

WE UPGRADE GAS ENGINES



IGNITION COIL TESTER

OPERATING MANUAL



ICT 
IGNITION COIL TESTER

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1 GENERAL INFORMATION

Prior to use, read this operating manual carefully and familiarize yourself with the product. The installation and start-up should not be performed without 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 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 prerequisite. Persons who are merely 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 shall be observed:



Example

This symbol marks examples that illustrate the necessary steps and techniques for you. Furthermore, the examples provide you with supplemental information to increase your knowledge.



Notice

This symbol marks important information for the operator. Follow these instructions. Additionally, this symbol is used for overviews that provide you with a summary of the required work steps.



Warning

This symbol indicates warnings of potential risks of property damage or health hazards. Read these warning notices carefully and take the stated safety precautions.



Danger

This symbol warns of danger to life, especially due to high voltage. Read these warning notices carefully and take the stated safety precautions.

1.4 What 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
AC	Alternating Current	Alternating current	
DC	Direct Current	Direct current	
EMC	Electromagnetic compatibility		Compatibility of electrical or electronic equipment items with their surroundings.
HV	High Voltage	High voltage	

2 SAFETY INSTRUCTIONS

2.1 General safety instructions

The following safety instructions must be observed in the environment in which the equipment is operated.



High voltage! Danger to life!

While the engine is running, especially the area around the ignition system holds the risk of danger to life due to high voltage. Therefore, the following parts must not be touched or pulled off:

- ignition coils and boots
- wires of the high voltage circuit
- connectors of the input / output wiring
- pickups and their wiring

Motortech equipment is manufactured as per the state of the art and therefore safe and reliable to operate. Nonetheless, the equipment may cause danger or damage if the following instructions are disregarded:

- The gas engine must be operated by trained and authorized personnel, only.
- 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 described 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 directives and regulations applicable to the operation of your system, including such not expressly stated herein.
- 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



High voltage! Danger to life!

During the coil tests (as soon as the *Ignition* button is pressed), the following parts must not be touched, as they may be live with high voltages of up to 40,000 V.

- high tension lead
- ignition coil
- metal parts of the spark gap
- metal tip of the grounding probe



High voltage! Danger to life!

Before each measurement, ensure that the tester is properly grounded. Use the green-yellow cable with the alligator clip for this purpose. Without proper grounding, high voltages of up to 40,000 V can occur.



Explosion hazard!

As the tests using the ignition coil tester produce open ignition sparks, such tests must never be performed in potentially explosive atmospheres.

2 SAFETY INSTRUCTIONS



Risk of destruction and injury

Actuate the ignition switch only if an ignition coil is correctly connected. Otherwise, the ignition system may be damaged. In addition, a voltage of between 200 and 300 V is applied across the ignition terminal, which can result in injuries.



Risk of destruction

Ignition coils and spark gaps can produce major electrical and electromagnetic interference (EMC), which can destroy other electronic devices. It must therefore be ensured that a distance of min. 2 m from other electronic equipment is observed during tests with the ignition coil tester.



Health hazard

Prolonged operation of the spark gaps produces ozone, which is a health hazard at high concentrations. Operate the spark gap only for short periods of time and ensure adequate ventilation.



Danger to persons with pacemakers!

The limits for effects on pacemakers can be exceeded by electromagnetic pulses in the cables connected to the ignition system. Persons with pacemakers must therefore not be present in the vicinity of the ignition system being operated. Mark the operating location of the ignition system with the corresponding standardized warning symbol.

2.4 Proper disposal

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

3 INTENDED USE

3.1 Function Description

With the ignition coil tester, you can perform and analyse function tests on ignition coils for gas engines. Aside from the ignition unit, the kit comprises connection leads and adapters for a variety of common ignition coil types.

With a grounding probe, the insulation of the coils can be checked for defects. This way, you can detect even cracks that are invisible to the naked eye. In addition, you can verify the values for the secondary voltage and the spark duration with an oscilloscope. The oscilloscope is not included in the delivery scope of the ignition coil tester.

3.2 Application Range

The ignition coil tester is designed for performing function tests on the ignition coil types listed in the section *Technical Data*. The connection data of the respective ignition coil must be taken into account for all tests.

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

The ignition coil tester has the following technical characteristics:

Property	Value
Supply voltage	110 bis 230 V AC
Primary voltage	adjustable with potentiometer from 0 to 300 V
Division ratio of measuring outputs	Primary voltage 10:1 Secondary voltage 1000:1
Temperature	max. -40° C to +70° C
Humidity	max. 85% without condensation

The following ignition coil types can be tested with the optionally available adapter kits:



Caterpillar coils

Adapter kit: 06.98.054-1

Consisting of:

Adapter: 06.98.057-1

Cable: 06.70.192-1

Altronic standard coils

Adapter kit: 06.98.054-2

Consisting of:

Adapter: 06.98.057-2

Cable: 06.70.192-2

European coils

Adapter kit: 06.98.054-3

Consisting of:

Adapter: 06.98.057-3

Cable: 06.70.192-2



Flanged coil

Adapter kit:	06.98.054-4
Consisting of:	
Adapter:	06.98.057-4
Cable (3-pin, neg. ground):	06.70.192-4
Cable (3-pin., pos. ground):	06.70.192-4-X

Integral coils (external)

Adapter kit:	06.98.054-5
Consisting of:	
Adapter:	06.98.057-5
Cable (2-pin, neg. ground):	06.70.192-3
Cable (3-pin, neg. ground):	06.70.192-4
Cable (3-pin, pos. ground):	06.70.192-4-X



Integral coils (internal thread)

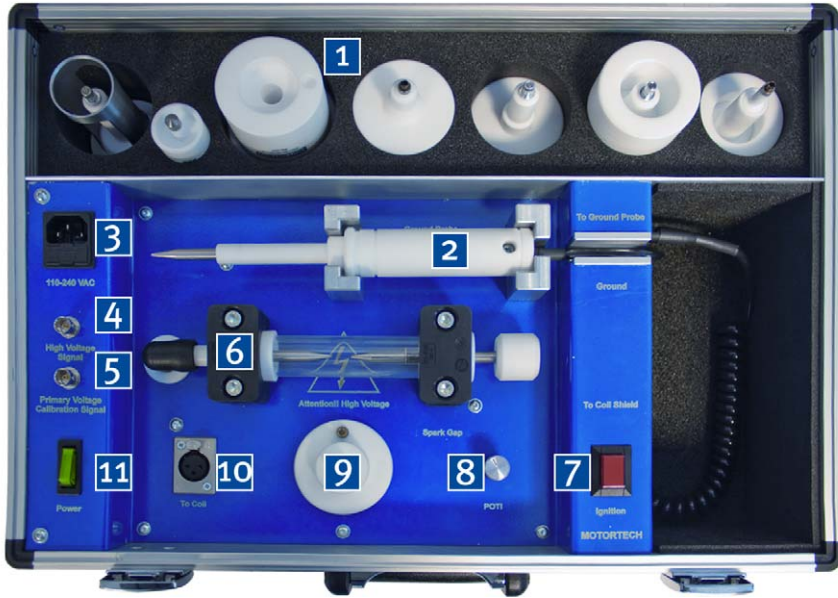
Adapter kit:	06.98.054-6
Consisting of:	
Adapter:	06.98.057-6
Cable (2-pin, neg. ground):	06.70.192-3
Cable (3-pin, neg. ground):	06.70.192-4
Cable (3-pin, pos. ground):	06.70.192-4-X

Shielded ignition coils

Adapter kit:	06.98.054-7
Consisting of:	
Adapter:	06.98.057-7
Cable (2-pin, neg. ground):	06.70.192-3
Cable (3-pin, neg. ground):	06.70.192-4
Cable (3-pin, pos. ground):	06.70.192-4-X

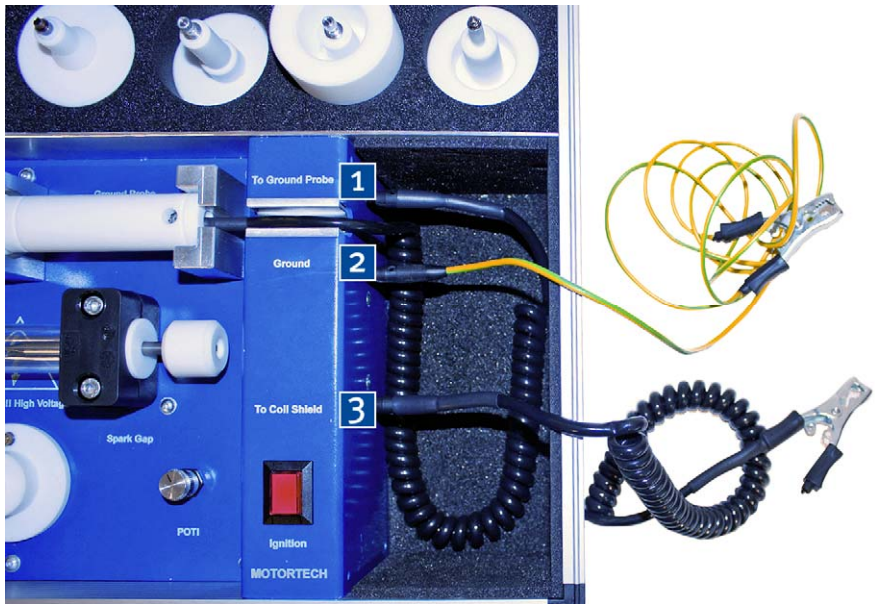
4 PRODUCT DESCRIPTION

4.2 Overview



Item No.	Description
1	Test adapters for different ignition coil types
2	Grounding probe for surface scan
3	Voltage supply (110 to 230 V)
4	Measuring output (high voltage)
5	Measuring output (primary voltage)
6	Spark gap
7	Button for ignition
8	Potentiometer for adjusting primary voltage
9	Adapter mount for ignition coil to be tested
10	Primary voltage terminal for ignition coil
11	Main switch for test system

Ground connections



Item No.	Description
1	Ground connection of grounding probe
2	Ground connection for grounding the entire test system
3	Ground connection for grounding the coil

5 OPERATION

5.1 Start-up

To start up the ignition coil tester and prepare it for testing, proceed as follows:

1. Connect the equipment to the voltage supply using the enclosed cable.
2. Ground the kit by connecting the green-yellow cable to the *Ground* jack and placing the alligator clip on an object suitable for grounding (e.g. a heating system pipe or radiator).
3. Connect an oscilloscope to the calibration input for the primary voltage (*Primary Voltage Calibration Signal*). For scaling, we recommend the following default values:
 - 5 V DC/Div
 - 200 μ s/Div

5.2 Overview Ignition Coil Data

Maximum Primary Voltage

The following table shows an overview of the maximum primary voltage for popular coil types:

Adapter	Coil Type	Part Number	max. Primary Voltage [V]
06.98.057-2	Altronic	06.50.053A	180
		06.50.054	180
		591010	180
		06.50.055	180
06.98.057-3	European Style Coils	06.50.003	300
		06.50.007	300
		06.50.060	180
06.98.057-4	Flange Coils	06.50.034	180
		06.50.035	180
06.98.057-5	Integral Coils (ext.)	95.09.010	180
		95.09.011	180
06.98.057-6	Integral Coils (int.)	95.08.010-L	180
		95.08.020-L	180
		95.08.021-L	180
		95.09.012-6	180
		95.09.012-10	180
		95.09.012-12	180
		95.09.013-L	180
95.09.021-L	180		

Adapter	Coil Type	Part Number	max. Primary Voltage [V]
06.98.057-7	Shielded Coils (ext.)	95.08.003	180
		95.09.053	180
		95.09.054	180
		95.09.055	180
		95.09.005	300

Measurands at 10 kV

The following table shows measurands and open measured secondary voltage for the coil types listed that should be achieved at a secondary voltage of 10 kV:

Coil Type	Part Number	max. Primary Voltage [V]	Secondary Voltage [kV], open	Spark Duration [μ s]
Altronic	06.50.053A	180	24	430
	591010	150	31	300
	06.50.055	150	32	260
European Style Coils	06.50.003	150	26	480
	06.50.007	180	30	380
	06.50.060	150	30	250
Flange Coils	06.50.034	150	31	300
	06.50.035	150	31	240
Integral Coils (ext.)	95.09.010	150	24	120
Integral Coils (int.)	95.08.010-L	150	24	120
	95.08.020-L	150	24	300
	95.08.021-L	150	23	260
	95.09.012-6	150	24	120

5 OPERATION

Measurands at 15 kV

The following table shows measurands that should be achieved by the coil types listed at a secondary voltage of 15 kV:

Coil Type	Part Number	max. Primary Voltage [V]	Secondary Voltage [kV]	Spark Duration [μ s]
Altronic	06.50.053A	180	15	420
	591010	180	15	330
	06.50.055	180	15	260
European Style Coils	06.50.003	300	15	650
	06.50.007	300	15	480
	06.50.060	180	15	250
Flange Coils	06.50.034	180	15	330
	06.50.035	180	15	270
Integral Coils (ext.)	95.09.010	180	15	120
Integral Coils (int.)	95.08.010-L	180	15	120
	95.08.020-L	180	15	250
	95.08.021-L	180	15	260
	95.09.012-6	180	15	120

5.3 Test Implementation Summary



High voltage! Danger to life!

During the coil tests (as soon as the *Ignition* button is pressed), the following parts must not be touched, as they may be live with high voltages of up to 40,000 V.

- high tension lead
- ignition coil
- metal parts of the spark gap
- metal tip of the grounding probe



High voltage! Danger to life!

Before each measurement, ensure that the tester is properly grounded. Use the green-yellow cable with the alligator clip for this purpose. Without proper grounding, high voltages of up to 40,000 V can occur.



Risk of destruction

When adjusting the primary voltage, ensure that the max. value permissible for the ignition coil is not exceeded. Otherwise, you will risk destroying the ignition coil.



Perform reference measurement

To enable the better analysis of the values measured on a used coil, we recommend to first perform a measurement with a new coil of the same type and to use the values thereby determined as a reference.

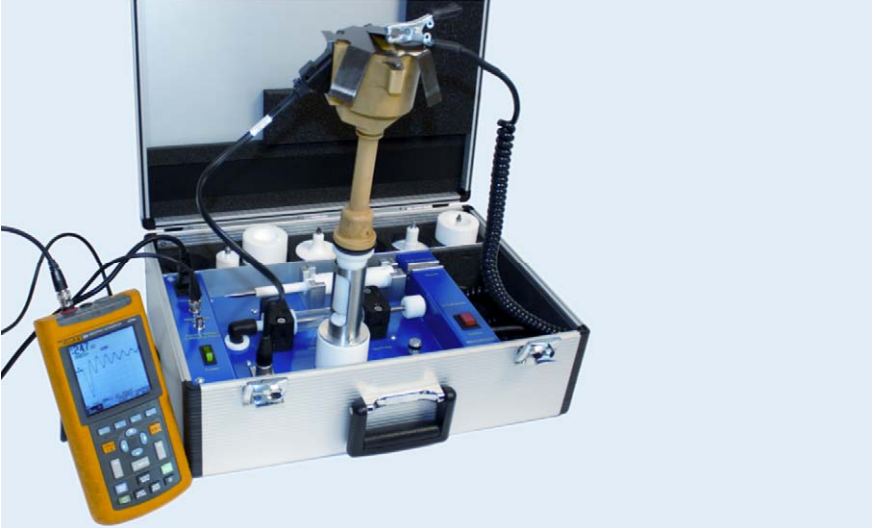
For testing Caterpillar coils, special requirements apply. For this topic, refer to the section *Testing of Caterpillar Coils* on page 22.

For testing all other ignition coil types, proceed as follows:

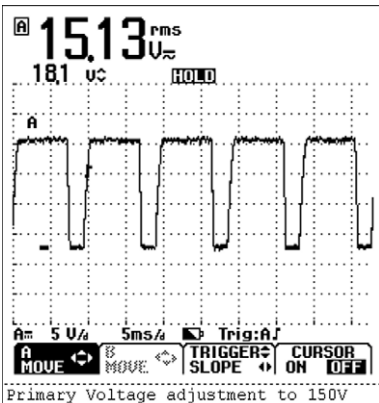
1. Select the adapter suitable for the ignition coil and place it on the adapter mount.
2. Clean the coil terminals as needed.
3. Place the coil on the adapter.
4. Connect the coil to the terminal *To Coil* using the appropriate cable. For cable 06.70.192-2, verify the proper polarity of the terminals (red +, black -).

5 OPERATION

5. Ground the coil at the shielding or the mount for the coiled cord connected to the terminal *To Coil Shield* as applicable for the respective coil type.



6. Rotate the potentiometer to the left-hand stop so that no primary voltage is applied across the coil upon start-up.
7. Switch on the test system using the main switch *Power*.
8. Set the primary voltage of the ignition coil via the potentiometer using the oscilloscope (connected to the measuring output *Primary Voltage Calibration Signal*). Observe the warning notice stated above! The subsequent figure shows an example for setting a primary voltage of 150 V.



9. First, check the insulation by moving the grounding probe closely along the insulation surface while holding down the *Ignition* button.



If there is a spark discharge, the insulation is defective at the respective location, and you must discontinue use of the ignition coil.

If no spark discharge is visible, you can proceed with the subsequent tests.

10. Connect the oscilloscope to the high-voltage measuring output (*High Voltage Signal*).
11. Start by setting the largest possible distance between the contacts of the spark gap.
12. Press the *Ignition* button, and check the values for the secondary voltage (open) on the oscilloscope.
13. Then, move the spark gap contacts closer together while holding down the ignition button until the first spark is discharged. Take care to touch only the plastic handle of the spark gap. All metal parts are live with high voltage!

This way, you can read the maximum spark duration on the oscilloscope.

14. Vary the distance between the spark gap contacts until the oscilloscope indicates the desired secondary voltage, and read the corresponding spark duration.

If secondary voltage and spark duration are in compliance with the required values, you can continue to use the ignition coil. For further information on this topic, refer to section *Evaluation of the Test Results* on page 20.

15. Switch off the test system using the main switch.
16. Briefly press the *Ignition* button again to ensure the complete discharge of the test system.

5 OPERATION



High voltage! Danger of electrocution!

Until the test system is fully discharged, high voltages may still occur. For this reason, perform the discharge as described in the above step before you remove the coil.

5.4 Evaluation of the Test Results

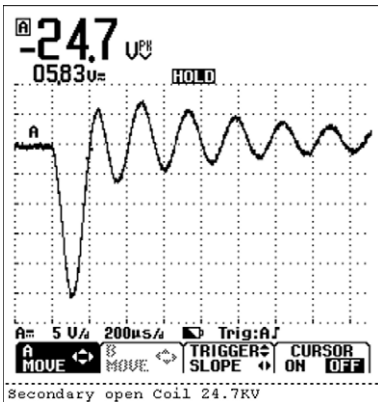


Measuring accuracy

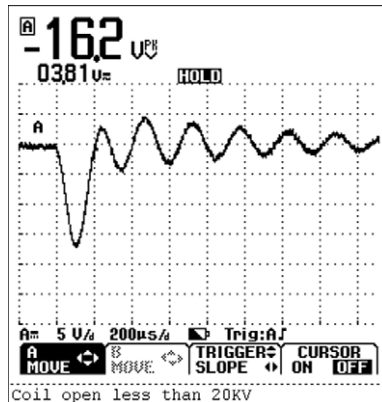
The measuring set-up offers an accuracy level of ± 2 kV. This may cause measuring results to vary. In addition, differences in humidity can influence the measuring results for the high voltage side.

The subsequent sections will present examples of different curve progressions of the measurands to be tested to give you a basic impression of the typical respective progression. The exact representation on the oscilloscope varies depending on the coil type.

Measuring the secondary voltage, open

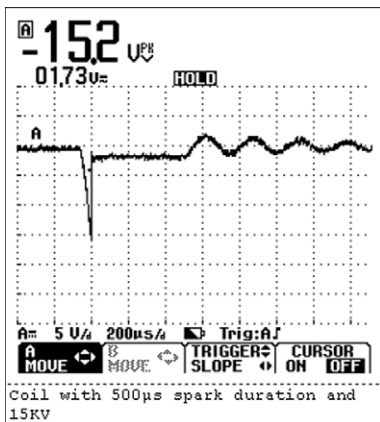


The coil is intact and attains the full secondary voltage.

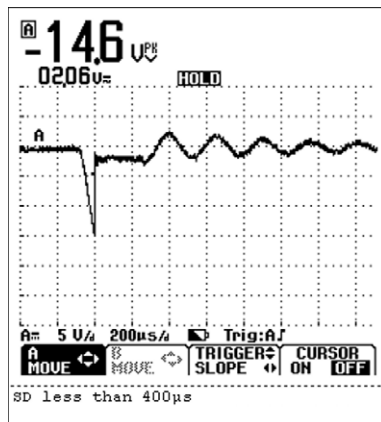


The coil is defective and does not attain the full secondary voltage.

Measuring the spark duration



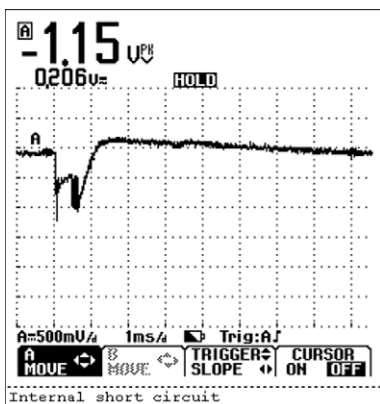
The coil is intact and attains the full spark duration.



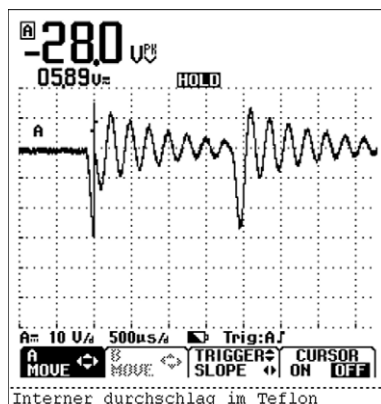
The coil is defective and does not attain the full spark duration.

Other defect cases

When the secondary voltage is measured (spark gap, max. distance), e.g. the following defect cases may occur.



The coil is defective due to an internal short-circuit of the windings.



The coil is defective due to an internal breakdown within the Teflon coating.

5 OPERATION

5.5 Testing of Caterpillar Coils

Caterpillar coils are exposed to greater thermal loads during operation on the engine. It is therefore recommended to test the coils while hot. An example of the complete test sequence is shown in the following:

1. Check the coil for cracks.
2. Remove the Teflon jacket and the grommet.
3. Clean the coil terminal with a brush and a cleaning agent containing an oil solvent.



4. Mount a test Teflon jacket to exclude test errors caused by a defective Teflon jacket.
5. Start up the test kit. For this purpose, please refer to section *Start-up* on page 14.
6. Connect the coil using the corresponding cable.

7. Place the coil on the corresponding adapter.



8. Connect the grounding cable to the shielding of the coil.



9. Perform the tests following the detailed instructions described in section *Test Implementation Summary* on page 16.
10. If the coil passed the test as GO, a second test is performed at a higher coil temperature.

5 OPERATION

11. Remove the coil from the test kit.
12. Thoroughly clean the entire coil using a cleaning agent containing an oil solvent.

This is absolutely necessary to ensure that the generation of harmful gases is minimised as the coil heats up.

13. Heat the coil to 100°C (212° F) for 30 minutes, e.g. in an oven.



14. Remove the coil from the oven using protective gloves or mitts, and retest the hot coil.

15. If the coil passes this test with GO, as well, you can continue using it after fitting it with a new Teflon jacket and a new terminal (repair set).



6 MAINTENANCE

6.1 Spare Parts and Accessories

For spare parts and accessories, please refer to our current product guide, which is available to you for download on the Internet at *www.motortech.de*.

6.2 Customer service information

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

Phone +49 5141 9399 0
Fax +49 5141 9399 99
E-mail servicemail@motortech.de

6.3 Returning equipment for repair / inspection

Enclose an insert comprising the following information when returning the equipment for repair and inspection:

- Name of operating company
- Name and location at which the equipment is installed
- Name and phone number of a contact person
- Part and serial numbers of the device
- Description of the defect/error
- Instructions concerning the desired type of repair/inspection

Providing this information will ensure the speedy and smooth processing of your repair order.

Send the equipment to one of the two addresses below, or to the nearest Motortech representative:

Motortech GmbH

Hogrevestrasse 21-23
29223 Celle

Germany

Phone +49 51 41 – 93 99 0
Fax +49 51 41 – 93 99 98

www.motortech.de
motortech@motortech.de

Motortech Americas

1400 Dealers Avenue
New Orleans. LA 70123

USA

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

www.motortechamericas.com
info@motortechamericas.com

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.



WE UPGRADE GAS ENGINES



WE UPGRADE GAS ENGINES

Original MOTORTECH Accessories for Stationary Gas Engines

As a supplier, MOTORTECH develops, manufactures and distributes accessories as well as spare and wearing parts for nearly all kind of stationary gas engines worldwide: Ignition control and monitoring, industrial spark plugs and high tension leads, wiring systems and gas regulation - from detonation to speed control and complete gas engine management. On-site support and special training courses complete our service.



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