

System 70 27 799 00
=> [€/\\$](#)
12 Volt System

generator/electronic ignition for [DKW NZ350-1](#)
(WH)  (cast iron engine block)

For the NZ350 (aluminium engine block) see [70 25 799 00!](#)



Magnet based generator with integrated fully electronic ignition. Output at 12V/100W DC. Solid state ignition with own power supply from within the system. Replaces old dynamo, points, centrifugal governor, ignition coils. No changes on engine casing needed. You may [drive without a battery](#), if you want.

advantage over original system

- all parts are new
- more light output
- very stable ignition with solid spark
- better starting, better fuel burning
- no wear anymore on points
- no delicate centrifugal governor

documentation

- [assembly instructions](#)
- [wiring diagram](#)
- [parts in the pack \(photo\)](#)

photos

- [NZ with the system](#)
- [additional picture](#)
- [look on the new stators](#)
- [additional picture](#)
- [assembled ignition coil in the switch box](#)

If you can install and time a stock ignition and possess basic mechanical skills, you can install a VAPE system!

If you never have worked on your ignition, better have it done by someone who knows.

VAPE can not monitor the compliance to those instructions, nor the conditions and methods of installation, operation, usage and maintenance of the system. Improper installation may result in damage to property and possibly even bodily injury. Therefore we assume no responsibility for loss, damage or cost which result from, or are in any way related to, incorrect installation, improper operation, or incorrect use and maintenance. We reserve the right to make changes to the product, technical data or assembly and operating instructions without prior notice.

Please read these instructions fully and carefully before starting work on your motorcycle

Please bear in mind that [any modification of the material as well as own repair attempts which have not been agreed with VAPE may result in a loss of warranty. Do not cut off wires. This leads to a loss of reverse polarity protection and often results in damage to electronics.](#) Also, please take note of the information provided on the information page for this system. Check that what you have bought really corresponds to the motorcycle you have. Wrong ignition settings may damage your engine and even hurt you during kickstart (violent kickbacks). Be careful during the first test runs. If needed change settings to safer values (less advance). During assembly check carefully that the [rotor \(flywheel\) does not touch the stator coils or anything else](#), which may happen due to various circumstances and lead to severe damage.



IMPORTANT:

Designated use

This system is designated to replace stock dynamo/alternator & ignition systems in vintage and classic motorcycles [whose engine characteristics have not been modified aftermarket](#). This system is not a tuning system and it will not bring significant increases in engine output. It does however significantly enhance roadworthiness and comfort by offering better lighting, better function of side indicators and horn and, compared with the aging stock systems, increased reliability. As our system does not tamper with engine characteristics it does not increase emission of gaseous pollutants and noise. In most cases emission of pollutants should even be reduced due to better combustion. If used as designated the system therefore will not normally infringe the existing legal status of the motorcycle (this statement is valid for Germany, for other countries, please check locally against your road licensing regulations). This system is not suitable for use in competition events. If used other than the designated way, warranty will be voided and it might well be that you do not obtain the desired results or, worst you loose legal

roadworthiness.

The charging system is only suitable for use with rechargeable 12V (6V systems 6V) lead-acid batteries with liquid electrolyte or sealed lead-acid batteries, AGM, Gel. [It is not suitable for use with nickel-cadmium, nickel-metal-hydride, lithium-ion or any other types of rechargeable or non rechargeable batteries.](#)

This is a [**replacement system and not a copy of the stock material**](#). The parts in this system therefore look different and might fit differently (notably ignition coil and regulator) requiring some adaptation by you.

During assembly imperatively start with assy of engine based parts to see that those really fit before you start fitting the external parts. In many cases customers assemble those first and thereby often [modify them in breach of warranty](#) which renders them unfit for renewed sale. [Replacing old ignition systems is not a matter of taking something from a supermarket shelf as there have been very many types, versions and possibly unknown aftermarket modifications which harbour plenty of room for error.](#)


Our systems are [**NOT tested for use with third party electronic devices \(such as GPS, mobile phones, LED lighting etc\)and may cause damage to such parts.**](#) Possibly existing [electronic tachometers](#) will not work with the new system. Read our [information for suitable solutions](#). Possibly existing safety switches and electronic valve controls are not supported. It might be that your motorcycle was originally equipped with an ignition that did limit top speed for legal reasons. The new system does not have such a facility, so check your legal situation beforehand.

If you have no expertise for the installation have it done by an expert or at a specialist's workshop. Improper installation may damage the new system and your motorcycle, possibly even lead to bodily harm.

Before you order a system, please check whether a [puller tool](#) for the new rotor is included in the kit. If not, better order it at the same time. You might want to order light [bulbs](#), [fuse](#), horn, [flasher unit](#) etc.

Never use anything other than the recommended puller tool to pull the new rotor again. Damage to the rotor as a result of use of other tools or methods is not covered by warranty.

The rotor is sensible to blows (including during transport). Before assembly, please always check for damage (on rotor without magnet plastification try to push the magnets aside with your

	<p>fingers). After impact the glued in magnets might have broken loose, sticking to the rotor solely by magnetic force, so that one does not notice right away. During engine run the damage would be considerable. Before placing the rotor onto the engine, please make sure that its magnets have not collected any metal objects such as small screws, nuts and washers. That equally would lead to severe damage.</p>
	<p>If you have access to the Internet, best view those instructions online. You get larger and better pictures by clicking onto them and possibly updated information. System list at http://www.powerdynamo.biz</p>



To pull the old rotor, you will need a puller tool M10x90 (part-no.: 89 99 026).



To disengage your new rotor again, you will need a puller M27x1,25 (part 99 99 799 00 **-Not provided!-**).

Note: Never use a claw puller, a hammer or any other device, that will shake the magnets off.

Notes on wiring:

Experience shows that in the course of time nearly every motorcycle undergoes changes to its wiring. As a result, wire colours and wires themselves on your bike might differ to those we describe. In case of doubt, please consult the original wiring diagrams.



You should have received those parts!

Please pay attention:

The stator is not screwed tight on the base plate. You have to remove the stator for mounting the base plate on the crank case.

Make sure your DKW rests securely on her stand, preferably on an elevated work bench and that you have good access to the generator side of the engine.

Disconnect your battery and take it out of the motorcycle. Note that you will have a 12 volts system further on, so you will either need a 12 volt battery or you use the option of driving without. You will have to replace all lightbulbs to 12 volt ones however in that case too. The horn may stay at 6 volts. For [driving without battery](#), please observe our [information on driving without battery](#).

You have to decide which method of ignition cut-off you will use. There are different ways, every one with pros and cons. We have pre-assembled the relay option.

Relay option (delivered as standard)

pro: You may use the ignition lock as previously. There are no changes on the handling of your bike.

contra: You can't use the new system without the battery (but in a case of emergency you can drive without, only the ignition cut-off is out of work).

Position 5 method

pro: The bike will be totally driven without battery. This is a big **PRO** for oldtimer, they will be seldomly driven.

contra: You can't cut-off the ignition with the ON/OFF position of the ignition lock, you have to switch the lock short-time on position 5 (previous bump-start position). Further, the bike may be kick-started without ignition key.

Cut-off switch method

pro: The bike will be totally driven without battery. There is no relay, that might fail.

contra: You have to install an additional cut-off switch, preferably at the handle-bars.

For positioning of the new ignition coil you have options:



The simplest solution:

Fasten the ignition coil by clamps or wire binders to the frame under the tank.

To make it look as real, lead a dummy ignition wire from switch box up under the tank (where it ends into a nothing, wich nobody will normally see). From the ignition coil here goes the real ht-wire back downwards to the spark plug.

(The photo shows a similar motorcycle!)



The smarter solution:

Place the new ignition coil in the coil case. You will have to modify the inner of the case and the new ignition coil. (its holderplate has to be cut)

(The photo shows the solution without ignition lock, but it is equally possible to keep the lock!)



Losen all cables to the generator, regulator and ignition coil, then remove the generator with the regulator and ignition coil.



Take the woodruff key from the crank. You will not need it anymore. Please do not forget to do so, otherwise you will have trouble later on the assembly.

(Remark: This woodruff key does not actually hold your rotor on the shaft, this is done by the taper. It simply guides to the correct setting which will now be otherwise achieved.)

(Picture shows similar engine!)



Take a look at the stator base plate (aluminium). You will find there, left from the cable passage ("Kabel"), a small notch ("Markierung") on the circumference.

This is an ignition marking.

Take care: That the stator cable leads through this opening, that is in our draft marked by "Kabel". Otherwise the ignition point won't be correctly, and the motor don't works.



Remove the 3 fixing screws which hold the stator coil to its base. Now you can lift-off the coil a little away from the ground plate (ca. 1cm). So as the mounting holes on the ground plate become accessible. Don't damage the paint insulation!

Mount the new stator plate (outer steel- & inner aluminium ring) on the crank case. The stator coil is hanging loose at its cable. Now screw it down with the 2 countersunk bolts M5. It is of no relevance which fastening holes you use or which way you put the stator in as long as the above shown arrangement between marking and stator wire is kept (wire has to pass opening near to marking).



Once the plate is fixed, reset the stator coil onto it. Here make double sure not to pinch any wires underneath. As the coil sits quite low in the engine, this is difficult to see.

Best push the coil gently down and pull at the same time at the wire from rear (ignition coil opening) - little by little until the unit sits properly. At the end, the coil will sort of snap in sharply, even with some noticable click. If it sits down rather softly, that you can bet there is a wire underneath.

Screw down the coil with the 3 screws M4.

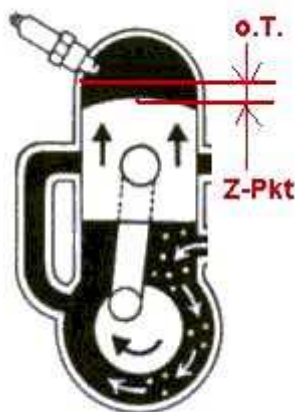


Please don't undertake any mechanical changes on the engine case, thinking that only with some modifications there you are able to fit the system. It will fit without physical changes, for sure.

The steel adapter of the system will come to sit at the upper recess for the dynamo, as shown here in the picture (and not somewhere further down the engine as you might initially tend to think).



Have a look at the new rotor. You will find on its circumference a small pressed in line. That is an ignition marking too. It is durable, but not well visible, so better highlighten it with some marker pen.



Z-Pkz = moment of ignition, here about 3.5 mm before top dead center (BTDC)!

Remove the spark plug and bring the piston into ignition position. That should be about 3.5mm BTDC.

For better control when turning the engine over, shift the transmission into fourth gear and use the rear wheel to rotate the engine. Alternatively, use the new rotor to turn the engine by attaching it to the crankshaft and turning it until the piston is at ignition position.

Hold this position of the crankshaft carefully and disengage the rotor again.



If you used the new rotor to turn the engine, carefully remove the rotor **without changing the position of the crankshaft!** With the engine still at ignition position, carefully replace the rotor on the crankshaft, aligning the timing mark on the rotor with the timing mark on the stator plate.

Carefully tighten the rotor mounting bolt making sure that neither the rotor nor the crankshaft moves while tightening the bolt. If either the rotor or the crankshaft moves, the timing will be incorrect and it will be necessary to reinstall the rotor.



When the rotor is correctly installed, replace the spark plug. If you used the rear wheel to rotate the engine, change gears back to neutral.

To disengage your new rotor again, you will need a puller M27x1,25 (part 99 99 799 00 **-Not provided!**).

Advices for mounting the ignition coil in the coil case:

You have the choice (in dependency of the quality of the material in the coil box and your willingness and possibilities for spending time):

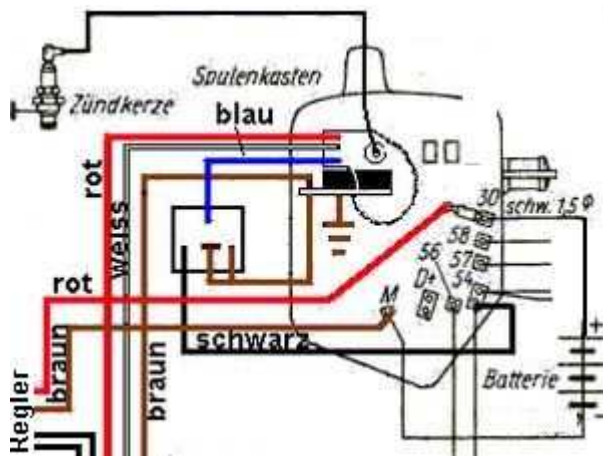
- to clear the whole case and installate only the ignition coil, or
- to remove only the old ignition coil and the regulator from the case and leave the switch in there

For the assembling of the ignition coil in the case, you have to remove the original ignition coil and the ignition lock. Take care: the cylinder of the lock is spring-loaded and it will be difficult to relocate. Then remove the ignition case and enlarge the original ht-cable openings. Relocate the coil case and saw-off the terminal block of the ignition lock (but leave the hole for the mounting screw on).

Now you have to modify the new ignition coil. Remove the mounting plate of the coil. Then you have to prepare (with plate and screws) a mounting of the coil in the case.

Mount the new rectifier/regulator on a convenient place. You can locate it in a side case (there are no problems with the cooling). Screw the new ht-cable into the new ignition coil and fasten the coil. Leave one of the screws loose, you have to screw down here one ground cable.

If you use the relay option, you have to search a convenient place for the relay too. Lay the new generator cable along the frame in that way, that all cables ending close to the regulator resp. ignition coil (use the enclosed cable fixers). Pay attention that nothing's pinched.



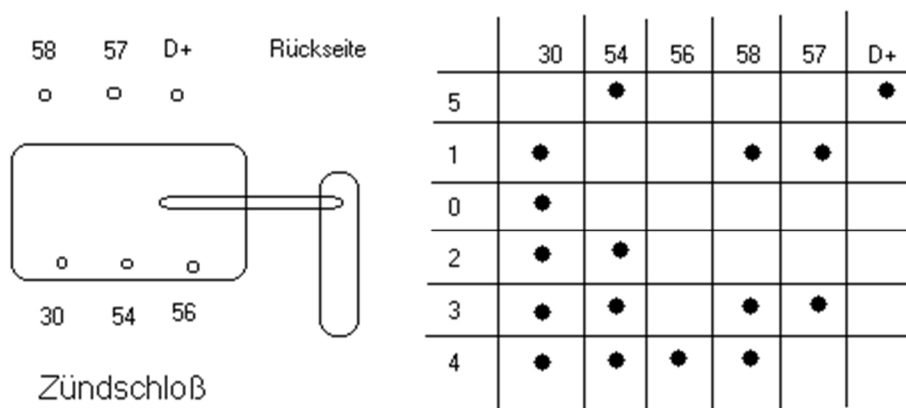
Connect the red, the white and the brown ground cable (from the new generator) and the blue cut-off cable to the new ignition coil.

Battery plus remains on pin 30. To that point (or direct to the battery) goes the red cable of the new regulator.

To solid ground goes either the brown cable of the regulator or the battery minus cable (then have to go the brown regulator cable direct to the battery minus pole).

The following steps are different, depending of the cut-off method:

At first take a look at the terminal allocation of the original main switch in the coil case.



Relay and kill-switch method:


- D+: the pin leaves empty, no cable goes to this point
- 30: battery and connection to the new regulator (red cable)

- 54: brake light, horn, plus for charge control- and neutral gear indicator and relay (if mounted)
- 56: main light
- 58: parking light, front and rear
- 57: blank

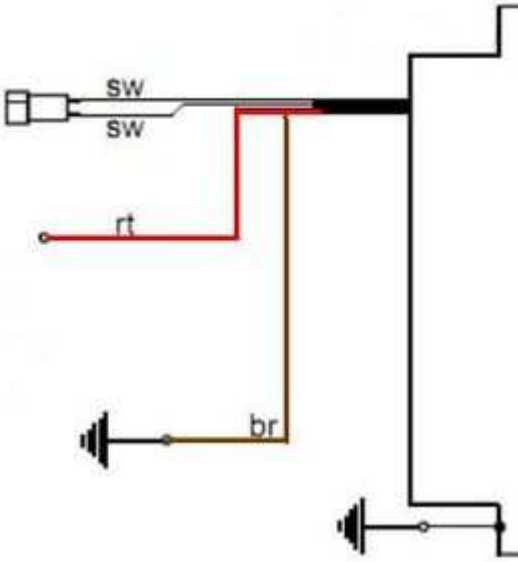

Position 5 method:

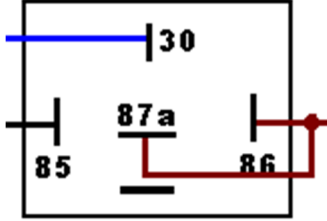
- D+: the blue cable of the new ignition coil
- 30: battery and connection to the new regulator (red cable)
- 54: brake light, horn, plus for charge control- and neutral gear indicator
- 56: main light
- 58: parking light, front and rear
- 57: blank

Attention: If the neutral gear indicator bulb is defect, is the cut-off circuit out of order. You can help yourself by actuating at the same time the rear-wheel brake.

<p>Connect the parts as shown in the respective wiring diagram!</p> <p>For our standard DC regulator (95 22 699 06), use the wiring diagram 71ir12: For our DC regulator with built in smooting condenser (73 00 799 50), use additional the wiring diagram reg_102:</p>	
*	<p>To facilitate wire exit through the often small openings in the engine casing, the plastic plug of the generator's wiring that leads to the ignition coil have not been put onto the wire terminal. You should place the plug there only once all has been properly installed on the engine side.</p>
	<p>Look for the ignition coil with its female plug and the two wires (red and white).</p> <p>Put the provided 2-position plug housing onto this plug and insert the two wires (red and white) from the generator. Make sure that the terminals engage securely in the housing and that you connect:</p> <ul style="list-style-type: none"> • white to white • red to red
<p>Should you need (or want) to get the terminals out of the plug housing again, enter a paper clip from front next to the terminals and push the little barb aside. Than pull the wire out.</p>	
<p>The brown wire from the new generator with the round eye terminal has to be screwed directly to the holder frame of the ignition coil (ground). Take note! disrespecting this is the most frequent cause for ignition problems !! Without this <u>direct</u> connection the system does not work or not work for long without problems. Please do not rely on the frame for ground. Paint, oil and dirt often prevent good contact!</p>	
<p>* Connecting VAPE alternator to lighting circuit (via regulator):</p>	

	<p>The 2 black wires running from the stator coil carry the voltage for lights, horn, flashers etc. They have nothing to do with ignition.</p> <p>This voltage (something between 10 and 50 volts AC) has however to be stabilized (regulated) and for most uses rectified into direct current (DC) as it primarily is alternating current (AC).</p> <p>For this we offer 2 different regulators:</p>
<p>⚠ Attention: Any confusion between plus and minus (with the DC versions) leads to immediate destruction of the regulator. This will not constitute a warranty case as it is negligence! One can recognize a burnt regulator mostly by its sharp smell.</p>	
<p>* Regulator type 1: with standard DC regulator (95 22 699 06), use the wiring diagram 71ir12:</p>	
<p>* </p>	<p>The new regulator/rectifier has a compact plug with 6 positions, of which <u>one</u> is not used. A female plug cover fitting to this plug is delivered. Into this female plug you have to insert the following wires (which have terminals that snap into the plug):</p>
<p>The two black cables leading from the generator ...</p>	<p>... connect to pins 1/4 of the new regulator (from there equally black wires lead inside the unit). It does not matter which wire connects to which of the both terminals (1/4) as they carry alternating current.</p>
<p>The new brown cable with the round eye terminal ...</p>	<p>... connects pin 3 of the regulator unit (from there equally a brown wire goes inside the unit) with the negative pole of the battery or (in case you drive without battery) to ground (chassis).</p>
<p>The new red cable with the round eye terminal ...</p> <p>Take care: Wrong polarity will damage the electronics!</p>	<p>... connects to pin 5 of the new regulator (from there equally a red wire goes inside the unit). Here your regulated positive voltage comes out to connect to battery plus, or (in case you drive without battery) to the voltage input terminal of the main switch (ignition lock, German bikes: pin 51/30).</p>
<p>Make sure that you have a 15A-fuse between battery and vehicle circuitry.</p>	
<p>The green/red wire at pin 6 of the new regulator ...</p>	<p>... is for the battery charge indicator (so your bike has one). You connect there the wire that formerly did run from the indicator light to the original regulator. Should your bike not have had such an indicator bulb, just</p>

	<p>keep this wire unused.</p> <p>Sure that this control only functions with a battery present. Should you drive without battery but still connect the wire, you will see that the light glows a little even as the generator generates voltage. So without battery, do not connect it. More information on the charge indicator function see here</p>
<p>The battery charge indicator function is based on a transistor switch and is an additional function. Even if that should fail, the regulator might still be in ok working condition. Simple check: have the engine running, turn lights on, disconnect the battery. If you have bright lights the unit is ok.</p>	
<p>* Regulator type 2: with DC regulator with built in smooting condenser (73 00 799 50), use additional the wiring diagram reg 102:</p>	
	 <ul style="list-style-type: none"> • the 2 black (sw) wires are the AC input from the alternator (as it is AC it does not matter which black to which black) • the red (rt) wire is the 12V DC output plus • the brown (br) wire is ground, internally connected to housing
<p>Remains the blue (sometimes blue/white) wire at the ignition coil. This is the kill (cut-off) wire.</p> <p>Connected to ground - it will stop ignition!</p> <p>* Note: Should you experience ignition failures, disconnect as a first measure this blue wire. In many cases that will permit you to get mobile again (particulars see: technical help)!</p>	<p>Switch off via separate kill switch <u>(when driving without battery):</u> The relay will not be fitted. The blue(/white) cable of the ignition coil will be connected to a kill switch, closing against ground (a button at the handlebars). Or you mount an ignition lock that has a facility to connect against ground when in OFF position.</p> <p>Battery method: Connect the brown relay wire to good ground. Lead the longer black wire from the relay to the wire that did run previously to a pin carrying voltage when the switch is on</p>

	<p>(in German bikes: pin 15) and connect it there. Connect the blue wire from pin 30 of the relay to the blue(/white) wire at the new ignition coil. Should your battery fail on the road, just disconnect that blue wire and your bike will run again (it will now only not stop by switching off).</p>
<p>Relay wiring (if used):</p> 	<p>The brown wire with the ring terminal from pins 87a und 86 goes to ground.</p> <p>The black wire from pin 85 goes to a main switch terminal carrying voltage if switched on.</p>
<p>Screw the high tension (ignition) cable ...</p> <p>* Please do not use any spark amplifying cables, such as "Nology supercables" or "hot wire". This will disturb the system and possibly damage it.</p>	<p>... into the ignition coil and pull over the rubber seal before mounting the coil (it will be easier).</p> <p>Please do use the cable arriving with the pack and not any old cable.</p>
<p>You will do yourself a favour to treat your bike to new spark plugs and spark plug sockets (preferably some between 0-2kOhm). Plenty of problems are to be traced back to "apparently good" (even completely "brand-new") sparks plugs, terminals and cables.</p> <p>Do not use spark plugs with an internal suppression resistor. NGK (e.g.) offered such spark plugs coded with an "R" (for resistor) together with a supressor cap also with internal resistance. Starting will be more difficult due to the high resistance. More information here.</p>	
<p>* Finally - and before installing the battery and before the first kickstart - please re-check carefully all connections and fitments against the wiring diagram. Do check battery and light bulbs for correct voltage (12V).</p> <p>Should something not work, please consult our trouble-shooting guide on our homepage. As a first step disconnect the blue wire from the coil and re-test.</p>	
<p>* IMPORTANT: During crank shaft repair the dynamo shaft is often machined and gets shorter. The result is a rotor sitting lower, possibly touching now with its rivets the stator coil. The result is a destroyed stator and ignition failure.</p> <p>For more detail and how to check see (online) here.</p>	

Important safety and operating information

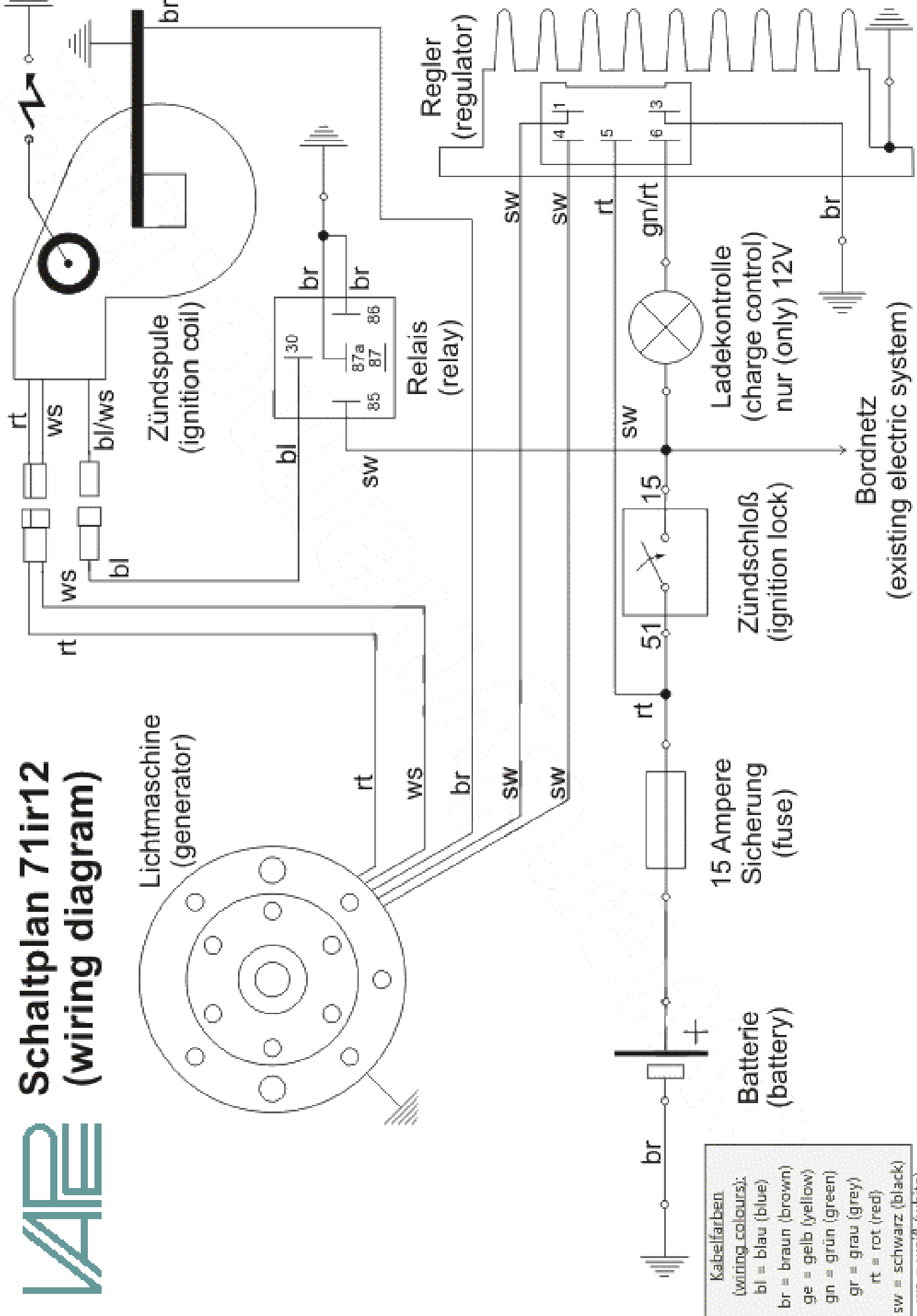
Safety first! Please observe the [general health and safety regulations motor vehicle repair \(MVR\)](#) as well as the safety information and obligations indicated by the manufacturer of your motorcycle.

The timing marks on the material are for general guidance only during first installation. Please check after assembly by suitable means (stroboscope) that settings are correct to prevent damage to the engine or possibly even your health. You alone are responsible for the installation and the correctness of settings.

#	<p><u>Ignition systems generate high tension!</u> With our material right up to 40,000 Volts! This may, if handled carelessly, not only be painful, but outrightly <u>dangerous</u>. Please do keep a safe distance to the electrode of your spark plug and open high tension cables. Should you need to test spark firing, hold the spark plug socket securely with some well insulating material and push it firmly to solid ground of the engine block.</p> <p>Never pull sparkplug caps when engine is running. Wash your vehicle only with engine at standstill and ignition off.</p>
#	<p>Should you have received in the kit HT cables with a fixed rubber boot(which does not contain a resistor) you might have to use spark plugs with an inbuilt resistor (or replace the cap with one containing a resistor) to comply with your local laws.</p>
#	<p>After installation, please <u>check tightness of all screws, even those preinstalled</u>. If parts get loose during run, there will be inevitably damage to the material. We pre-assemble screws only loosely.</p>
#	<p>Give the newly installed system a chance to work, <u>before you start to check and test values</u>, or what is worse apply changes to it.</p> <p>Our parts have been checked before delivery to you. You will not be able to check much anyway. At any rate do refrain from measuring the electronic components (such as ignition coil, regulator and advance unit). You risk severe damage to the inner electronics there. You will not get any tangible results from the operation anyway. Bear in mind that also your carburetor, your spark plugs and spark plug sockets (even if completely new) might be the reason for malfunction. The general experience with our systems is that the carburetor will have to be re-adjusted to lower settings. Should the system not start after assembly, first disconnect the blue (or blue/white) cut-off wire directly at the ignition coil (or in some cases advance unit) to eliminate any malfunction in the cut-off circuitry. Check ground connections carefully, make sure there is a good electrical connection between frame and engine block.</p> <p>In case of troubles, please consult our Knowledge Base first before you send off the material to us for checking</p>
#	<p>The spark of classic, points based ignition systems has with about 10,000 Volts comparatively little energy and looks therefore yellow and fat (which however makes it highly visible). The spark from our system is a high energy spark with up to 40,000 Volts and therefore is needle thin focused in form, and blue in colour, which makes it not so visible. Furthermore you get spark only at kick-start operated speeds and not by pushing the kick-lever down slowly with your hand (as you might get with battery based ignitions).</p>
#	<p>Systems using a twin outlet ignition coils have a few peculiarities. Please observe that during tests on one side, the other has either to be connected to an fitted spark plug or securely earthed/grounded. Otherwise there will be no spark on either side. Also with such open exits long and dangerous sparks may fly all over the coil.</p>
#	<p>Never do electric arc welding on the bike without completely disconnecting all parts containing semiconductors (ignition coil, regulator, advance) stator and rotor need not be taken off. The same is true for soldering. Before touching electronics disconnect the soldering iron from mains! <u>Never use copper putty on spark plugs.</u></p>

#	Electronics are very sensitive to wrong polarity. After work on the system, do check correct polarity of the battery and the regulator. Wrong polarity creates short circuits and will destroy the regulator, the ignition coil and the advance unit. As a rule, wiring will always be colour to colour. Instances, where colour jumps between wires are expressly mentioned in our instructions.
#	When you handle the new rotor, take care not to damage its magnets. Refrain from direct blows to the circumference of the rotor. When transporting never put the rotor over the stator. Observe our information relative to transport of the material.
#	Do not use spark plug sockets with a resistance of more than 5kOhm. Better use 1 or 2kOhm ones. Bear in mind that spark plug sockets do age and thereby increase their internal resistance. Should an engine start up only when cold, a defective spark plug socket and/or spark plug is very probably the cause. In case of problems check high tension cables too. Never use carbon fibre HT-cables, never use so called "hot wires" which promise to increase spark.
#	It is a good idea to cover the rotor in a thin layer of oil to reduce the risk of corrosion.
#	Never use a claw puller or a hammer to disengage the rotor. Its magnets might become loose in the event. We offer a special puller for disengaging the new rotor again (see assembly instruction)!
#	Should the motorcycle not be in use for some longer period, please disconnect the battery (so existing) to prevent current bleeding through the diodes of the regulator. Though, even a disconnected battery will empty itself after a while.
#	Please do observe these remarks, but at the same time, don't be afraid of the installation process. Remember, that before you, thousands of other customers have successfully installed the system. <i>Enjoy driving your bike with its new electric heart!</i>

Schaltplan 71ir12 (wiring diagram)



Kabelfarben (wiring colours):	
bl	= blau (blue)
br	= braun (brown)
ge	= gelb (yellow)
gn	= grün (green)
gr	= grau (grey)
rt	= rot (red)
sw	= schwarz (black)
ws	= weiß (white)