

SparkScan1 – High Voltage Clamp

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?

The following abbreviations/acronyms are used in the operating manual.

| Abb. | Term | Description | Explanation |
|------|-------------------------|-------------------------------------|---|
| BNC | Bayonet Neill Concelman | | Special design of coaxial connectors |
| CE | Conformité Européenne | Conformity with EU legislation | Mark based on EU legislation for certain products in conjunction with product safety |
| UKCA | UK Conformity Assessed | Conformity with British legislation | Mark based on British legislation for certain products in conjunction with product safety |

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, there is danger to life through high voltage particularly in the area of the ignition system. 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 implanted cardiac devices!

Electromagnetic impulses in the wiring of the ignition system may exceed the permissible limits of active implanted cardiac devices such as pacemakers or defibrillators. Persons with cardiac devices 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.

2 Safety Instructions

- 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 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. It is imperative that you avoid contact with hot spots and wear safety gloves.
- Personal protective equipment (PPE), e.g. safety shoes and gloves, must be worn during all work on the gas 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.

2.3 Special Safety Instructions for the Device



High voltage! Danger to life!

While the engine is running, there is danger to life through high voltage particularly in the area of the ignition system. Do not touch the spark plug leads, ignition coils, and spark plugs with your hands while the engine is running. You can safely touch the grounded SparkScan1 high voltage clamp even when the engine is running.



High voltage! Danger to life!

Without proper grounding of the SparkScan1 high voltage clamp, life-threatening high voltage can occur. For your own safety, observe the following:

- Ensure at all times that the SparkScan1 is properly grounded to the engine via the grounding cable.
- If the grounding of the SparkScan1 comes loose during measuring (e.g. by tripping over the grounding cable), do not touch the measuring clamp and the cables of the SparkScan1 or the BNC connector of the SparkView. Switch off the engine, and when the ignition is inactive, restore proper grounding before proceeding with measuring.



High voltage! Danger to life!

In a wet environment and when the products are wet, there is a danger to life from high voltage with the SparkView high voltage indicator and SparkScan1 high voltage clamp. Likewise, wetness can destroy the products. Therefore, use the products only in dry condition in a dry environment.



High voltage! Danger to life!

If the SparkView high voltage indicator or the SparkScan1 high voltage clamp show any visible signs of damage in particular to cables and connectors, there is danger to life through high voltage and the measurements may be faulty. In such a case, refrain from using the respective product under any circumstances.



Risk of injury!

There is a risk of crushing in the area of the clamp. Be sure to keep fingers or other body parts away from the clamping surfaces.

2 Safety Instructions



Risk of injury!

To avoid injuring yourself, be careful not to trip over the cables of the SparkScan1 high voltage clamp.



Risk of damage!

Hot engine parts can damage the cables of the SparkScan1 high voltage clamp or the SparkView high voltage indicator. Avoid contact of the products with hot spots. Do not use damaged products.

Special Safety Instructions for the SparkView High Voltage Indicator



Risk of destruction!

Excess voltage may destroy or damage the SparkView high voltage indicator. Stop the measurement immediately if continuously values above 25 kV (set measuring range up to 25 kV) or above 50 kV (set measuring range up to 50 kV) are measured.



Risk of destruction!

When the battery compartment is open, moisture and dirt may get into the SparkView high voltage indicator and destroy it. You should therefore only use the device with the battery compartment cover firmly screwed shut.



Risk of destruction! Operational safety!

Third-party products can destroy the SparkView high voltage indicator and lead to incorrect measurement results. Operate the SparkView solely with the MOTORTECH SparkScan1 high voltage clamp, with high-quality MOTORTECH BNC cables and with MOTORTECH ignition coils featuring a BNC diagnostic interface.

2.4 Proper Disposal

For the proper disposal of MOTORTECH equipment, observe the information provided at www.motortech.de.

3 Intended Use



3.1 Functional Description

The SparkScan1 high voltage clamp offers the opportunity to measure the high voltage requirements and the spark duration of the spark plugs. From the measured values you can draw conclusions about the condition of the ignition system and of the spark plugs.

The capacitive measuring process can be used for preventive maintenance or for supportive analysis in the event of a problem. Regular measurements can thus also contribute to reducing maintenance costs. The measuring results are displayed via an oscilloscope or the SparkView high voltage indicator from MOTORTECH.

3.2 Application

The SparkScan1 high voltage clamp is designed exclusively for short-term measurements under full load on unshielded MOTORTECH high voltage spark plug leads with a maximum diameter of 7 mm (0.27").

In addition to the high voltage clamp SparkScan1, a SparkView high voltage indicator from MOTORTECH (length of SparkScan1 signal line max. 3 m / 118") or an oscilloscope is required for measuring. The SparkScan1 high voltage clamp must only be used with the specified devices under the specified conditions.

The SparkScan1 high voltage clamp must only be used by qualified personnel (see section *Who Is this Operating Manual Targeted to?* on page 5).

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 SparkScan1 high voltage clamp is certified as follows: CE, UKCA

The certificates can be obtained on request from your MOTORTECH contact person (see section *Customer Service Information* on page 23).

4.1.2 Mechanical Data

The SparkScan1 high voltage clamp has the following mechanical characteristics:

| Feature | Value |
|---|--|
| Dimensions high voltage clamp | 169 mm x 64 mm x 90 mm (6.66" x 2.52" x 3.55") (length x width x height) |
| Available lengths coaxial and grounding cable | 2 m (80"), 5 m (200"), 10 m (400") |
| Shape of device | See section <i>Overview</i> on page 14 |
| Mechanical environmental conditions | Pollution degree: 1 |
| Climatic environmental conditions | -20 °C (-4 °F) to +70 °C (+158 °F) Max. 80 % relative humidity without condensation Up to 2,000 m (6,561') above sea level |

4.1.3 Warning Notices on the Device

Warning Notice on the Clamping Handle of the High Voltage Clamp

Warning! Before use read and understand the operating manual. Always ground before use.

Warning Symbols on the Clamping Handle of the High Voltage Clamp



Warning of a hazardous point



Read operating manual

4 Product Description



Warning Notice on the Wrap-Around Label of the BNC Connector

Length of coaxial cable 2 m (80"):

WARNING! Only for use with SparkView high voltage indicator or an oscilloscope.

Length of coaxial cable 5 m (200") and 10 m (400"):

WARNING! Only for use with an oscilloscope.

4.1.4 Product Identification – Labeling on the Device

The necessary numbers for product identification are on the device:



Illustration example

| Abb. | Meaning |
|------|-----------------------------------|
| P/N | Part number of high voltage clamp |
| PC | Production code |

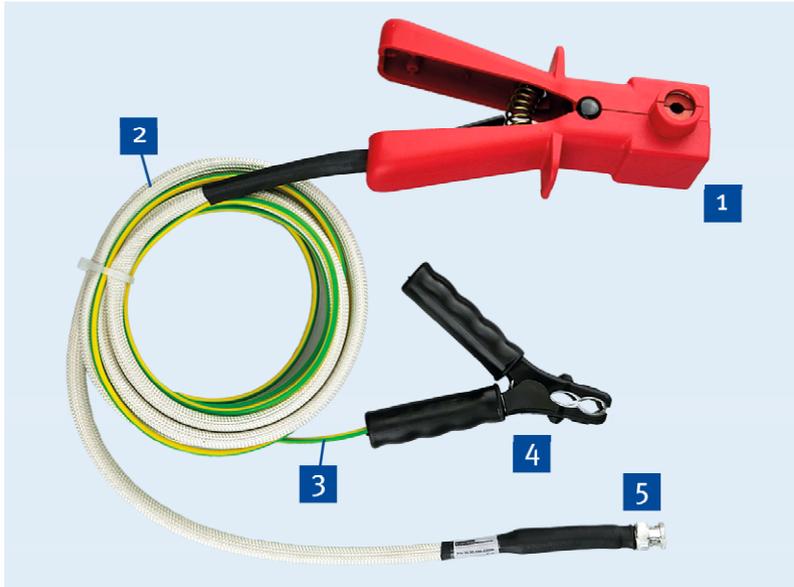
4.1.5 Electrical Data

The SparkScan1 high voltage clamp has the following electrical characteristics:

| Feature | Value |
|---|---|
| Measuring range | 5 kV to 50 kV (in operation) |
| Tolerance | Up to 20 kV: ± 1 kV At higher voltages: ± 2 kV |
| Voltage ratio | 1000:1 |
| Maximum diameter of MOTORTECH spark plug lead | 7 mm (0.27") |

4 Product Description

4.1.6 Overview



| Pos. | Designation |
|------|---|
| 1 | Clamp body, in the form of a clamping handle |
| 2 | Coaxial cable |
| 3 | Grounding cable |
| 4 | Ground terminal, alternative design as eyelet |
| 5 | BNC connector |

5 Operation

5.1 Unpacking

Unpack the inductive high voltage clamp, taking care not to damage it, and ensure that the operating manual is always near to the device and is easily accessible. Check the contents for completeness and verify that the equipment meets your application requirements.

5.2 Measuring High Voltage



High voltage! Danger to life!

While the engine is running, there is danger to life through high voltage particularly in the area of the ignition system. Do not touch the spark plug leads, ignition coils, and spark plugs with your hands while the engine is running. You can safely touch the grounded SparkScan1 high voltage clamp even when the engine is running.



High voltage! Danger to life!

In a wet environment and when the products are wet, there is a danger to life from high voltage with the SparkView high voltage indicator and SparkScan1 high voltage clamp. Likewise, wetness can destroy the products. Therefore, use the products only in dry condition in a dry environment.



Operational safety!

Additionally follow the instructions in the manual of the SparkView high voltage indicator and of the oscilloscope in order to guarantee the safe operation of the SparkScan1 high voltage clamp.



Risk of injury!

There is a risk of crushing in the area of the clamp. Be sure to keep fingers or other body parts away from the clamping surfaces.



Risk of injury!

To avoid injuring yourself, be careful not to trip over the cables of the SparkScan1 high voltage clamp.

5 Operation

The SparkView high voltage indicator is only suitable for measurements taken with the SparkScan1 with two meter (80") long coaxial cable.

Damages to the SparkScan1 high voltage clamp including its cables may result in danger to life through high voltage and the measurements may be faulty. Before each use, visually inspect the SparkScan1 to make sure it is not damaged, otherwise do not use the SparkScan1. If you have any questions on the safe operation and measurement accuracy of your SparkScan1, contact your MOTORTECH contact person (see section *Customer Service Information* on page 23).

Prepare for measuring as follows:

1. Adjust the oscilloscope or the SparkView high voltage indicator from MOTORTECH for the measuring process. Further details about adjustments can be found in the operating manual of the corresponding device.



High voltage! Danger to life!

Without proper grounding of the SparkScan1 high voltage clamp, life-threatening high voltage can occur. For your own safety, observe the following:

- Ensure at all times that the SparkScan1 is properly grounded to the engine via the grounding cable.
- If the grounding of the SparkScan1 comes loose during measuring (e.g. by tripping over the grounding cable), do not touch the measuring clamp and the cables of the SparkScan1 or the BNC connector of the SparkView. Switch off the engine, and when the ignition is inactive, restore proper grounding before proceeding with measuring.



High voltage! Danger to life!

If the insulation of the ignition components is insufficient or damaged, there is a danger to life through high voltage due to leaping sparks and the measurements may be faulty.

Stop the measurement immediately if sparks leap. Switch off the engine and do not proceed with the measurement until you are sure that the ignition components are sufficiently insulated.



Risk of damage!

Hot engine parts can damage the cables of the SparkScan1 high voltage clamp or the SparkView high voltage indicator. Avoid contact of the products with hot spots. Do not use damaged products.

5 Operation

- Depending on its design, ground the high voltage clamp at a suitable location on the engine that provides a safe electrical connection to ground.
 - Design with grounding clamp: For grounding, use the grounding clamp at the high voltage clamp's grounding cable.



- Design with eyelet: For grounding, use the eyelet at the high voltage clamp's grounding cable. Make sure that the eyelet is securely fastened to the grounding point.



- Connect the coaxial cable with the aid of the BNC connector to an oscilloscope or to the SparkView high voltage indicator from MOTORTECH.

5 Operation

4. Clamp the high voltage clamp as far away as possible from the ignition coil and with sufficient distance to the spark plug to an unshielded spark plug lead from MOTORTECH without touching the spark plug lead, the ignition coil, or the spark plug with your hands.

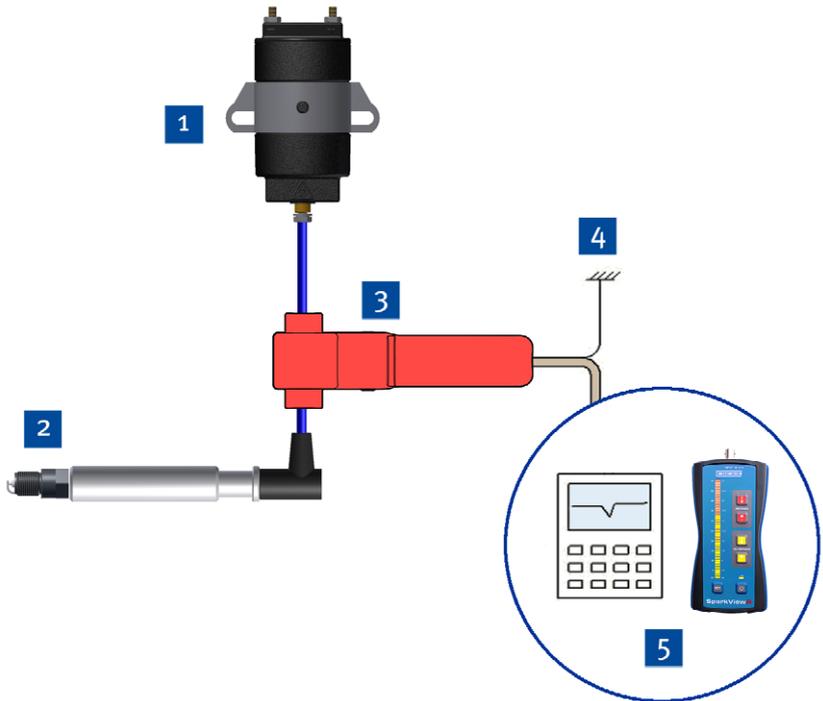


Maximum diameter of spark plug leads

For a reliable measurement it is necessary for the contact surfaces to be touching each other. This is only guaranteed for MOTORTECH spark plug leads up to a maximum diameter of 7 mm (0.27").

5 Operation

- ▶ The test setup looks like this:



| Pos. | Designation |
|------|--------------------------|
| 1 | Ignition coil |
| 2 | Spark plug |
| 3 | High voltage clamp |
| 4 | Grounding |
| 5 | Oscilloscope / SparkView |

- ▶ You can read out or record the measured values from the oscilloscope or the SparkView.

5 Operation



Risk of damage!

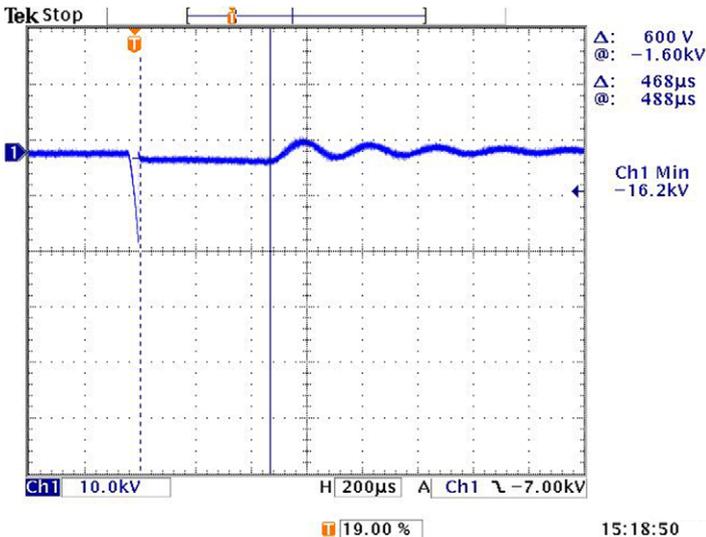
The SparkScan1 high voltage clamp is designed for short-term measuring of high voltages under full load and must not remain on the spark plug lead permanently. Otherwise, the spark plug lead may be damaged.

5.3 Evaluation of Measuring Results

This section contains some typical results from measurements taken with the inductive high voltage clamp and an oscilloscope. The important factors include both the voltage and spark duration as well as a clean curve. In order to be able to draw reliable conclusions about the condition of your ignition system, please also read the operating manuals for the engine, the ignition system and the oscilloscope used.

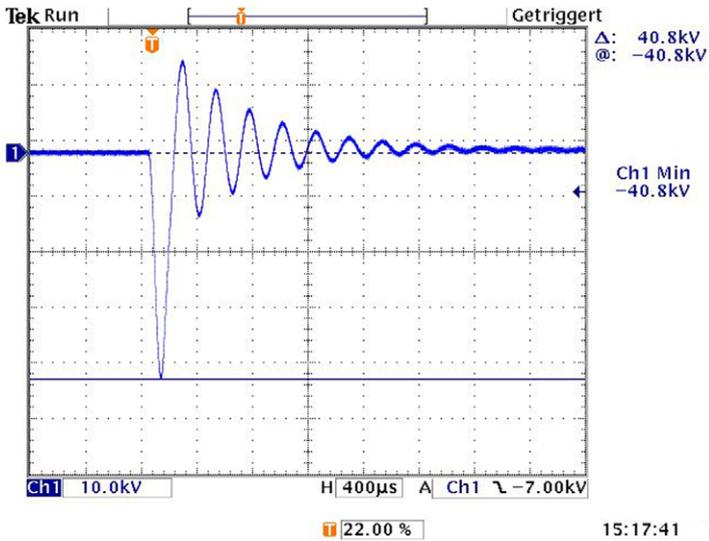
Typical Curve for an Intact Ignition System

- Measurement with ignition coil connected:



5 Operation

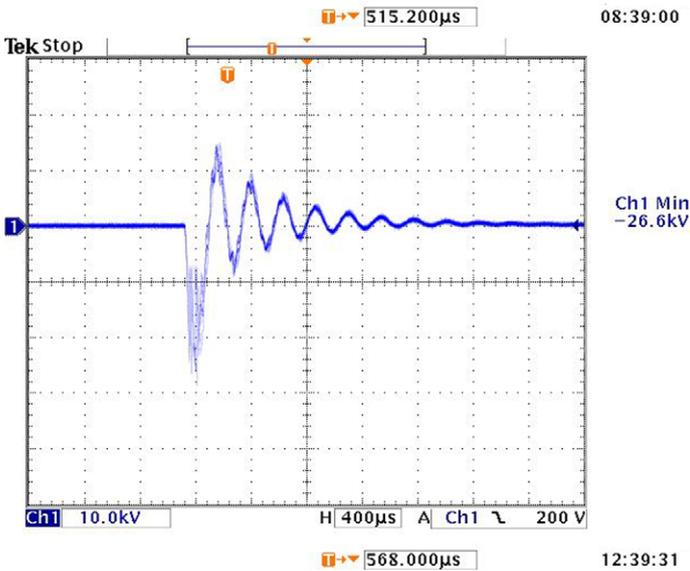
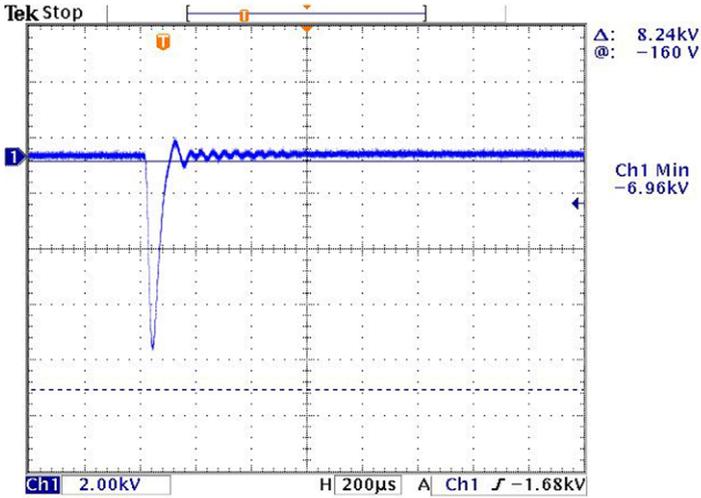
- Measurement without spark plug connected (open circuit):



5 Operation

Typical Curves with a Defective Ignition Coil (Short Circuit in Coil)

– Measurements without spark plug connected (idle voltage)



6.1 Possible Faults

Damages to the SparkScan1 high voltage clamp including its cables may result in danger to life through high voltage and the measurements may be faulty. Do not use the SparkScan1 if it is damaged. If a fault is suspected, the SparkScan1 may be sent to MOTORTECH for a functional check. In such a case, contact your MOTORTECH contact person (see section *Customer Service Information* on page 23).

6.2 Customer Service Information

You can reach us during our business hours by:

Phone: +49 5141 93 99 0
Email: service@motortech.de (technical support)
sales@motortech.de (all other matters)

6.3 Returning Equipment for Repair / Inspection

To return the device for repair and inspection, first consult your MOTORTECH contact person (see *Customer Service Information* on page 23). From him you will receive all the information you need to process your order quickly and smoothly. For return shipment, also observe the instructions in the section *Instructions for Packaging the Equipment* on page 23.

6.4 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.

7 Maintenance

The SparkScan1 high voltage clamp does not have any parts to be serviced by the user.

7.1 Cleaning



High voltage! Danger to life!

If the SparkScan1 high voltage clamp is wet, there is a danger to life from high voltage. Likewise, wetness can destroy the SparkScan1. Only use the SparkScan1 when it is dry.

If necessary, clean the SparkScan1 high voltage clamp with a dry or damp cloth. Prior to the next use, ensure that the SparkScan1 is dry. Remove wetness with a cloth or allow the SparkScan1 to dry. The SparkScan1 high voltage clamp must not be used when wet.

7.2 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.

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GAS ENGINE TECHNOLOGY

| | |
|--------------------------------|------------|
| Ignition Systems | Red |
| Spark Plugs & Accessories | Orange |
| Gas Engine Control Systems | Light Blue |
| Sensor Systems | Yellow |
| Air/Fuel Ratio Control Systems | Green |
| Exhaust Gas Aftertreatment | Green |
| Gas Engine Accessories | Grey |