GmbH**  
**Hogrevestrasse 21-23**  
**29223 Celle**

declares that the products: **VariStep stepper motor card**

intended purpose: **use with gas Otto engines**

complies with the provisions of the following EC Directives:  
**EMC Directive 2004/108/EC**

under consideration of the following standards:  
**DIN EN 61000-6-4:2007**  
**DIN EN 61000-6-2:2006**  
**DIN EN 61000-4-2, DIN EN 61000-4-3**  
**DIN EN 61000-4-4, DIN EN 61000-4-5**  
**DIN EN 61000-4-6, DIN EN 61000-4-8**

The marking of the product is: **P/N 31.01.955**

This declaration is submitted by:  
Name: Florian Virchow Position in company: Managing Director

Celle, dated 16.02.2011  
Place, date

  
Legally binding signature

### 4.1.2 Mechanical Data

The stepper motor card has the following mechanical characteristics:

Feature	Value
Dimensions	217 x 128 x 50 mm (8.54 x 5.04 x 1.97") (length x width x height)
Weight	655 g (1.44 lbs)
Shape of device	See chapter <i>Overview Drawings</i> on page 19
Mechanical Environmental Conditions	Protection: IP20
Climatic Environmental Conditions	-15 °C to 55 °C (5 °F to 131 °F) 85 % relative humidity, max. without condensation up to 2000 m (6561') above sea level

### 4.1.3 Warning Notices on the Device

Top of Device

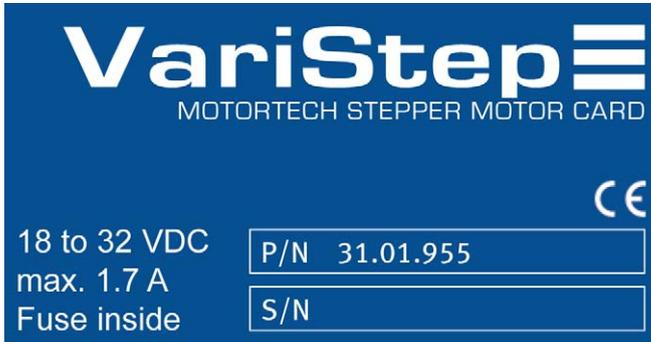
Warning	Meaning
 <p><b>WARNING!</b> Read and understand the installation and operating manual prior to installing or making any adjustments. Do not disconnect equipment unless power has been switched off.</p>	<p>Component subject to electrostatic hazards</p> <p><b>WARNING:</b> Read and understand the installation and operating manual prior to installing or making any adjustments. No connections to components may be separated under voltage.</p>

## 4 PRODUCT DESCRIPTION

### 4.1.4 Product Identification – Labeling on the Device

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

Top of Device



Bottom of Device



Abb.	Meaning
P/N	Product number of the stepper motor card
S/N	Serial number of the stepper motor card

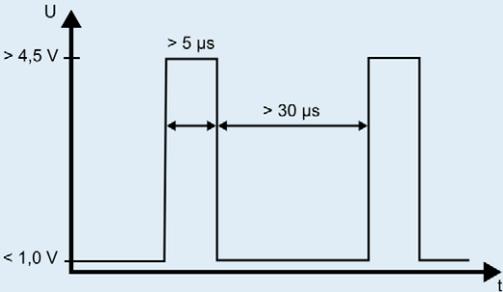
### 4.1.5 Electrical Data

The stepper motor card has the following electrical characteristics:

Feature	Value
Power consumption	Max. 31 W
Supply voltage	18 to 32 V DC
Required current	Max. 1,7 A
Internal fuse	3,15 A, delay, 5x20 mm, exchangeable

## Electrical Data for Inputs and Outputs

The inputs and outputs of the stepper motor card have the following electrical data:

Inputs and outputs	Values/characteristics
Digital inputs	<ul style="list-style-type: none"> <li>- Galvanically isolated</li> <li>- Input voltage up to 32 V DC</li> <li>- Input current at least 5 mA for high level</li> <li>- Save low level: Voltages below 1.0 V DC for at least 30 <math>\mu</math>s</li> <li>- Save high level: Voltages above 4.5 V DC for at least 5 <math>\mu</math>s</li> </ul> <p><b>Diagram of the Signal</b></p>  <p>When the reset signal is given, the high level must be present at the relevant input for at least 50 ms before it is possible to initiate the reset.</p>
Digital outputs	<ul style="list-style-type: none"> <li>- Galvanically isolated</li> <li>- Low level: output is high-impedance</li> <li>- High level: output is low-impedance</li> <li>- Switching voltage: maximum 32 V</li> <li>- Current: maximum 500 mA</li> </ul>
Analog voltage input ( $U_{in}$ )	<p>Permissible voltage: 0 to 10 V</p> <p>Input resistance: 12,4 k<math>\Omega</math></p>
Analog current input ( $I_{in}$ )	<p>Permissible current: 0 to 20 mA</p> <p>Max. difference in potential relative to device ground: +/-15 V</p> <p>Input resistance: 10 <math>\Omega</math></p>

## 4 PRODUCT DESCRIPTION

Inputs and outputs	Values/characteristics
Analog voltage output ( <i>U<sub>out</sub></i> )	Output voltage: 0 to 10 V Working resistance: min. 300 Ω
Analog current output ( <i>I<sub>out</sub></i> )	Output current: 0 to 20 mA Working resistance: max. 300 Ω

### 4.1.6 Interfaces

#### USB

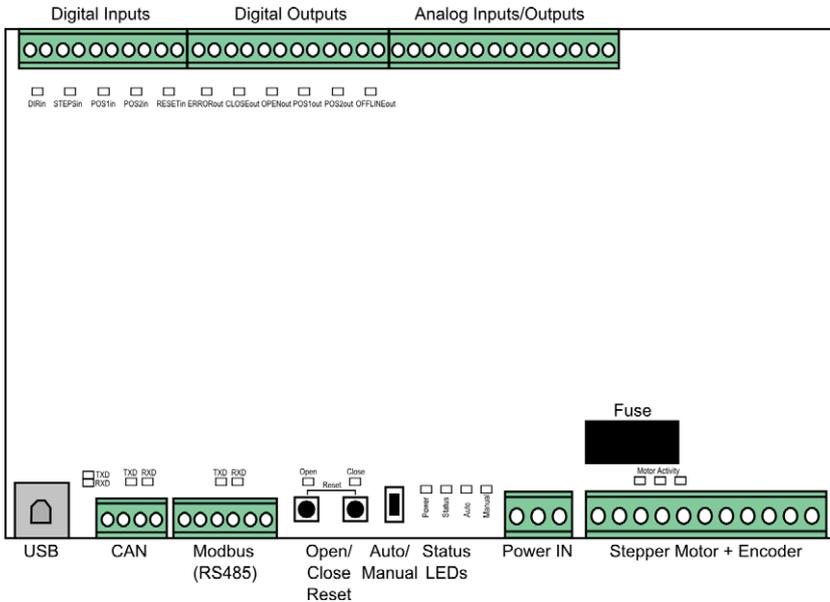
- Compatible with USB 1.1 and USB 2.0
- The connector *type B* is only suitable for temporary data exchange and not for a permanent connection.

#### CAN Bus 2.0B Interface

- As per ISO 11898, up to 1 MBit/s
- Transient-proof (automotive classification)
- Max. 110 participants

## 4.1.7 Overview Drawings

### Ports/Connections and LEDs



Designation	Function
Digital Inputs	Digital inputs via which position changes of the stepper motor are conducted. Beyond that, there is a digital input for a reset signal available (see <i>Wiring Digital Inputs</i> on page 26).
Digital Outputs	Digital outputs which signal the position of the stepper motor and the status of the stepper motor card (see <i>Wiring Digital Outputs</i> on page 27).
Analog Inputs/Outputs	Analog inputs and outputs by means of which you can change and resend the position of the stepper motor (see <i>Wiring Analog Inputs and Outputs</i> on page 28).
USB	Port for the data transmission to the PC. Data transmission is signaled by the blinking LEDs <i>TXD</i> and <i>RXD</i> ( <i>TXD</i> =Data are being sent, <i>RXD</i> =Data are being received).
CAN	Port for communication via CAN bus with master control ALL-IN-ONE. Data transmission is signaled by the blinking LEDs <i>TXD</i> and <i>RXD</i> ( <i>TXD</i> =Data are being sent, <i>RXD</i> =Data are being received).

## 4 PRODUCT DESCRIPTION

Designation	Function
Modbus (RS485) (not yet available)	Port for communication via Modbus with superordinate control devices. Data transmission is signaled by the blinking LEDs <i>TXD</i> and <i>RXD</i> ( <i>TXD</i> =Data are being sent, <i>RXD</i> =Data are being received).
Open/Close; Reset	In manual mode the stepper motor can be driven via the buttons <i>Open</i> and <i>Close</i> (see <i>Manual and Automatic Operation</i> on page 30). In the case of an error, the error can be reset followed by a reference run if you press the two buttons simultaneously.
Auto/Manual	Switch for changing between manual and automatic mode (see <i>Manual and Automatic Operation</i> on page 30)
Status LEDs	<ul style="list-style-type: none"> <li>– <i>Power</i>: The LED lights up if sufficient supply voltage is available.</li> <li>– <i>Status</i>: You can find details about status signaling in the following information box. <ul style="list-style-type: none"> <li>– flashes green The stepper motor card is working without any errors.</li> <li>– flashes orange A warning has occurred.</li> <li>– flashes red An error has occurred. (see <i>Runtime Data – Errors</i> on page 59).</li> </ul> </li> <li>– <i>Auto</i>: The LED lights up if the stepper motor card is in automatic mode and is controlled by the signals of the master control.</li> <li>– <i>Manual</i>: The LED lights up if the stepper motor card is in manual mode.</li> </ul>
Power IN	Connection for the supply voltage (see <i>Wiring Power Supply</i> on page 23)
Stepper Motor + Encoder	Port for the stepper motor and the encoder. The LEDs <i>Motor Activity</i> flash if the stepper motor moves (see <i>Wiring Stepper Motor and Encoder</i> on page 24).
Fuse	Replaceable fuse (3.15 A)



### Status signaling

The status of the VariStep stepper motor card is signaled via the LED *Status*.

- **Error-free operation:** flashes green
- **Warning:** flashes orange  
Warnings are reset by a reference run or by downloading a configuration to the device. For example, warnings are triggered by:
  - VariStep stepper motor card is unconfigured.
  - Device connected was changed.
  - Over-temperature or over current error confirmed by MICT.
- **Error:** flashes red  
Error can be confirmed via MICT, simultaneously pressing button *Open* and *Close* or by the external reset signal. Errors can for example be caused by:
  - Step Loss
  - Over temperature
  - Low voltage
  - Over current

# 5 INSTALLATION INSTRUCTIONS

## 5.1 Installation Instructions

Unpack the stepper motor without damaging it and ensure that the operating manual is always within reach of the device and easily accessible. Installation locations where strong vibrations or ambient temperatures of below  $-15\text{ }^{\circ}\text{C}$  ( $5\text{ }^{\circ}\text{F}$ ) or above  $+55\text{ }^{\circ}\text{C}$  ( $+131\text{ }^{\circ}\text{F}$ ) are present are not permissible and result in the warranty being voided.



### **Risk of damage!**

The device must not be installed directly on or at the engine, as vibration and heat may cause damage to electronic components.



### **Risk of damage!**

Make sure that the device is not covered and ensure sufficient circulation of air.



### **Risk of destruction due to electrostatic discharge!**

The VariStep stepper motor card may only be installed by specialized personnel who has been trained in handling ESD sensitive components and with due regard to relevant ESD standards. It must be installed into a control cabinet, and it is necessary to comply with the ESD standard DIN EN 61340-5-1; VDE 0300-5-1:2008-07.

Damages caused by electrostatic discharge are not covered by the guarantee.

## Scope of Supply

The VariStep stepper motor card as supplied consists of the following components:

- VariStep stepper motor card
- CD-ROM
- USB cable
- Operating manual

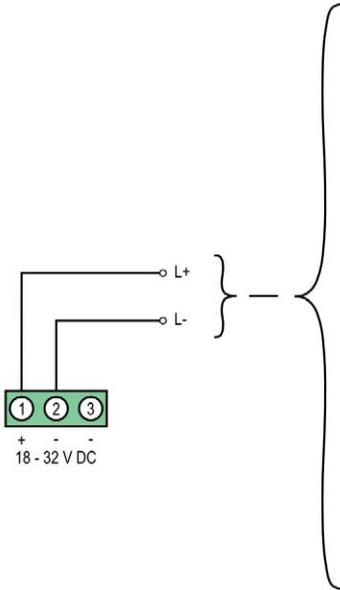
## Installation of the VariStep stepper motor card

1. Install the VariStep stepper motor card on a DIN rail in the panel.
2. Fix the card using the attachment screws on the sides.

# 6 WIRING OF THE STEPPER MOTOR CARD

## 6.1 Wiring Power Supply

The power supply is wired using the 3-pole plug.



Variations		
1	Battery	Generator Control Unit
2	Supply voltage	
3	Battery	Charger

# 6 WIRING OF THE STEPPER MOTOR CARD

## 6.2 Wiring Stepper Motor and Encoder

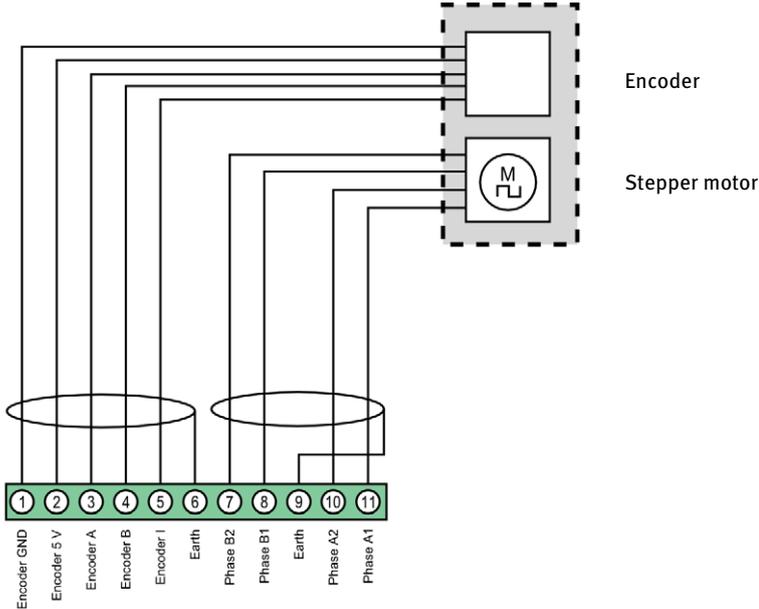


### Risk of damage!

To rule out the possibility of moving the devices connected out of the control area, observe the following procedure when connecting the stepper motor to the VariStep stepper motor card:

1. Configure the VariStep stepper motor card for the device type desired (see section *External Device* on page 46).
2. Separate the stepper motor card from the power supply.
3. Connect the stepper motor of the VariFuel2 gas mixer or the throttle to the stepper motor card.
4. Connect the VariStep stepper motor card again to the power supply.
  - ▶ Now, the stepper motor card will initiate a reference run. The device is ready for operation.

Wiring via the 11-pole plug on the stepper motor card. The length of the connecting cable must not exceed 10 m (32').



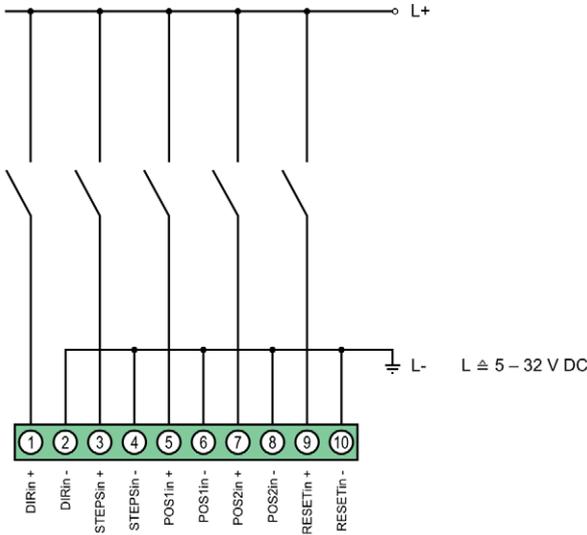
Pin assignment when using the original MOTORTECH wiring harness:

PIN stepper-motor card	Description	Pin stepper motor and encoder	Wire color/designation
1	Encoder ground	J	brown
2	Encoder 5V supply voltage	I	yellow
3	Encoder A	E	white
4	Encoder B	F	green
5	Encoder I (index)	G	gray
6	Encoder earth	H	shield
7	Stepper motor phase B2	D	4
8	Stepper motor phase B1	C	3
9	Stepper motor earth	H	shield
10	Stepper motor phase A2	B	2
11	Stepper motor phase A1	A	1

## 6 WIRING OF THE STEPPER MOTOR CARD

### 6.3 Wiring Digital Inputs

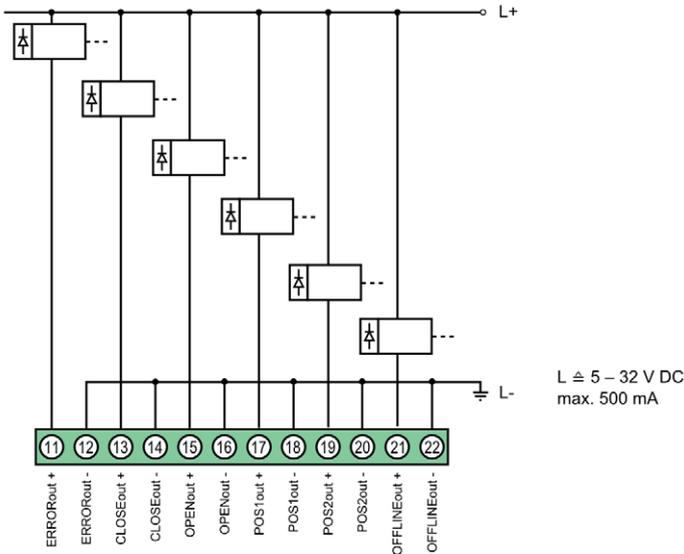
The digital inputs are wired using the 10-pole plug. The inputs can be switched both on the side of the operating voltage and on the ground side.



Pin	Designation	Function
1	DIRin +	The level on the digital input indicates the direction towards which the fuel ring of the VariFuel2 or the throttle is moved if there are pulse signals on the STEPSin input (see <i>Inputs / Outputs – Control Setup</i> on page 49).
2	DIRin -	
3	STEPSin +	Pulses on the input adjust the fuel ring of the VariFuel2 or the throttle in steps (see <i>Inputs / Outputs – Control Setup</i> on page 49).
4	STEPSin -	
5	POS1in +	If a high level is applied, position 1 as defined in the configuration is approached.
6	POS1in -	
7	POS2in +	If a high level is applied, position 2 as defined in the configuration is approached.
8	POS2in -	
9	RESETin +	If a high level is applied for at least 50 ms, the device exits the error mode and the stepper motor card is reset. Subsequently, it initiates a reference run.
10	RESETin -	

## 6.4 Wiring Digital Outputs

The digital outputs are wired using the 12-pole plug. The outputs can switch both the operating voltage and the ground.

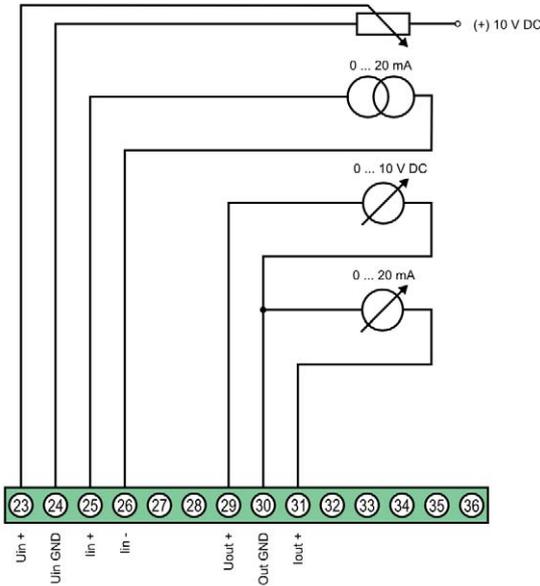


Pin	Designation	Function
11	ERRORout +	The output is low-resistance if an error has occurred and the stepper motor card is in automatic mode. To exit the error state, the error needs to be acknowledged (refer to <i>Acknowledging Faults</i> on page 71).
12	ERRORout -	
13	CLOSEout +	The output is low-resistance if the stepper motor has reached the closed position.
14	CLOSEout -	
15	OPENout +	The output is low-resistance if the stepper motor has reached the open position.
16	OPENout -	
17	POS1out +	The output is low-resistance if the stepper motor has reached the configured position 1.
18	POS1out -	
19	POS2out +	The output is low-resistance if the stepper motor has reached the configured position 2.
20	POS2out -	
21	OFFLINEout +	The output is low-resistance if the stepper motor card is in a state in which it does not react to external control signals (e. g. manual mode or reference run).
22	OFFLINEout -	

# 6 WIRING OF THE STEPPER MOTOR CARD

## 6.5 Wiring Analog Inputs and Outputs

The analog inputs and outputs are wired using the 14-pole plug.



Pin	Designation	Function
23	Uin +	Voltage input, via which the fuel ring of the VariFuel2 or throttle can be adjusted (see <i>Inputs / Outputs – Control Setup</i> on page 49).
24	Uin GND	
25	lin +	Current input, via which the fuel ring of the VariFuel2 or throttle can be adjusted (see <i>Inputs / Outputs – Control Setup</i> on page 49).
26	lin -	
29	Uout +	Voltage and current output with shared ground. The outputs provide the current position of the fuel ring of the VariFuel2 or throttle as corresponding signal.
30	Uout/lout GND	
31	lout +	

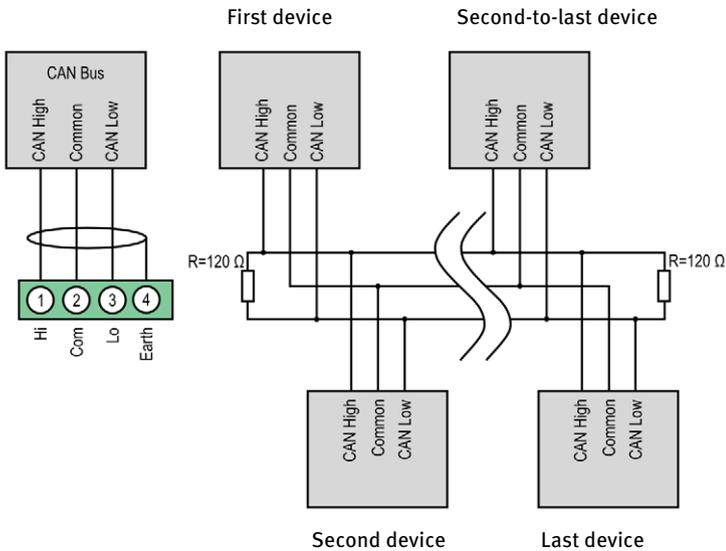


### Unused inputs and outputs

Note that the terminals for the analog inputs and outputs not selected in the MICT must remain unoccupied.

## 6.6 Wiring CAN Bus

The CAN bus interface is wired using the 4-pole plug.



### CAN bus wiring

Note the following when connecting the CAN bus:

- There can be a maximum of 110 devices connected to one CAN bus.
- The maximum wire length is 250 m (820') depending on the transfer rate.
- Each bus end must be fitted with a terminating resistor of 120 Ω (see drawing).

# 7 FUNCTIONS

## 7.1 Manual and Automatic Operation

Adjusting the opening of the throttle or the openings in the fuel ring of the VariFuel2 can be carried out via the stepper motor card in two operation modes:

- Manual operation
- Automatic operation

You can switch between manual and automatic mode using the switch *Auto/Manual* or via the MICT. In this case, the MICT overwrites the switch position on the device. Switching via the button *Auto/Manual* can be blocked by a setting in MICT. Illumination of the status LEDs *Manual* or *Auto* indicates in which operation mode the stepper motor card is at the moment.

### Manual Operation

In manual operation, the external input signals of the master control are ignored. You can change the position of the throttle and fuel ring of VariFuel2 using the two buttons *Open* and *Close*. The stepper motor card must also be in manual operation for configuration via the MICT and for transferring settings to the device.



#### Risk of damage!

In manual operation, the signals of the master control are not analyzed. If you make any adjustments in the manual mode with the gas engine running, make sure that these settings do not endanger the correct operation of the gas engine.

### Automatic Operation

In automatic operation, the stepper motor card evaluates the external input signals of the control unit connected. The buttons *Open* and *Close* are deactivated. The device cannot be configured via the MICT. In automatic operation, the MICT can only be used to display the data and to create log files.

## 7.2 Reference Run

After the device is switched on or was reset, the VariStep stepper motor card initiates a reference run. This means that the stepper motor determines its current position. In automatic mode, the stepper motor subsequently approaches the position defined by the master control. In manual mode the device connected initially remains in the following position:

- VariFuel2 gas mixer remains in the open position.
- Throttles remain in the closed position.

During the reference run the output *OFFLINEout* is low resistance and the corresponding LED lights up. The signals of the inputs are not analyzed. A reference run can also be triggered via the MICT.

### 7.3 Open/Closed Positions

The Open and the Close position are specified as follows:

- *Open*: Throttle or fuel ring of the VariFuel2 is completely open (100 % open)
- *Closed*: Throttle or fuel ring of the VariFuel2 is completely closed (0 % open)

When one of these positions is reached, the relevant digital output *OPENout* or *CLOSEout* will be switched and the relevant LED lights up. The connected devices cannot be moved beyond these two positions and all corresponding signals are limited.

### 7.4 Configurable Opening Angles (Position 1 and 2)

Two opening angles are configured via the MICT, which can be driven directly via digital inputs (*POS1in*, *POS2in*). If the signals *POS1in* and *POS2in* are simultaneously present, position 1 is driven. When the stepper motor reaches one of the two positions, the relevant digital output (*POS1out*, *POS2out*) is switched and the corresponding LED lights up. In this way, you can define the opening angles for certain operating states such as starting or purging the gas engine.

You can configure positions 1 and 2 with the MICT. *Positions – Values* on page 52.

### 7.5 Change of Opening Angles via Digital and Analog Inputs

In automatic mode the opening angle can be controlled directly via the following inputs.

- Digital inputs *DIRin* and *STEPSin*
- Analog voltage input *Uin*
- Analog power input *Iin*
- Field bus *CAN*

Depending on which master control you are using, you can select the required input using the MICT. If one of both end positions (*open* or *closed*) has been reached, the signals are limited at the inputs in the corresponding direction.

You can configure the inputs with the MICT. Refer to the section *Inputs / Outputs – Control Setup* on page 49.

### 7.6 Analysis of Positions via Analog Outputs or Field Bus

The current position of the throttle or the fuel ring of the VariFuel2 can be sent to the master control via an analog voltage output or an analog current output or a field bus. Using the MICT, it is possible to configure which of the two outputs is to be used and which voltage or current value corresponds to the Open or Close position. The current or voltage applied on the output is then determined accordingly proportional to the current opening angle.

You can configure the outputs with the MICT. Refer to the section *Inputs / Outputs – Control Setup* on page 49.

# 7 FUNCTIONS

## 7.7 Access Control

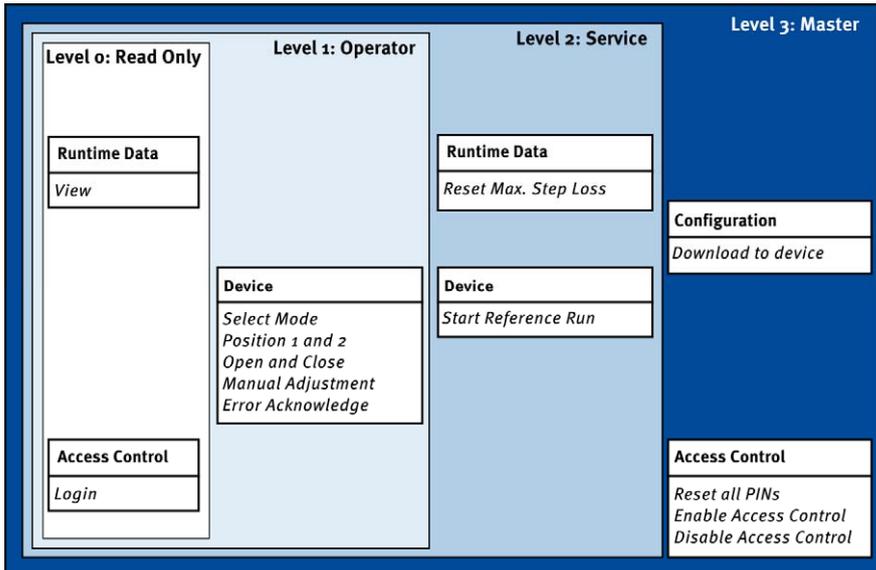
You can protect the VariStep stepper motor card against unauthorized access by establishing the access control in the MICT. The access control has four operating levels, three of which can be secured with different PINs. As a default setting, the access control is not activated. If the access control for the stepper motor card is activated, it is independent from the access levels that control the views within the MICT.



### Access Control

A user is logged in to the *Advanced Service* access level on the MICT. He changes a configuration and would like to download the latter to the stepper motor card. Although he has the full authorization set in the MICT, he is prompted to log in with the PIN for the *Level 3 (Master)*. This ensures that it is not possible for any user with an MICT and the generally valid password to change the configuration of your stepper motor card.

Various functions are at your disposal on the four operating levels. 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)**  
At this level the user can make position changes (closed and open position, position 1 and position 2, and make manual changes to the opening). Beyond that, he can change the operation mode and can confirm errors.
- **Level 2 (Service)**  
The service personnel can also initiate a reference run and reset the maximum step losses within the runtime data.
- **Level 3 (Master)**  
At this level, the master can also reset all PINs and activate and deactivate the access control. Moreover, only the master is authorized to download a changed configuration to the stepper motor card.

For information on the access levels in the MICT, please refer to the section *Access Levels in the MICT* on page 35.

# 8 SETTINGS VIA THE MICT

MICT is an abbreviation for *MOTORTECH Integrated Configuration Tool*. You configure your VariStep stepper motor card via the MICT and can adjust it to the master control and the device connected (gas mixer or throttle).

## 8.1 MICT System Requirements

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

- x86-compatible PC, at least performance class Intel Pentium 4 with 2 GHz
- 128 MB free RAM
- 100 MB free disk space
- USB interface 1.1 or higher
- Display with minimum XGA resolution (1024 x 786 pixels)
- Microsoft Windows XP, Windows 7

## 8.2 MICT Installation

The software for the installation of the MICT is on the CD-ROM enclosed with the VariStep stepper motor card.

To install the MICT, proceed as follows:

1. Start the installation.
  - CD-ROM as installation medium  
Insert the CD-ROM in the CD/DVD drive of your PC. If the Autorun function is activated for the drive, the installation will start automatically. If the function is disabled for the drive, the installation routine can be started with the file *setup.exe* from the CD-ROM directory.
  - Alternative  
Copy the installation routine *setup.exe* to your PC. The installation is started by executing the file.
2. Run the installation.  
Follow the instructions of the installation routine. Please note that the license agreement terms must be accepted before using the MICT. If the terms are not accepted, the installation cannot continue.
3. Install the USB driver by executing the file *CDMxxxxx\_Setup.exe* (e.g. *CDM20824\_Setup.exe*).
  - ▶ You have set up the MICT and can now connect your PC to the stepper motor card via the USB interface.

### 8.3 Access Levels in the MICT

You can open the MICT via *Start -> Programs -> MOTORTECH -> MICT -> MICT* on your PC.

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 71).



The following access levels are available:

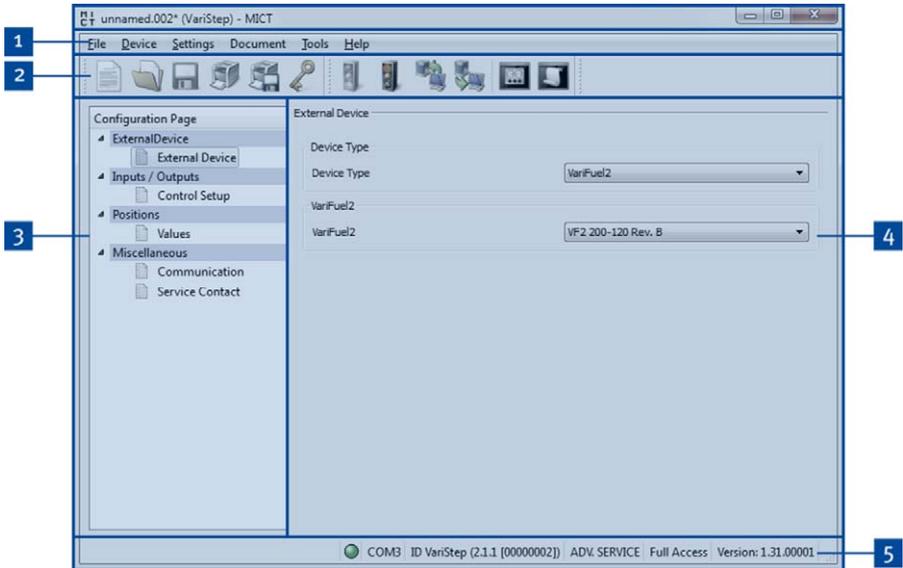
- **Read Only**  
On this level, the user can open a configuration and transfer it to the device. However, he cannot make changes to the configuration. The user has read-only access to all other settings.
- **Customer**  
This level enables the configuration of the basic functions required for operation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

## 8.4 Configuration Pages (Overview)

The configuration pages are divided into the following sections:



Item no.	Area
1	Menu bar
2	Toolbar
3	Navigation bar
4	Configuration section
5	Status bar

The functions in the menu, 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 controller:
  - 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 VariStep 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). Please refer to the section <i>Runtime Data</i> on page 55.
	<i>File -&gt; Open pickup trace</i>	Opens a saved recording of pickup signals (putrace file), for example from a MOTORTECH ignition controller. Pickup signals cannot be recorded by the VariStep.

## 8 SETTINGS VIA THE MICT

Symbol	Menu	Function
	<i>File -&gt; Change Access Level</i>	Changes the 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 PC to the device. This function can only be executed in manual mode.
	<i>Device -&gt; Upload from device</i>	Uploads configuration data from the device to the PC.
	<i>Device -&gt; Runtime data</i>	Opens the window <i>Runtime data</i> . Please refer to the section <i>Runtime Data</i> on page 55.
	<i>Device -&gt; Log</i>	Opens the window <i>Log (Advanced Service only)</i> . Please refer to the section <i>Log</i> on page 63.
	<i>Device -&gt; Select Mode</i>	Opens the window <i>Select operation mode</i> in which you can select the operation mode. The following modes are possible: <i>Manual operation mode</i> , <i>Automatic operation mode</i> or <i>Switch controls operation mode</i> .
	<i>Device -&gt; Manual Adjustment</i>	Opens a window in which you can manually adjust the opening angle.
	<i>Device -&gt; Open Position</i>	Completely opens the throttle or the fuel ring of the VariFuel2 in manual mode.
	<i>Device -&gt; Close Position</i>	Closes the throttle or the openings of the fuel ring of the VariFuel2 in manual mode.

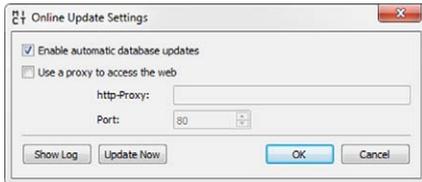
Symbol	Menu	Function
	<i>Device -&gt; Position 1</i>	In manual mode selects the position 1 set in the configuration by a percentage.
	<i>Device -&gt; Position 2</i>	In manual mode selects the position 2 set in the configuration by a percentage.
	<i>Device -&gt; Reference run</i>	Conducts a reference run in manual mode (only <i>Service</i> and <i>Advanced Service</i> ).
	<i>Device -&gt; Temperature Extremes</i>	Opens a window in which the maximum and minimum temperature are displayed. These values are measured throughout the operating time on the board of the stepper motor card.
	<i>Device -&gt; Error Acknowledge</i>	All operating errors are acknowledged.
	<i>Device -&gt; Access Control</i>	The setup for the access control to the device is described in a separate section. Please read the chapter <i>Access Control of the Stepper Motor Card</i> on page 41.
	<i>Device -&gt; Trigger Software Reset</i>	Restarts the device's operating software (only <i>Advanced Service</i> ).
	<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> . Please refer to the section <i>Online Update Settings</i> on page 40.
	<i>Settings -&gt; Database settings</i>	Opens a dialogue window in 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>	This function is available for certain MOTORTECH ignition controllers and has no effect in conjunction with the VariStep.
	<i>Document</i>	Has no function with the VariStep.
	<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

The MICT uses data from a VariFuel 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**  
Enable and disable the automatic online update using the checkbox. 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**  
Using the checkbox, you can activate settings for Internet access via a proxy server, which you can then set up by entering *http Proxy* and *Port*.
- **Show Log**  
Use this button to open a window in which the online updates performed are logged.
- **Update Now**  
Use this button to manually start an online update.



### Online Update

After the online update, the updated data will only be used if these have been downloaded onto the device. However, this requires the relevant authorization.

Whenever the configuration is uploaded from the device, the version of the configuration saved in the device will be compared with the version in the database. If the two versions are not the same, a window with additional instructions will open up.

## 8.7 Access Control of the Stepper Motor Card

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

- **Troubleshooting**
- **Position changes** (Open, Close, Position 1 and 2, Manual Adjustment, Reference Run)
- **Configuration** (transfer of a configuration to the stepper motor card)

The access control regulates the accesses to the stepper motor card via the MICT. For explanations concerning access control to the stepper motor card and the delimitation of the access levels in the MICT, refer to section *Access Control* on page 32.

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

*Device -> Access Control*

### 8.7.1 Enabling/Disabling Access Control



#### Enabling/Disabling 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 controls 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 *Resetting all PINs* on page 42.

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 SETTINGS VIA THE MICT

## 8.7.2 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*

## 8.7.3 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.

## 8.7.4 Resetting 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 in to the *Master (level 3)* level, you will be prompted to log in with the relevant PIN.
3. Accept 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 partner at MOTORTECH (refer to *Customer Service Information* on page 71). 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 partner.
3. Open with the menu entry *Device -> Access Control -> Input of authorization keys to reset all PINs* of the same window 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*.

## 8.8 Working with Configurations

To ensure that the VariStep stepper motor card interprets incoming data correctly and converts them to the desired control signals, it requires information on the device connected and the master control connected. This information is stored in a configuration file on the stepper motor card.

You need the MICT for the following tasks:

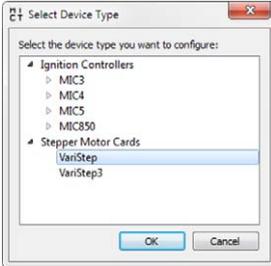
- Creating configuration files
- Opening configuration files from a data carrier
- Processing configuration files
- Saving configuration files on a data carrier
- Downloading configuration files to a VariStep stepper motor card
- Uploading configuration files from a stepper motor card
- Displaying current and saved runtime data

# 8 SETTINGS VIA THE MICT

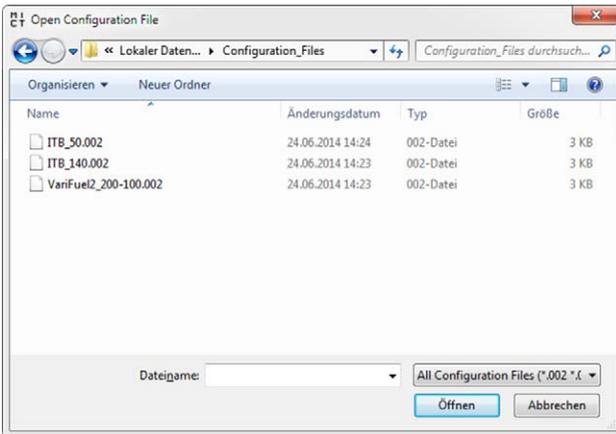
## 8.8.1 Create, Open, Save



Click on the symbol to launch a new configuration and select the entry *Stepper Motor Cards* -> *VariStep*.



Click on the symbol to open a saved configuration.



Click on the symbol to save the configuration currently displayed in the MICT to a data carrier.

## 8.8.2 Upload, Download



Click the symbol to upload the current configuration from the VariStep stepper motor card to the MICT. If applicable, the MICT first establishes a connection to the stepper motor card connected.



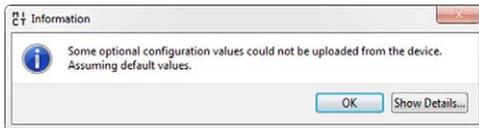
Click the symbol to download the configuration set in the MICT to the VariStep stepper motor card. This function can only be executed when the stepper motor card is in manual mode. This action overwrites the existing configuration of the MICT. If applicable, the MICT first establishes a connection to the stepper motor card connected.



### Existing configuration is cleared!

If you download a configuration to a VariStep stepper motor card, the previously used configuration is deleted and the new settings are immediately implemented.

## 8.8.3 Compatibility Information



If you upload a configuration from the VariStep stepper motor card 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 supported by the MICT.

The following situations can occur if you download a configuration from the MICT to a VariStep stepper motor card 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 supported by the firmware.

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

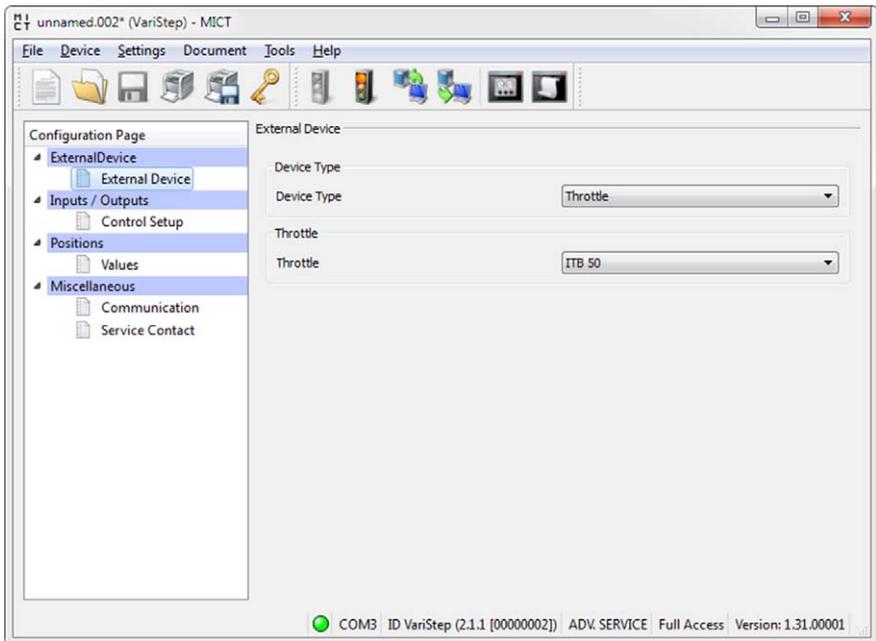
# 8 SETTINGS VIA THE MICT

Perform a firmware update, if necessary, and/or update your MICT so that you can use all the functions of the VariStep stepper motor card without restriction.

## 8.9 Configuration

The window opens after you select the device type for a new configuration or an existing configuration or have uploaded one from the device. 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.

### 8.9.1 External Device



To change the device type, approval for the access level *Advanced Service* is required.

## Device Type

Select the device type you wish to configure and drive with the VariStep stepper motor card from the drop-down list.

- **VariFuel2**  
Select this option to select the VariFuel2 type from the following drop-down list that corresponds to the device you want to configure. Note the stepper motor revision when making your selection.
- **Throttle**  
Select this option to select the throttle from the following drop-down list with integrated stepper motor (ITB) or the throttle gear (TG) that corresponds to your application.
- **Unknown**  
This option corresponds to the factory setting and cannot be reassigned if the device has been changed once.
- **None**  
Select this option if you wish to take the VariStep stepper motor card temporarily out of operation or store it. In addition, this option can be selected if the VariStep stepper motor card was configured for one device type and is then to be used for another device type. For this, also read the information box *Changing the device type*.



### Note the stepper motor revision

The revision of the stepper motor can be identified from the nameplate on the stepper motor of your VariFuel2.

VariFuel2 stepper motors whose revisions are not stated on the nameplate or which are supplied without a nameplate are revision A stepper motors. For revision A select under *External Device* the entry of your VariFuel2 type without revision information (e. g. *VF2 200-120* for a VariFuel2 of the type 200-120 with a revision A stepper motor).

If no VariFuel2 types with matching stepper motor revision are displayed under *External Device*, the VariFuel database of your MICT is not up-to-date. In this case, perform an online update. For further information, refer to the section *Online Update Settings* on page 40.

## 8 SETTINGS VIA THE MICT



### Changing the device type

The process how to exchange one VariFuel2 type for another is described below. However, the process can also be carried out correspondingly if you change the device type. For example, you would now like to use the VariStep which you used for a VariFuel2 gas mixer for a throttle.

#### Scenario:

You have replaced one VariFuel2 gas mixer with another VariFuel2 type.

#### Problem:

After connecting the new VariFuel2 gas mixer, the stepper motor card performs a reference run. However, since this configuration still contains data from the first gas mixer, it is possible that the VariFuel2 may leave the traversing range and be mechanically damaged as a result, or there is a risk that the VariFuel2 has to be readjusted.

#### Solution:

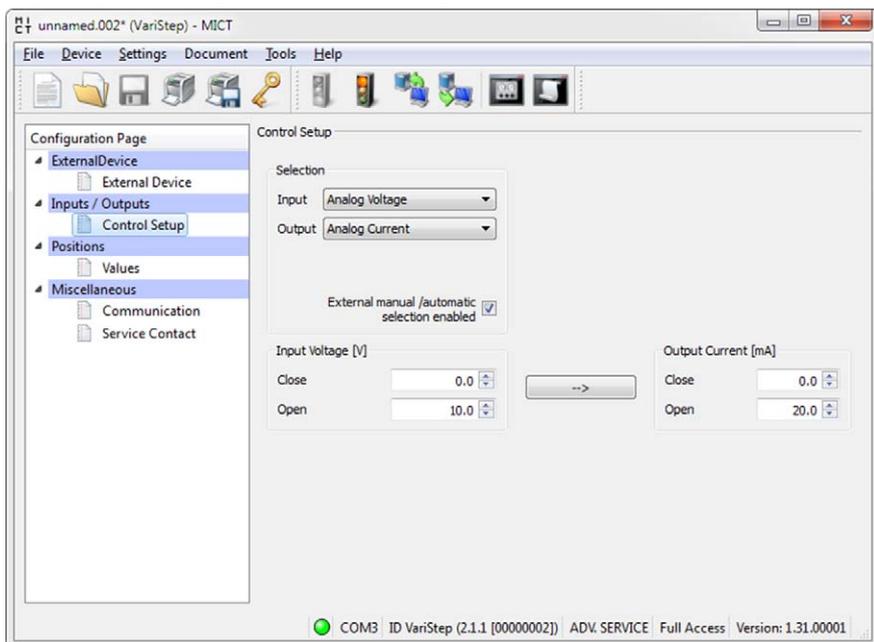
The following procedure will help to solve the problem:

1. Separate the first VariFuel2 from the stepper motor card.
2. Connect the MICT to the stepper motor card.
  - ▶ The defective connection with the stepper motor causes an operating error.
3. Switch to manual mode.
4. Acknowledge the error via the MICT (*Device -> Error Acknowledge*).
5. Change the configuration to the new VariFuel2 type.
6. Download the altered configuration to the device.
7. Separate the stepper motor card from the supply voltage.
8. Connect the new VariFuel2 to the stepper motor card.
9. Reconnect the stepper motor card to the supply voltage.
  - ▶ A reference run will be performed. The new VariFuel2 is then ready for operation.

#### Tip:

When you first configure the VariStep stepper motor card with the option *None* in the drop-down list *Device Type* no operating error is triggered after the device has been separated from the stepper motor card. You can now reconfigure the stepper motor card directly.

## 8.9.2 Inputs / Outputs – Control Setup



The settings on the configuration page depend on the inputs and outputs used by your master control. In this case, refer to all information given in the relevant documentations of the control units. To make changes, approval for the access level *Advanced Service* is required.

### Selection

#### – Input

Select the input that is to be used for position setting by the higher control connected. The following options are possible:

- **Analog Voltage**  
Position setting is achieved via an analog voltage signal.
- **Analog Current**  
Position setting is achieved via an analog current signal.
- **Digital Steps/Dir**  
Position setting is achieved via a digital signal.
- **Field bus**  
Position setting is achieved via the ALL-IN-ONE. For this purpose the communication with the ALL-IN-ONE must be configured (see *Miscellaneous – Communication* on page 53)

## 8 SETTINGS VIA THE MICT

- **Output**  
Select the analog output that is to be used by the connected master control.
- **External manual/automatic selection enabled**  
Please deactivate the check box to disable the switch *Auto/Manual* on the stepper motor card. The stepper motor card may then only be put in manual mode via the MICT with the corresponding authorization.

### Input Voltage/Input Current

Depending on which input is selected, you have different adjustment options available. For the analog inputs, enter the values for the open and closed position of the fuel ring. Here, please adhere to the following values:

- Input voltage: 0 to 10 V
- Input current: 0 to 20 mA

### Input Step Count/Step Count Configuration

Set the *Direction* and the *Init Position* of the steps for the digital inputs. The initial position (=Init Position) will be approached after the reference run of the stepper motor.

To make these settings, refer to all additional information as provided in the following note.



Click this button to apply the settings of the analog input (current or voltage) to the output selected. If you have selected another input as output (e. g. input: current; output: voltage), the adjusted values are converted in accordance with the output's value range.

### Output Voltage/Output Current

Depending on the selection, enter the relevant current or voltage values, which are to correspond to the open and closed position. Here, the same value ranges are applicable as with the analog inputs.



### Settings of the input selected

#### Analog Inputs (Current or Voltage)

Based on the values used by your master control, you can define the values of the Open and the Close position for the analog inputs in the MICT. The value applied to the input is then converted proportionally to the values entered in a corresponding opening angle of the throttle or the fuel ring of the VariFuelz.

#### Example:

Your master control works with a power input of 4 to 20 mA. In the MICT, you configure 4 mA to refer to the closed position and 20 mA to the open position. If the current on the input is now 16 mA, the opening is 75 %.

#### Digital Inputs

In the MICT, you can define the behavior for the digital inputs *DIRin* and *STEPSin*. The level on *DIRin* determines the direction in which the fuel ring of the VariFuelz or throttle move if pulses occur on *STEPSin*.

#### Example:

In the MICT under *Direction* you selected the option *Logic 1 -> Open*. If a high level is now applied on the *DIRin* with each pulse on the *STEPSin* one step is added to the current position. The fuel ring or throttle will then move gradually from the Close to the Open direction.

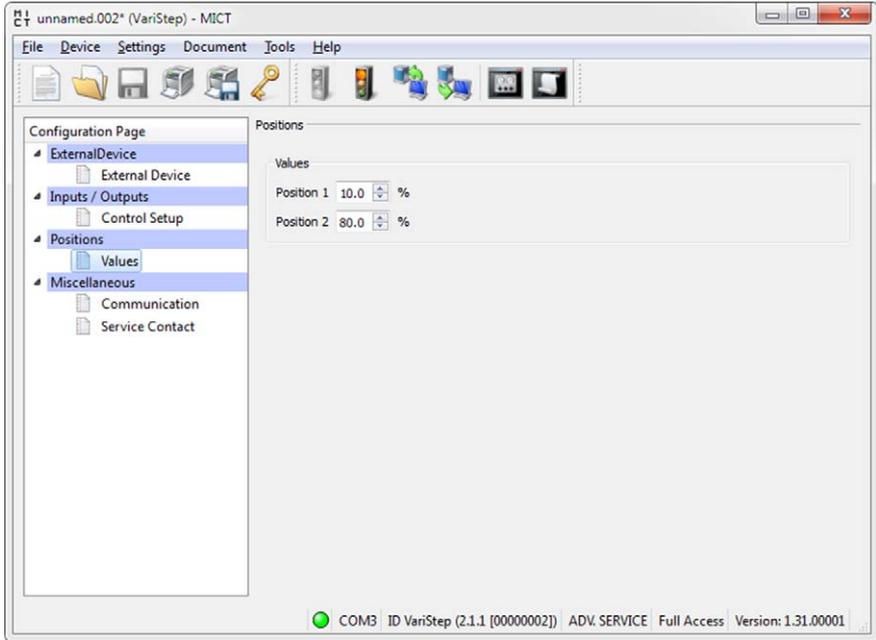


### Unused inputs and outputs

Note that the terminals for the analog inputs and outputs not selected in the MICT must remain unoccupied.

# 8 SETTINGS VIA THE MICT

## 8.9.3 Positions – Values

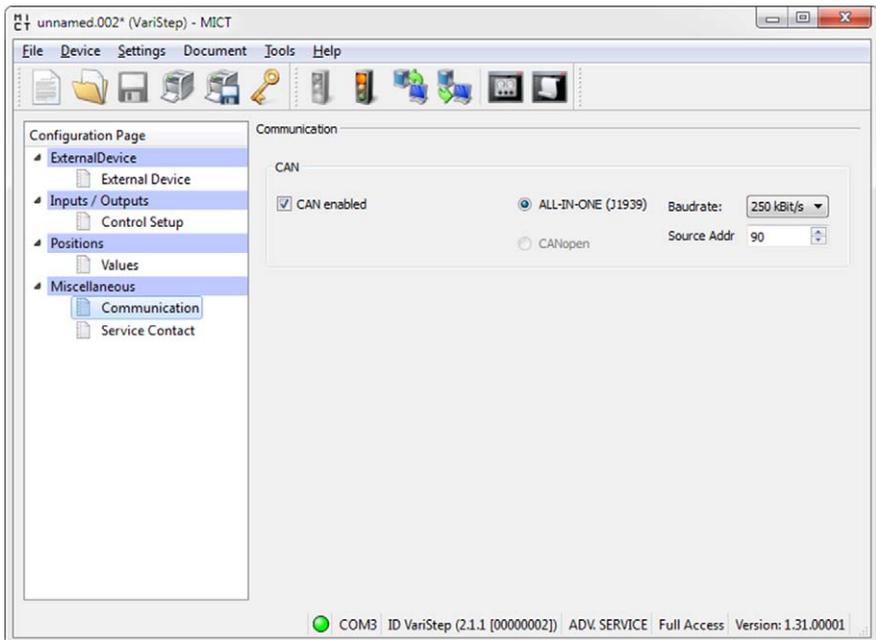


### Position 1/Position 2

You can define two configurable positions using these two input fields. For this approval for the access level *Service* or *Advanced Service* is needed. Enter the desired opening angle of the fuel ring of the VariFuel2 or throttle as percentage (100 % refers to open, 0 % refers to closed). The openings named here can be set in manual mode using the MICT or in automatic mode using the digital inputs of the stepper motor card.

For further information, refer to section *Configurable Opening Angles (Position 1 and 2)* on page 31.

## 8.9.4 Miscellaneous – Communication



### CAN

Deactivate or activate the CAN interface on the device via the field *CAN enabled*.

- **ALL-IN-ONE (J1939)**  
The protocol for communication with the ALL-IN-ONE is automatically selected upon activation of the CAN interface.
- **Baudrate**  
Select the desired data transfer rate from the list. In the protocol *ALL-IN-ONE (J1939)* 250 kBit/s and 500 kBit/s are available for selection.
- **Source Addr**  
In the protocol *ALL-IN-ONE (J1939)* the source address can be assigned between 0 and 253. Please note that IDs cannot be assigned more than once.

## 8 SETTINGS VIA THE MICT

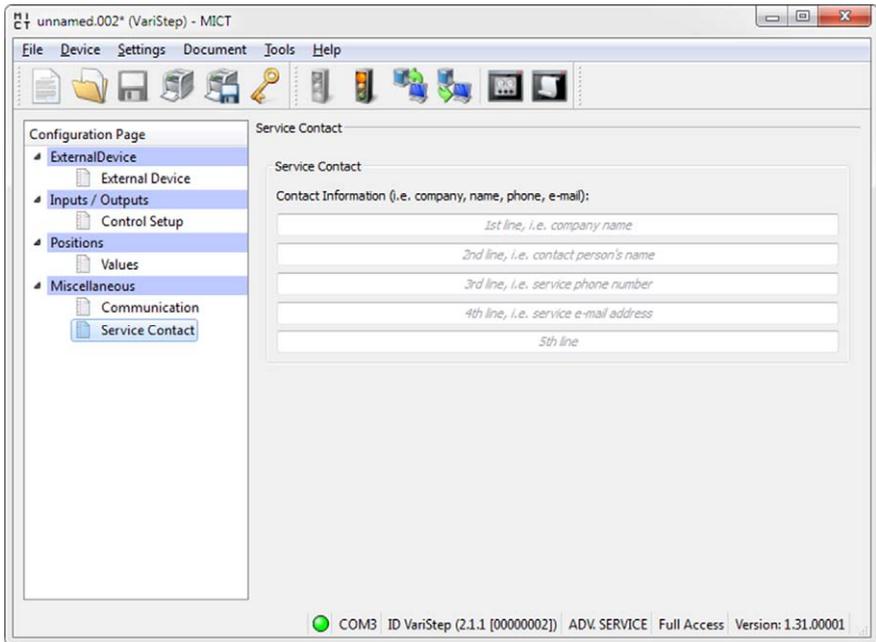


### Setting the transfer rate

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

### 8.9.5 Miscellaneous – Service Contact

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



#### Contact

In this area, you can store individual contact data.

## 8.10 Runtime Data



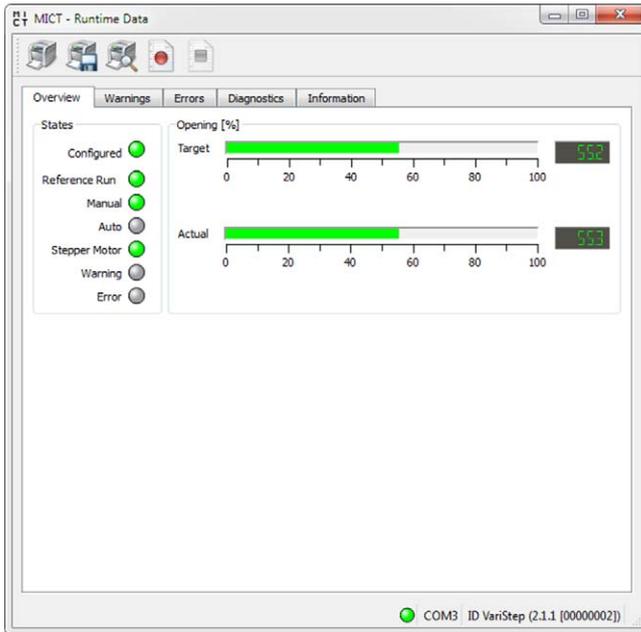
Click on the symbol to open the window *Runtime Data*. The following sections will give you an overview of the data you can view on the individual tabs.

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.

# 8 SETTINGS VIA THE MICT

## 8.10.1 Runtime Data – Overview



In this screen, you can find the following information:

### Reference Run

The status display provides information on the reference run:

- Green: The reference run was completed successfully.
- Yellow: The reference run is being carried out.
- Red: Errors occurred during the reference run. The reference point was not found.

### Manual/Auto

The status display indicates the operation mode selected:

- Green: The operation mode is set.
- Yellow: A command is carried out in the operation mode selected. In automatic operation mode, the status display will only turn yellow if position 1 or 2 is approached.
- Red: An error occurred in the operation mode selected.

### Stepper Motor

The status display indicates the condition of the stepper motor:

- Green: The stepper motor is ready.
- Yellow: The stepper motor is active.
- Red: An error occurred.

### Warning/Error

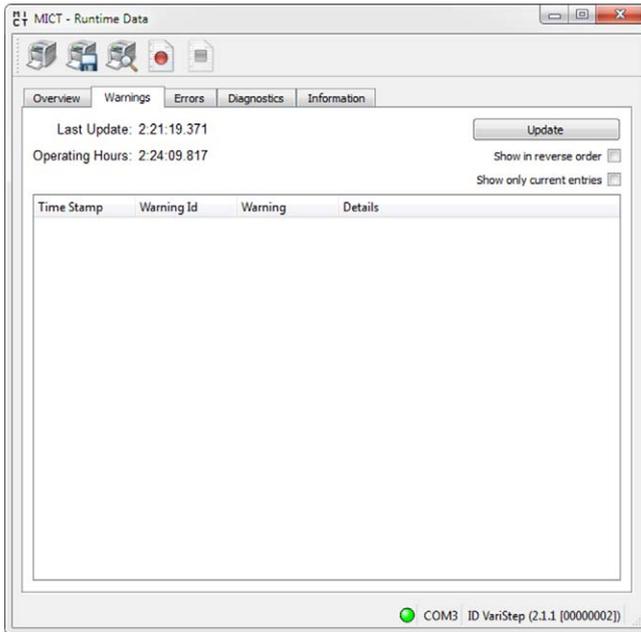
A red status display indicates that an error or a warning message occurred. The display will go out if the error is acknowledged via the MICT (*Device -> Error Acknowledge*). Please read sections *Runtime Data – Errors* on page 59 and *Runtime Data – Warnings* on page 58.

### Opening

- **Target**  
Value that is assigned to the stepper motor card in automatic mode by the master control or in manual mode by the MICT or the Open/Close buttons on the device.
- **Actual**  
The value shown corresponds to the percentage opening of the throttle or the fuel ring of the VariFuelz.

# 8 SETTINGS VIA THE MICT

## 8.10.2 Runtime Data – Warnings



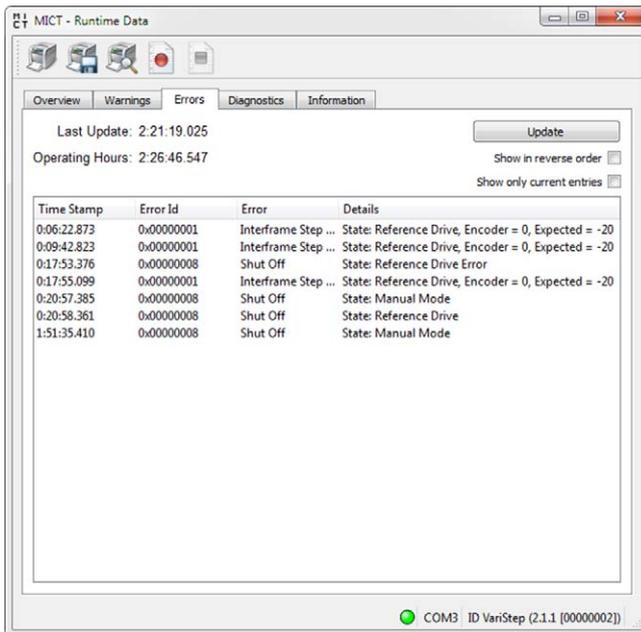
The following information is provided:

- **Time Stamp**  
Status of the operating hours counter at which the warning occurred.
- **Warning ID**  
The warning ID is used to identify the warning.
- **Warning**  
Brief description of the warning.

You have the following options:

- **Update**  
With the *Update* button, you can manually update the warning list displayed. If a warning occurs, the list is updated automatically.
- **Show in reverse order**  
Please activate the checkbox to reverse the order of the listed entries.
- **Show only current entries**  
Activate the checkbox to only show the entries which are still up-to-date.

### 8.10.3 Runtime Data – Errors



The following information is provided:

- **Time Stamp**  
Status of the operating hours counter at which the error occurred.
- **Error Id**  
The error ID serves to identify the error.
- **Error**  
Short description of the error. The following errors are possible:

Error	Description
Interframe Step Loss	<p>Step losses on account of rough running gas mixer or rough-running throttle</p> <p><b>Remedy:</b> Check device for rough running. In the case of the gas mixer, belt tension that is too high may be responsible for rough operation.</p>

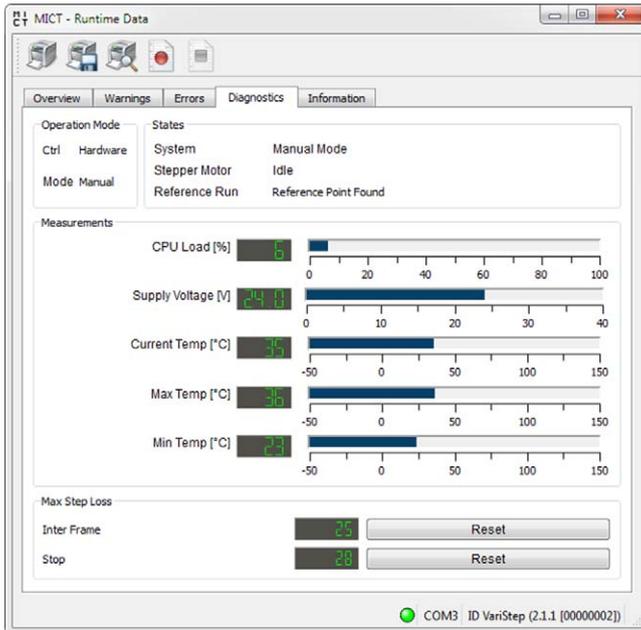
## 8 SETTINGS VIA THE MICT

Error	Description
Stop Step Loss	Step losses on account of rough running gas mixer or rough-running throttle  Remedy: Check device for rough running. In the case of the gas mixer, belt tension that is too high may be responsible for rough operation.
Timeout	The relevant action could not be finished within the predefined time.  Please inform the technical service incl. the entire error message.
Shut Off	Device was switched off.
Low Power IRQ	Short-time drops of the supply voltage.  Remedy: Improve supply voltage.
Etpu Handler Msg Queue Full	Software is overloaded. Please inform the technical service.
Input Handler Msg Queue Full	Software is overloaded. Please inform the technical service.
Output Handler Msg Queue Full	Software is overloaded. Please inform the technical service.
CAN Handler Msg Queue Full	Software is overloaded. Please inform the technical service.
Over Temperature IRQ	Over temperature  Remedy: Improve cooling.
Over Current IRQ	The current to the stepper motor is too high.  Remedy: Check wiring to the stepper motor.

You have the following options:

- [Update](#)  
With the *Update* button, you can manually update the error list displayed. If an error occurs, the list is updated automatically.
- [Show in reverse order](#)  
Please activate the checkbox to reverse the order of the listed entries.
- [Show only current entries](#)  
Activate the checkbox to only show the entries which are still up-to-date.

## 8.10.4 Runtime Data – Diagnostics



In this screen, you can find the following information:

### Operation Mode

The operation mode section shows which operation mode (*Manual* or *Automatic*) is currently active and how the operation mode was adjusted. Here, there are the following two options:

- **Ctrl**  
Shows if the operation mode was adjusted using the MICT or the switch *Auto/Manual* on the device (*Hardware*).
- **Mode**  
The operation mode set is shown.

### States

This area shows the current conditions of the stepper motor card, the stepper motor and all individual phases of the reference run.

### CPU Load

Current capacity utilization of the processor.

# 8 SETTINGS VIA THE MICT

## Supply Voltage

Current supply voltage of stepper motor card.

## Current Temp.

Current temperature of board.

## Max. Temp.

Maximum reached temperature of the board since the stepper motor card was switched on the last time.

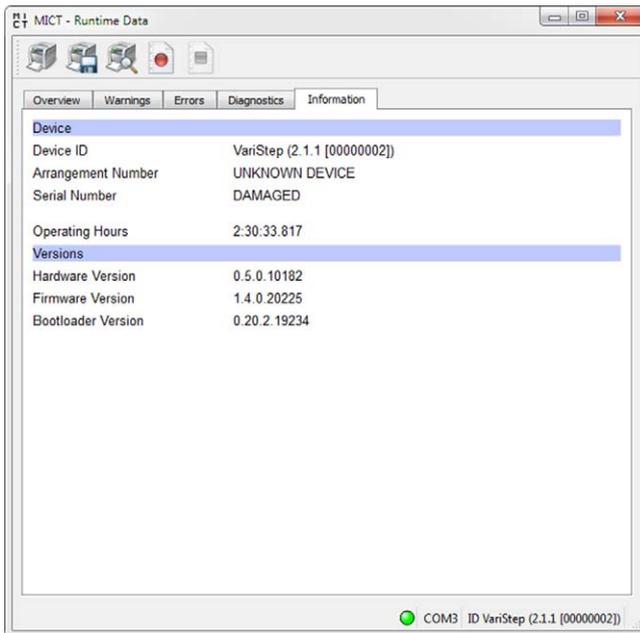
## Min. Temp.

Minimum reached temperature of the board since the stepper motor card was switched on the last time.

## Max. Step Loss

Internal diagnosis parameters associated with the control of the stepper motor. If the step losses are too high, this will cause an error message.

## 8.10.5 Runtime Data – Information



The screenshot shows a software window titled "MICT - Runtime Data" with a tabbed interface. The "Information" tab is selected, displaying the following data:

Device	
Device ID	VariStep (2.1.1 [00000002])
Arrangement Number	UNKNOWN DEVICE
Serial Number	DAMAGED
Operating Hours	2:30:33.817
Versions	
Hardware Version	0.5.0.10182
Firmware Version	1.4.0.20225
Bootloader Version	0.20.2.19234

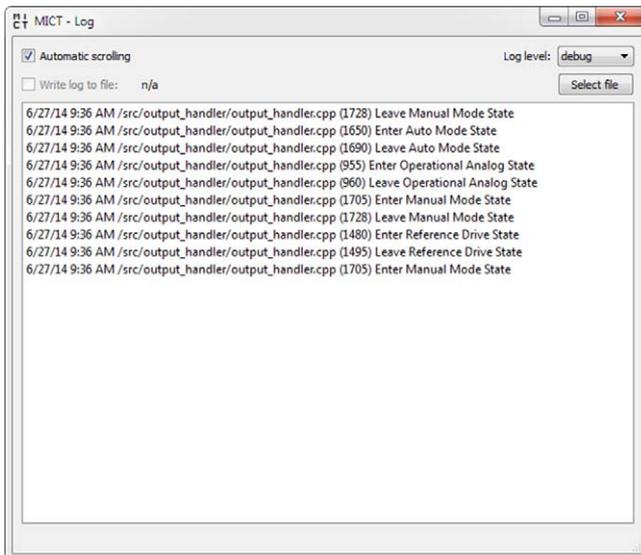
The status bar at the bottom of the window indicates "COM3 ID VariStep (2.1.1 [00000002])".

In this view, you can find an overview of the device and version data. You can also print the current runtime data or, in case of problems, send them to the MOTORTECH Service Department via fax or as a PDF file via e-mail. For fast support, we will then immediately have all required information.

## 8.11 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 disables, 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.

## 8 SETTINGS VIA THE MICT

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

## 9 OPERATION

### 9.1 Firmware Update

Using the MOTORTECH Flash Tool, you can perform a firmware update for the stepper motor card. The provided CD-ROM comprises this program.

#### Install MOTORTECH Flash Tool

This is how to install the MOTORTECH Flash Tool:

1. Start the installation.
  - Insert the CD-ROM into the CD/DVD drive of your PC. If the Autostart function is enabled for the drive, cancel the installation program for the MOTORTECH Integrated Configuration Tool if necessary.
  - Copy the file *MOTORTECHFlashTool-x.x.x.zip* (e. g. *MOTORTECHFlashTool-o.8.3.zip*) to your PC.
  - Unzip the file.
  - Start the installation routine by running the unzipped file *setup.exe*.
2. Install the program.
 

Follow the installation process instructions. Note that the license agreement terms must be accepted before using the MOTORTECH Flash Tool. If the terms are not accepted, the installation cannot continue.
3. If it has not yet occurred, install the USB driver by executing the file on the CD ROM *CDMxxxx\_Setup.exe* (e.g. *CDM20824\_Setup.exe*) .
  - ▶ You have now installed the MOTORTECH Flash Tool and can now connect your PC to the stepper motor card via the USB interface.

#### 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.

# 9 OPERATION

Symbol	Menu	Function
	<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 device, you need the PIN for the level *Master* for the firmware update. For more information read the section *Access Control of the Stepper Motor Card* on page 41.



### 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 further information please refer to the section *Working with Configurations* on page 43.

To start the firmware update, proceed as follows:

1. If an MICT is connected with the stepper motor card, disconnect this connection.
2. Launch the MOTORTECH Flash Tool via *Start -> Programs -> MOTORTECH -> MOTORTECH Flash Tool -> x.x.x (e. g. 0.8.3) -> MOTORTECH Flash Tool*.
  - ▶ The MOTORTECH Flash Tool will now start.
  - ▶ The software automatically checks all ports for connected devices.

3. Check in the area *Status* under *Device* whether your device was correctly recognized.
  - ▶ If the MOTORTECH Flash Tool does not recognize a device that is connected to your PC via the USB interface, you can usually still carry out a firmware update. To do so, observe the instructions in the information windows of the MOTORTECH Flash Tool for the following steps.
4. In the area *File* using the button *Select* select 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 stepper motor card will be restarted automatically.
  - ▶ Now, a window opens informing you about the firmware version currently used on your stepper motor card and also about the relevant update version.
7. Please 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.
  - ▶ Now, the stepper motor card will initiate a reference run.
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.



### 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 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: 1000 ms to 10000 ms, default value: 3000 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: 1000 ms to 10000 ms, default value: 3000 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 DISTURBANCES

### 10.1 Troubleshooting

If the stepper motor card detects an error, the LED *status* blinks red. You can find details about status signaling in the following information box. In automatic mode, the digital output *ERRORout* is also activated in the event of a fault and the corresponding LED lights up. Using the MICT you can see the type of error occurred. For this, refer to the section *Runtime Data – Errors* on page 59.



#### Status signaling

The status of the VariStep stepper motor card is signaled via the LED *Status*.

- **Error-free operation:** flashes green
- **Warning:** flashes orange  
Warnings are reset by a reference run or by downloading a configuration to the device. For example, warnings are triggered by:
  - VariStep stepper motor card is unconfigured.
  - Device connected was changed.
  - Over-temperature or over current error confirmed by MICT.
- **Error:** flashes red  
Error can be confirmed via MICT, simultaneously pressing button *Open* and *Close* or by the external reset signal. Errors can for example be caused by:
  - Step loss
  - Over temperature
  - Low voltage
  - Over current

### 10.2 Possible Faults

#### Low power

The supply voltage has fallen under 11 V.

Potential causes:

- The power supply is dimensioned too small.
- The battery is worn out.
- The wiring for the power supply is defective.
- The wiring for the power supply is routed incorrectly.

# 10 DISTURBANCES

## **Step loss**

The steps prescribed by the stepper motor card have not been carried out by the stepper motor.

Potential causes:

- The belt tension of the VariFuelz is too high.
- The fuel ring of the VariFuelz or throttle is stuck (e.g. due to deposits).
- The wiring to the stepper motor is defective or incorrect.
- The stepper motor is defective.

## **Over temperature**

The temperature of the board of the stepper motor card has been exceeded.

Potential causes:

- The ambient temperature is too high.
- Air circulation around the device is insufficient.

## **Reference run failed**

It was not possible to determine the reference point of the stepper motor.

Potential causes:

- The belt tension of the VariFuelz is too high.
- The fuel ring of the VariFuelz or throttle is stuck (e.g. due to deposits).
- The wiring to the stepper motor is defective or incorrect.
- The stepper motor is defective.

## **Over current**

The current to the stepper motor is too high.

Potential causes:

- The wiring to the stepper motor is defective or incorrect.
- The stepper motor is defective.
- The stepper motor card is defective.

## **Device does not react**

The throttle connected or gas mixer connected does not react to the signals of the stepper motor card.

Potential causes:

- The connection between the stepper motor and throttle or gas mixer has been interrupted.

### 10.3 Acknowledging Faults

In manual mode, you have the following options for acknowledging operating errors:

- By means of the function *Error acknowledge* in the MICT
- By pressing the *Open* and *Close* buttons simultaneously

In automatic mode, you have the following options for acknowledging operating errors:

- The master control sends a signal to the digital reset input
- By pressing the *Open* and *Close* buttons simultaneously
- By means of the function *Error Acknowledge* in the MICT

Critical errors can only be acknowledged by switching the device off and on.



#### **Error confirmation in automatic operation**

If the VariStep stepper motor card is in automatic mode and an error should immediately reoccur after the acknowledgment of this error via the MICT, switch over into the manual mode before re-acknowledging the error again. After you have acknowledged the error, you can correct a defective configuration and transfer it to the device via download.

### 10.4 Customer Service Information

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

Phone: +49 5141 93 99 0

Fax: +49 5141 93 99 99

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

# 10 DISTURBANCES

## 10.5 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  
Telefax: +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  
Telefax: +1 504 355 4217

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

## 10.6 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 Spare Parts and Accessories

For spare parts and accessories, please refer to our current Product Guide, which is available for you to download on the Internet at [www.motortech.de](http://www.motortech.de).

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### **MOTORTECH GmbH**

Hogrevestr. 21-23  
29223 Celle  
Phone: +49 5141 93 99 0  
Fax: +49 5141 93 99 99  
[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  
Phone: +1 504 355 4212  
Fax: +1 504 355 4217  
[www.motortechamericas.com](http://www.motortechamericas.com)  
[info@motortechamericas.com](mailto:info@motortechamericas.com)