

Installation and operating manual

for POWER SPARK from software version 2.0

Electronic ignition system

POWER SPARK

- Versions:**
- 1 cylinder
RC-i 100, RC-i 120
 - 2 cylinders
RC-i 200, RC-i 220
(twin, boxer)
 - 3 & 4 cylinders
RC-i 400, RC-i 420
(double-twin, double-boxer)

included:

- POWER SPARK
- speed sensor
- magnet for speed sensor
- 2x bushings for speed sensor
- programming magnet
- installation and operating instructions

Dear customer,

thank you for your purchase.

Please read the following instructions carefully, so you wouldn't have any difficulties to install and operate the POWER SPARK.

We wish you a successful installation and much pleasure using the POWER SPARK.

SEVERE WARNING

The ignition system produces electromagnetic interfering fields as well as high voltages at the spark coil and the spark plug. These interfering fields are sufficiently screened if the spark plug is assembled in the engine and the cables are professionally connected.

- ⇒ **Do not touch non insulated cables or the spark plug if the ignition system is activated.
HIGH VOLTAGE, MORTAL DANGER**
- ⇒ **Make sure, that you do not use any attachments that are sensitive to electromagnetic interfering fields or devices that are life-supporting (heart pacemaker etc.) if the ignition system is active.**

Warranty

We guarantee the function of the „power spark” two years beginning on the day of purchase. Damages as a result of improper installation make an exception of the guarantee.

We are always interested in improvements and look forward to your feedback. Please contact:

tne.systeme

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¹⁾ Only versions with diagnostic functions RC-i x2x, ²⁾ only multiple cylinders versions RC-i 2xx & RC-i 4xx
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Features

General

- micro controlled, high-precision electronic ignition system
- constant spark energy in the complete speed range
- spark energy independent from supply voltage, integrated voltage booster compensates voltage swing
- 2-digit brilliant red LED display
- simple installation and programming
- numerous possibilities to customize
- red anodized, waterproof aluminum housing
- speed up to 30000rpm with one or more cylinders²⁾
- display of the actual engine speed
- ignition starts at a minimum engine speed (safe start-up)
- separate ignition endstages²⁾ => low power consumption when using multiple cylinders, (because additional cylinders ignite separately and not parallel to the first one)
- no need of an additional battery pack, ignition system can be powered from the receiver battery pack (min. 4 batt.= 4,8V)

adjustment possibilities

- 10 pre-programmed ignition maps
- application of 5 custom ignition maps
- adjustable speed sensor angle (mechanical sensor offset)
- adjustable ignition energy (3 steps)

diagnosis features

- display of maximum engine speed and battery voltage
- operating time counter
- supervision of main battery voltage
 - low voltage warning (generation of ignition misses)
 - engine stops if low voltage detected
- supervision of receiver battery voltage¹⁾
- supervision of receiver servo signal¹⁾
 - free definable supervision window
 - => engine stops if FAILSAFE-signal is detected
 - „killswitch“- functionality

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Backfitting an engine with magnetic ignition system

The POWER SPARK ignition was designed in a way that the original magneto ignition can be replaced with few modifications.

This installation and operating instruction describes the modifications using the example of the ZENOAH-260-PUM- engine.

The modifications of other engines can be done in the same way; deviations can result in the geometry of the flywheel, the fitting of the speed sensor etc.

Advantages of the POWER SPARK

Elimination of red primary ignition coil and flywheel with integrated magnets.

- smoother engine running, since the unsymmetrical magnetic brake torque for generating the ignition spark is eliminated
- allows the assembly of compact engines with more cylinders, because the prime-ignition coils are inapplicable.

Replacement of the original flywheel with integrated magnets.

- flywheel with increased inertia can be used (accessories)
 - ⇒ increased engine smoothness
 - ⇒ reduced idle speeds possible

The original secondary ignition coil(s) are used furthermore.

- Instead of the red primary ignition coil the POWER SPARK is connected to the secondary ignition coil.
 - ⇒ high voltage circuit only between secondary ignition coil and spark plug
 - ⇒ no high voltage at POWER SPARK
- secondary ignition coil(s) do not have to be mounted to the engine

Quick way to success

The POWER SPARK has a lot of adjustment possibilities and functions. To ensure a fast assembly and initial startup, please act according to the following checklist.

Assembly

- attend safety and assembly instructions p.05
- assemble POWER SPARK p.06
- assemble magnet of speed sensor into new flywheel (if own flywheel is used) p.07
- assemble speed sensor to engine p.07
- perform wiring p.09

Programming

- check mechanical position of speed sensor p.32
- possibly adjust sensor angle of speed sensor p.31
- choose ignition map p.22

Initial startup

- adjust speed limit p.28
- start engine and perform a test run
- possibly choose another ignition map p.22
- activate monitoring functions p.42

Safety and installation instructions

Please read the following instructions carefully.

Please work carefully. Do not pull on cables or cable connections. Improper cable connections may result in cable fires by reason of short circuits.

Improper cable installations or cable connections may result in malfunction or damages to the components.

Correct positioning and connection of cables is essential for long term, error free function of the POWER SPARK.

The connector plugs of the sensor cable have adjustments, please notice that and plug in the connector very carefully to avoid damage of pins.

- Install the cables in unpowered state, disconnect all battery packs.
- Do not locate the cables near sharp edges or hot or moving parts, so that they cannot be damaged.
- To connect the cables use only suitable connectors. Make sure, that the cables have a good contact and that the conductive parts of the connector cannot be touched when connected.
- **Install the cables, especially the sensor cable and the cable to the RC-receiver as far as possible from the ignition coils to avoid interference.**
- **To avoid short circuit or damages of components isolate non-used cables with insulating band or insulating screw joints.**
- If possible, install the plug-in connectors at a suitable place where no splash water or other liquids like petrol or oil can reach them and keep care that they cannot detach from their place (use tape or cable binders).
- Please ask an expert if you have problems with the installation.

We are not responsible for consequential damages by installing and using the POWER SPARK .



Assembly of the POWER SPARK

Please note the following points when installing the POWER SPARK:

- **mechanic installation**

- the housing of the POWER SPARK can get hot when running the engine with high speeds over a long period
 - => do not install heat sensitive components near the POWER SPARK
 - => make heat dissipation possible (don't cover)
 - => install in an adequate distance to the engine
- install at a place with low vibration
- choose the position so that the display of the POWER SPARK can be read easily
- choose the position that the magnetic sensitive element for programming the POWER SPARK is accessible.
(see programming)
- ensure a robust mechanical installation of the POWERSPARK (for example with special brackets for laminating)
(accessories: assembly set, item-nr.: EB-1)
- the dimensions of the POWER SPARK and the distances of the fastening bores shows the scale on page 51.

- **electric installation**

- engines with more than one cylinder and engine speeds exceeding 20000rpm need battery packs with minimum 9V supply voltage
- keep the supply cables (red & black) as short as possible
- keep the cables to the ignition coils as short as possible
- don't place the cables to the ignition coils near signal cables (for example the cables to the servos)
- place the signal cable to the speed sensor and to the RC-receiver¹⁾ in an adequate distance to the ignition coils
- **fuse the plus cable of the POWER SPARK**
(accessories: SI-3, SI-5, Si-10)
 - ⇒ **fuse 3A** (for versions RC-i 1xx)
 - ⇒ **fuse 5A / 10A** (for versions RC-i 2xx / RC-I 4xx)
- establish a **ground connection** from the engine to the battery minus with a cable of at least 1,5mm² cross section

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Installation of speed sensor

A precise ignition to the right time assumes the correct assembly of the speed sensor to the engine. The magnet and the speed sensor have to be installed in a way that, during a rotation, the speed sensor is triggered by the magnet 75° before reaching the top dead center. As the sensing magnet is surrounded by a magnetic stray field, the speed sensor will be triggered about 10° before passing the magnet mechanically. For this reason the sensing magnet must pass the speed sensor 65° before the top dead center. The value of the stray magnetic field about 10° applies to the shown geometry (see illustration). When installing the magnet on an increased radius the pre-triggering of the speed sensor decreases.

Speed sensor

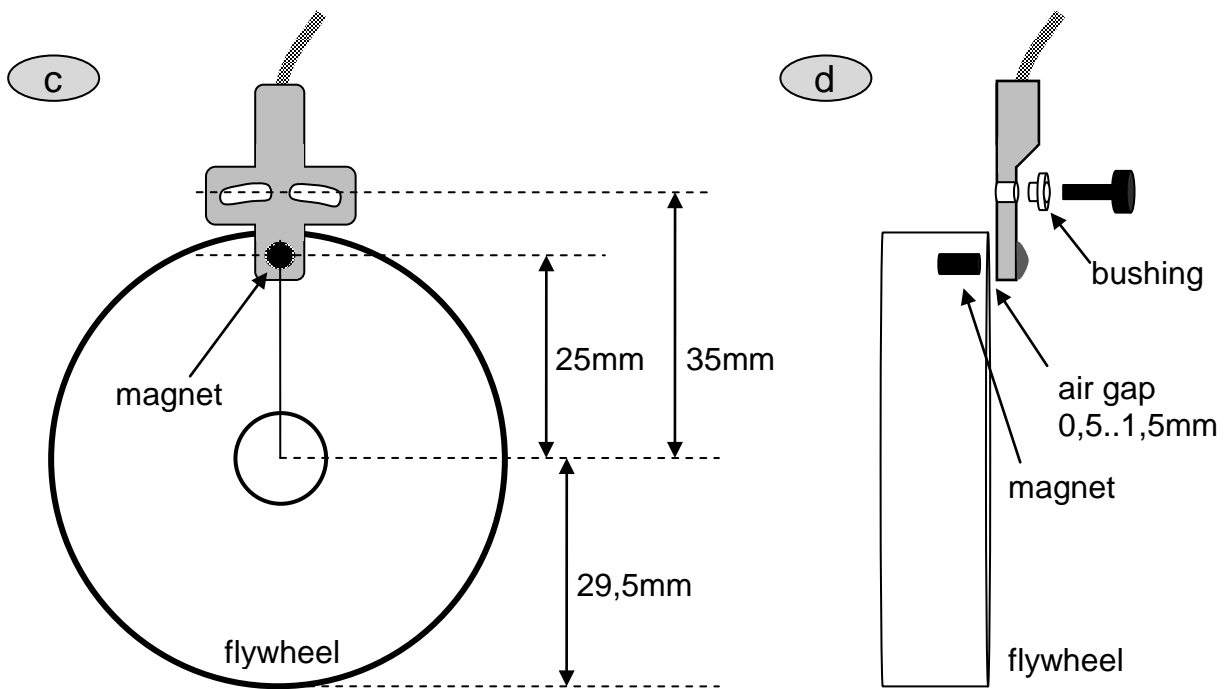
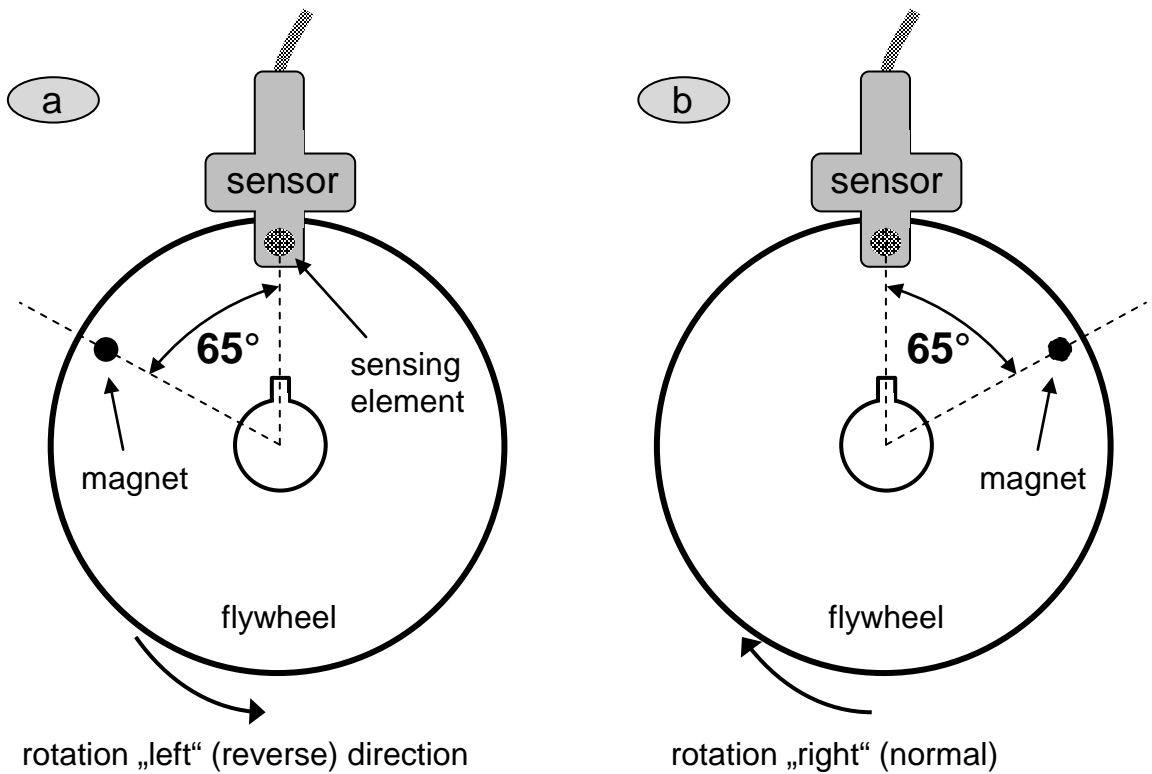
- Install speed sensor at an adequate place to the engine
 - Assemble the speed sensor with M3 screws. For protecting the strip conductors put the provided bushings under the screws. (see d)
 - the magnet in the flywheel and the speed sensor element have to be at the same level (see c,d)
The exact adjustment can be made with the help of two 0,5mm-holes in the area of the speed sensor`s sensitive element, you can find the sensitive element in the middle of the connecting line between the two holes.
 - the speed sensor`s flattened side faces the flywheel (see d)
 - set the air gap between the speed sensor and the flywheel between 0,5mm - 1,5mm. (see d)

magnet

- place the magnet ($\varnothing 3\text{mm}$, length 4mm) into the flywheel in a way:
 - that it passes the speed sensor in direction of rotation 65° before reaching the top dead center (a,b) For checking the sensor angle use the menu „CS“ (p.32), and correct it with menu „SA“ (p. 31).
 - that the surface of the magnet is located max. 1mm under the surface of the flywheel (d)
 - that it is permanently fixed (for example use instant adhesive).The polarity of the magnet can be ignored.

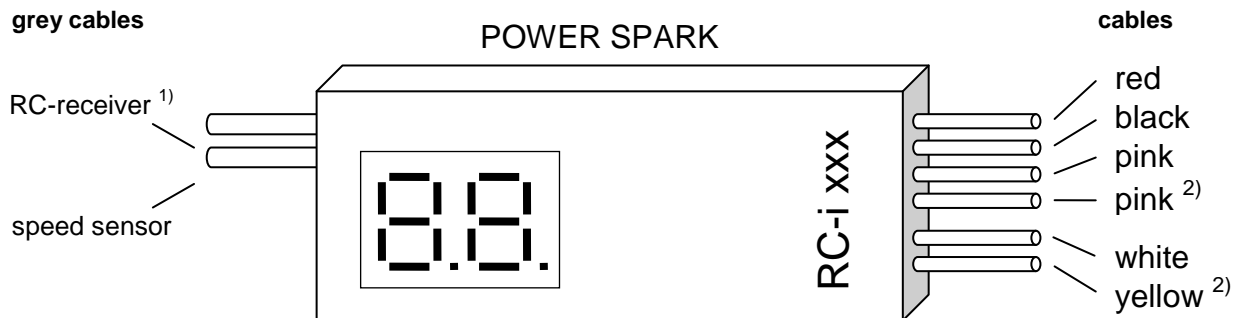
Detail description of magnet and speed sensor

- Presentation a,b: cylinder 1 is on top dead center



→ HINT: For fine adjustment use menu „control sensor” (p.32) in the configuration menu.

Connections



¹⁾ only RC-receiver control versions RC-i x2x

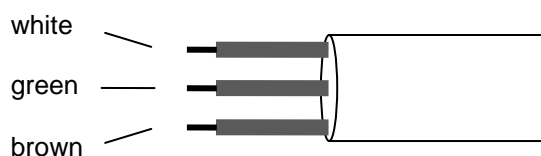
²⁾ only multiple cylinders versions RC-i 2 xx

Pin assignment of POWER SPARK

color	Function	cross section	length
red	+ supply (4..12V), use fuse (value see p. 43)	1 mm ²	25 cm
black	- supply (earth)	1 mm ²	25 cm
pink	+ supply ignition coil 1	1 mm ²	35 cm
pink ²⁾	+ supply ignition coil 2 ²⁾	1 mm ²	35 cm
white	- supply ignition coil 1	1 mm ²	35 cm
yellow ²⁾	- supply ignition coil 2 ²⁾	1 mm ²	35 cm

Pin assignment of RC-receiver-cable ¹⁾

color	Function	cross section	length
white	+ voltage receiver (3..12V)	0,14 mm ²	21 cm
green	receiver signal (servosignal)	0,14 mm ²	21 cm
brown	- voltage receiver (earth)	0,14 mm ²	21 cm



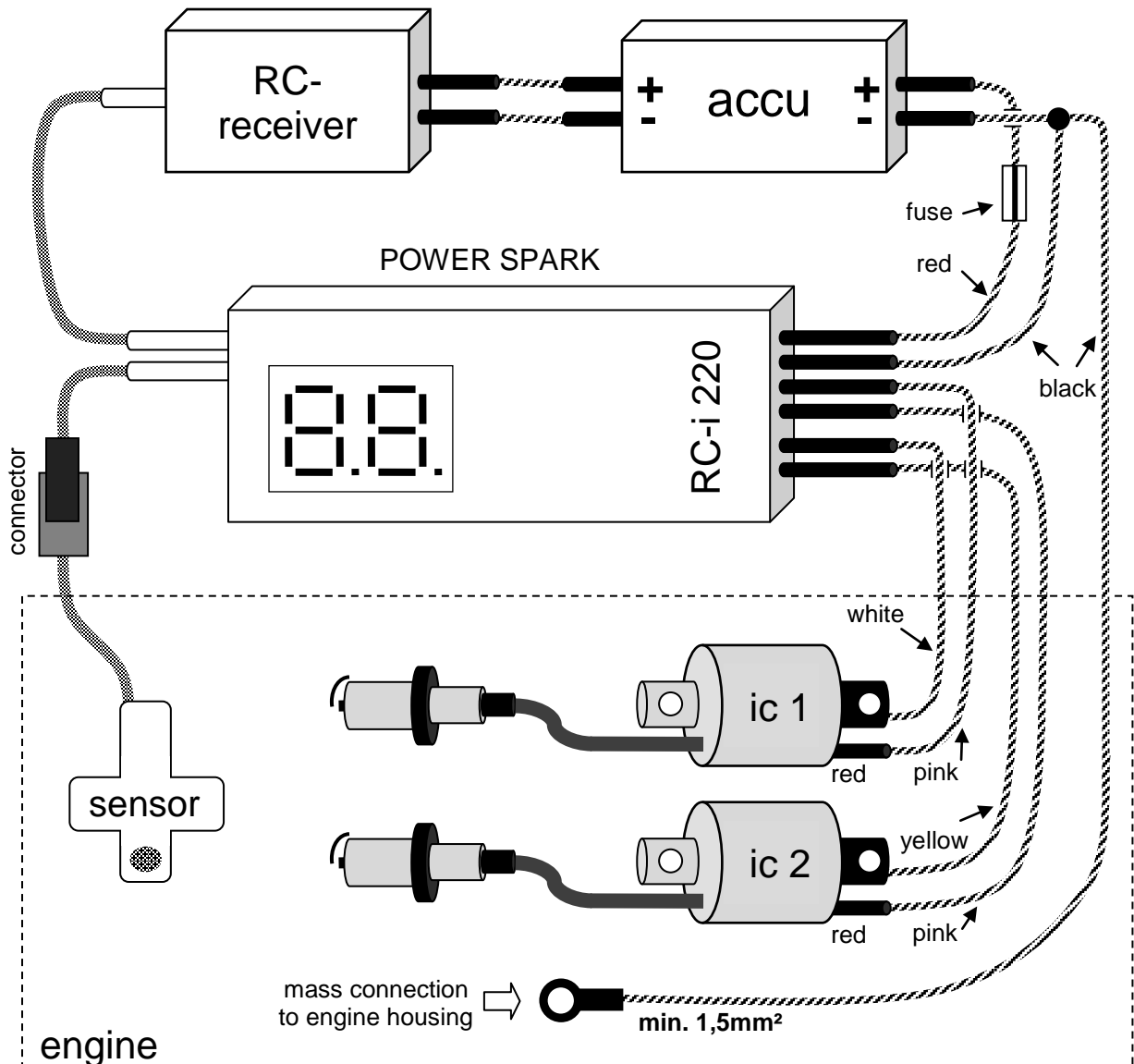
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Connecting diagram 1

exemplary for POWER SPARK RC-i 220:

- shared battery pack (accu) for receiver and POWER SPARK



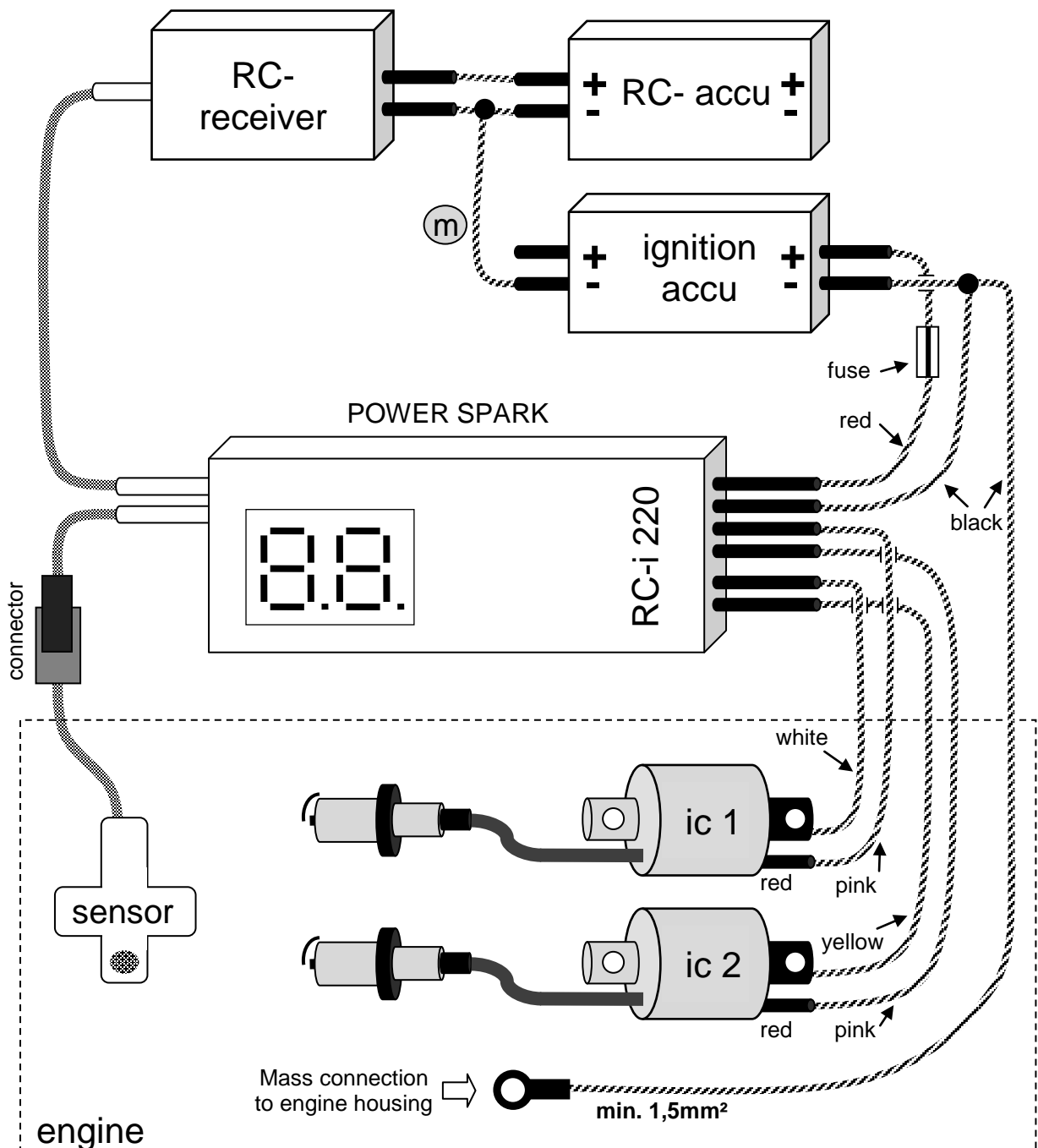
important: → insulate non-used cables with insulating tape
 → extend cables only with min 1,5mm² cables

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Connecting diagram 2

exemplary for POWER SPARK RC-i 220:

- separate battery packs for receiver and POWER SPARK
 ⇒ mass connection (m) established between batteries

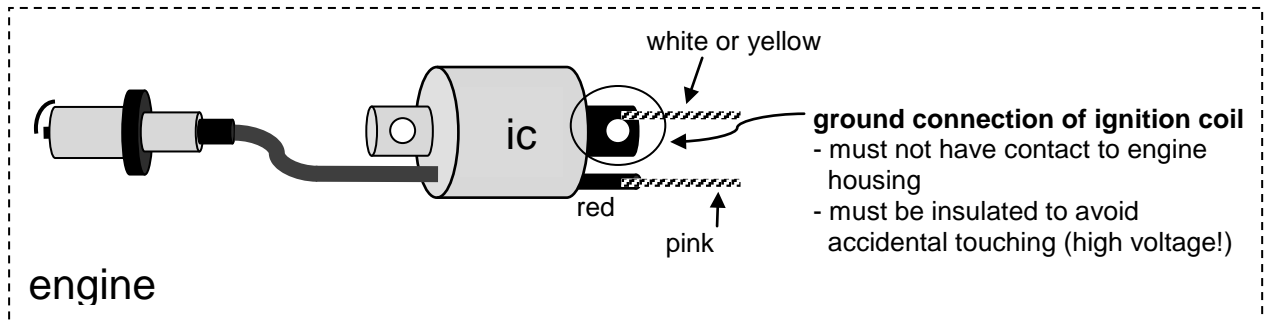


important: → insulate non-used cables with insulating tape
 → elongate cables only with min $1,5\text{mm}^2$ cables

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Connection of ignition coil

The POWER SPARK conducts the ignition pulse via the white or yellow cable to the ignition coil's ground connection. The ground connection of the ignition coil must not have an electric contact to the engine housing, contrary to the original application. Furthermore it has to be insulated to avoid accidental touching.



Modification of ignition coil

(Proposal on application of an insulating bushing that is available as accessories, item-nr.: IB-1)

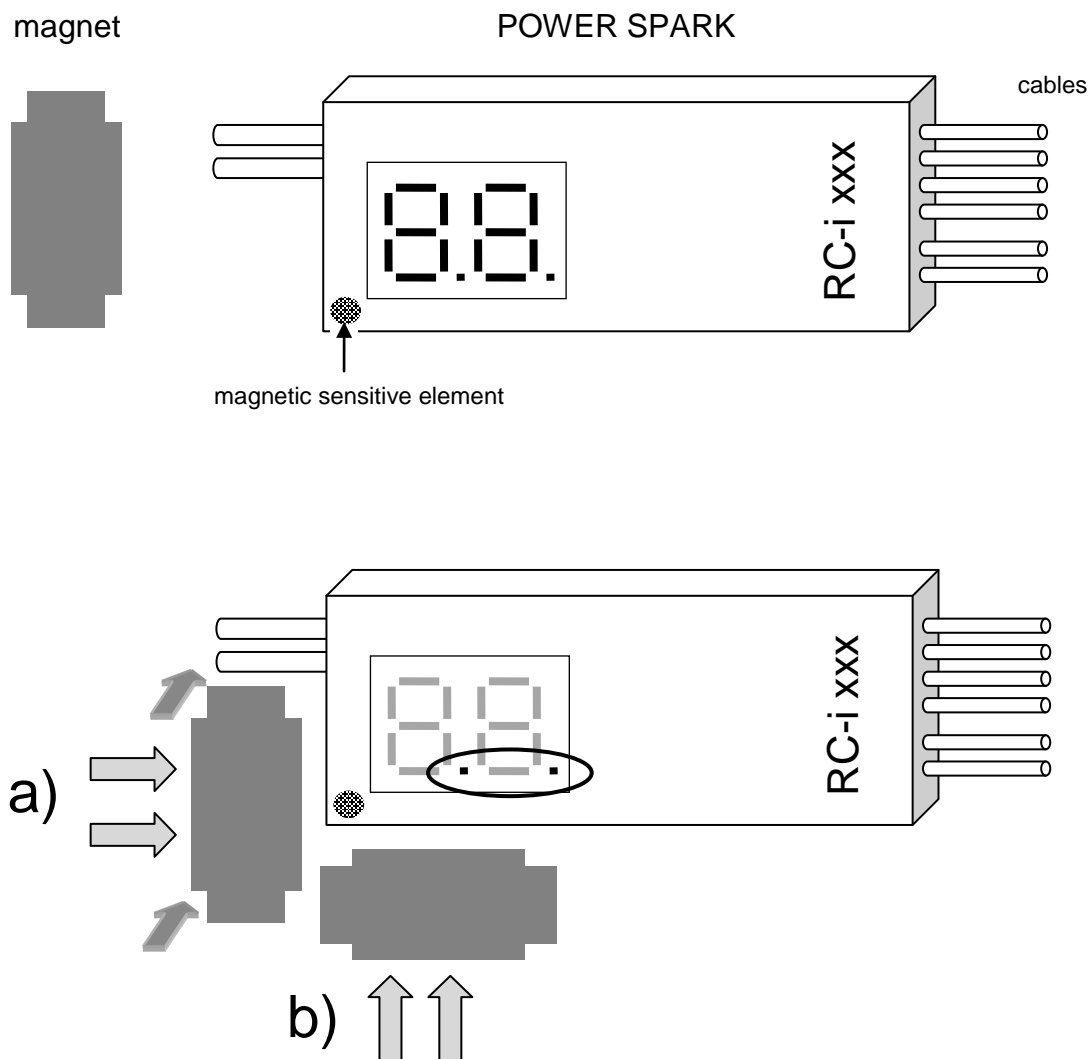
<p>original state - ignition coil with electrically conductive metal bushing (1)</p>	
<p>➤ drill out bushing - use drill with Ø 6,2mm</p>	
<p>➤ (3) connection of white/ yellow cable with eye (4) insulation bushing (access.) (5) grommet (6) screw M4</p>	
<p>➤ (7) insulate the electrically conductive components, for example with silicone or adhesive tape</p>	

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Programming - essentials

General

To make the programming as simple as possible, the POWER SPARK can be programmed with the provided programming magnet. In the left bottom corner there is a magnetic sensitive element that can be triggered by approaching the programming magnet.



By approaching the programming magnet parallel to the **left side** of the POWER SPARK (sideways or from top, position a)) in a distance of less than 10 mm the magnetic sensitive element is triggered. The POWER SPARK confirms the activation and shows „ . . “ additional to the active display.

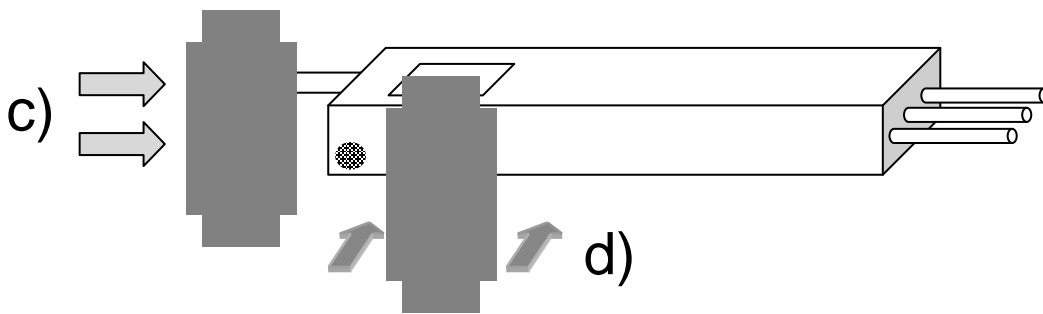
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- After that confirmation remove the magnet.

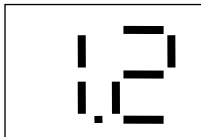
Alternatively the programming magnet can be approached along the bottom side (position b), see figure.

If there is few space the programming magnet can also be approached vertically to the magnetic sensitive element.

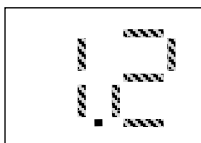
- c) Approach the magnet vertical from the left side to the bottom left corner.
- d) Alternatively approach the magnet vertical from the bottom to the bottom left corner of the POWER SPARK.



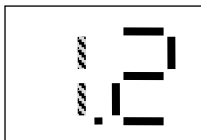
Symbolic



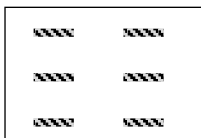
display: „1.2“
=> no input expected



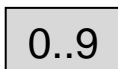
display: „1.2“, flashing
=> user input expected



display: „1.2“
„1“ flashing, „2“ not flashing
=> user input expected



display: „1.2“
modified values are stored



acceptable range of values (0 to 9)



action of operator required

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Menu structure

The operation of the POWER SPARK results by selection of the desired set or displayed parameters by approaching and removing the programming magnet.

The parameters are arranged in three main menu groups

- configuration menu „Co“
 - engine adjustments, that are changed rarely
- status menu „|||“
 - displays actual values
- diagnostics menu „dd“
 - modifying of diagnostic parameters

A parameter can be modified by the following procedure

- select the according main menu
 - the adjustable menu items flash one after another for 3sec
- confirm the desired menu item by approaching and removing the programming magnet
 - (for confirmation the display shows „. . “ additionally)
- display shows the actual value of the parameter
- selection of values by the user
 - adjustable values flash one after another for 3sec
- confirm the desired menu item by approaching and removing the programming magnet (possibly several times)
- display shows the new modified values
- POWER SPARK returns to the normal operation mode (display of engine speed)

Annotations

- the configuration menu can only be activated when the POWER SPARK is turned on
- the status- and diagnostic menus can be called only when the engine is not running
- the POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby) if no confirmation happens during the changing displays of the individual menu items
- if no confirmation (with the programming magnet) happens during the change of any value, the prior values will be retained

Example:

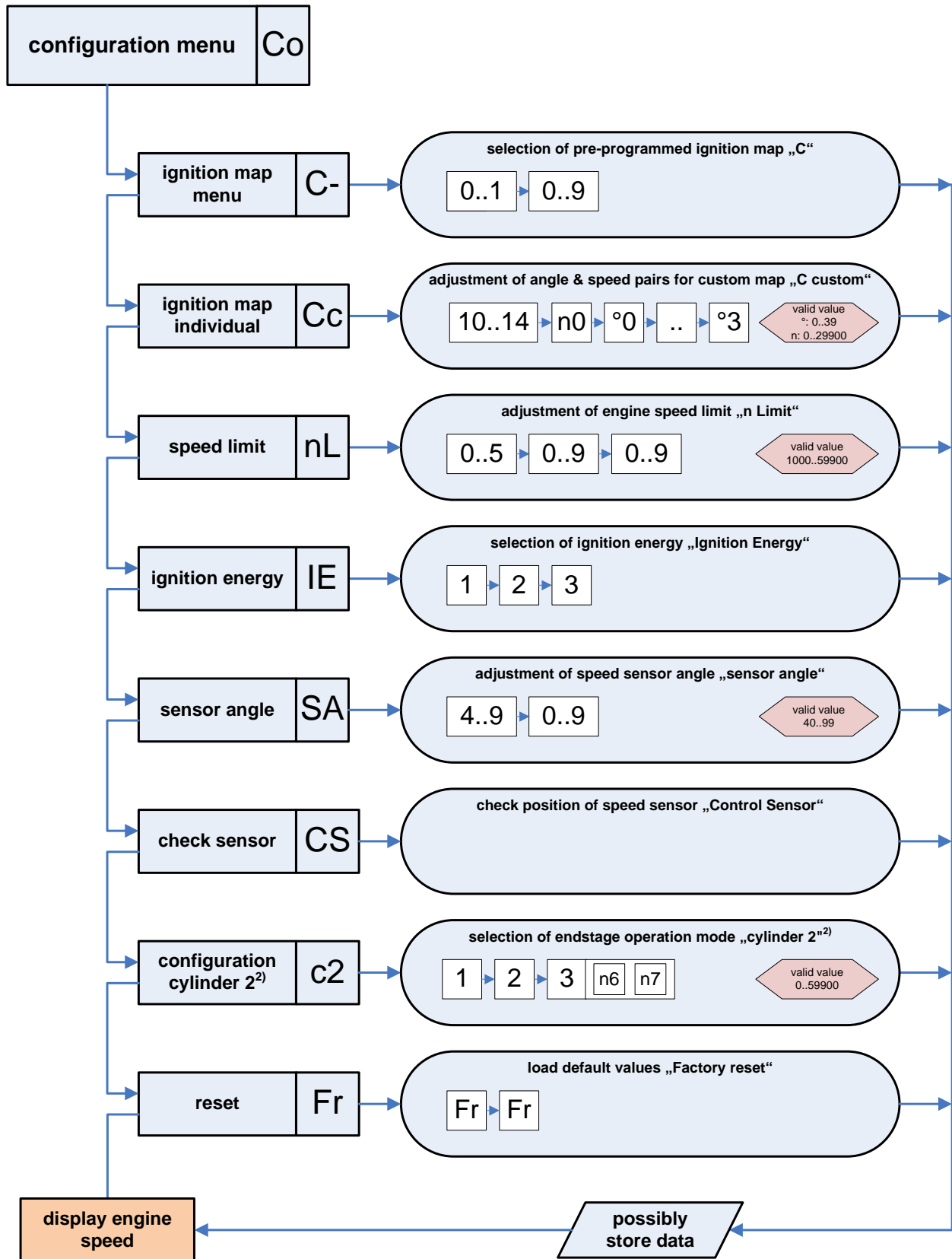
The preset ignition map „2“ shall be selected:

- the ignition map can be adjusted in the menu item „ignition map menu“ contained in „configuration menu“

nr.	action	display
1-4	➤ select configuration menu, see page 21	
5	selectable menu items flash one after the other (see configuration menu) ➤ wait until „C-“ flashes	
6	➤ actuate magnetic element (by approaching the programming magnet to the housing near the magnet sensitive element, remove after display shows “. .”)	
7	display shows current ignition map (here ignition map „1“)	
8	adjustable values flash one after another for 3sec	
9	➤ wait until „2“ flashes	
10	➤ actuate magnetic element (by approaching the programming magnet to the housing near the magnet sensitive element, remove after display shows “. .”)	
11	display shows the new selected ignition map (ignition map „2“)	
12	display indicates that new values are stored	
13	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

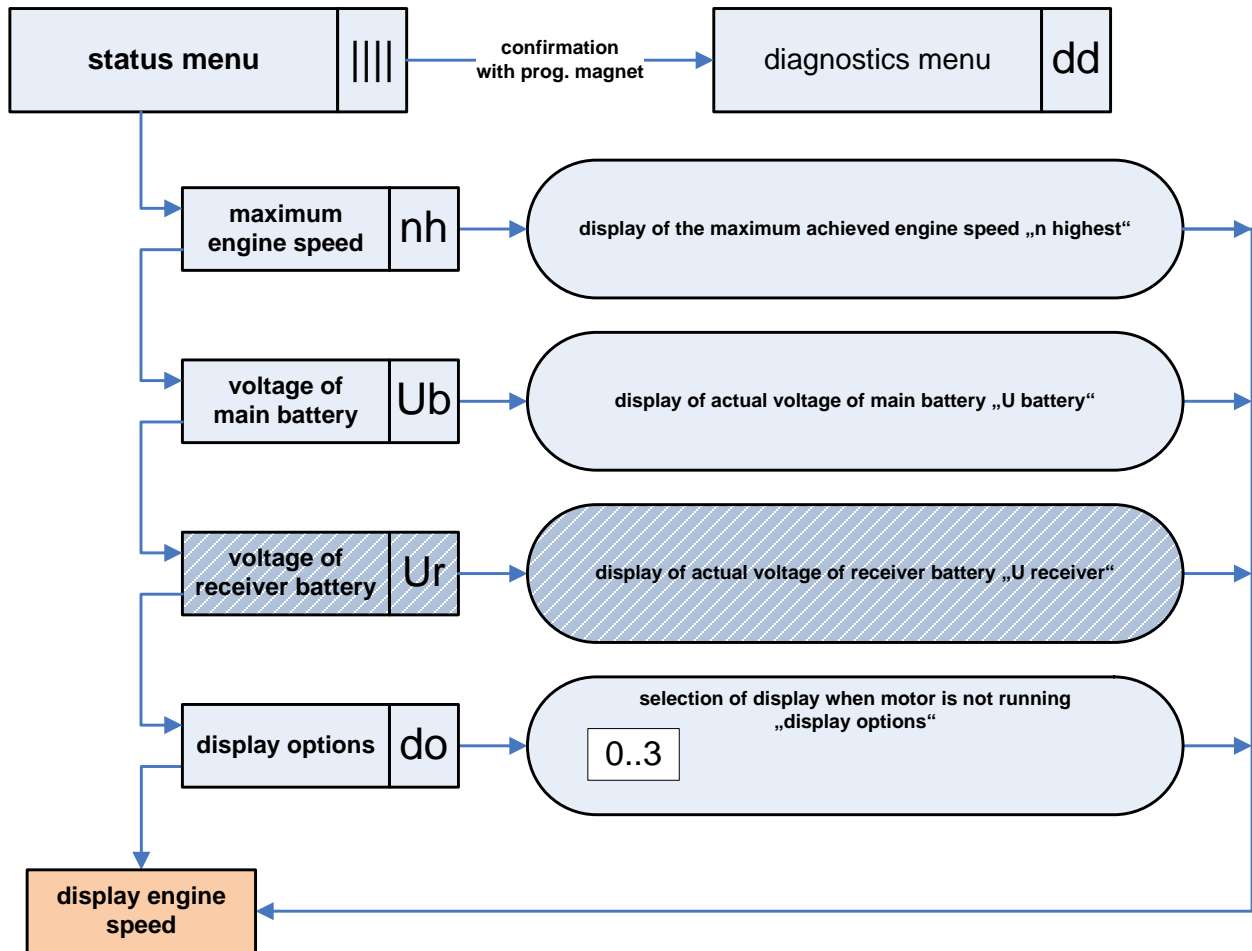
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Overview configuration menu



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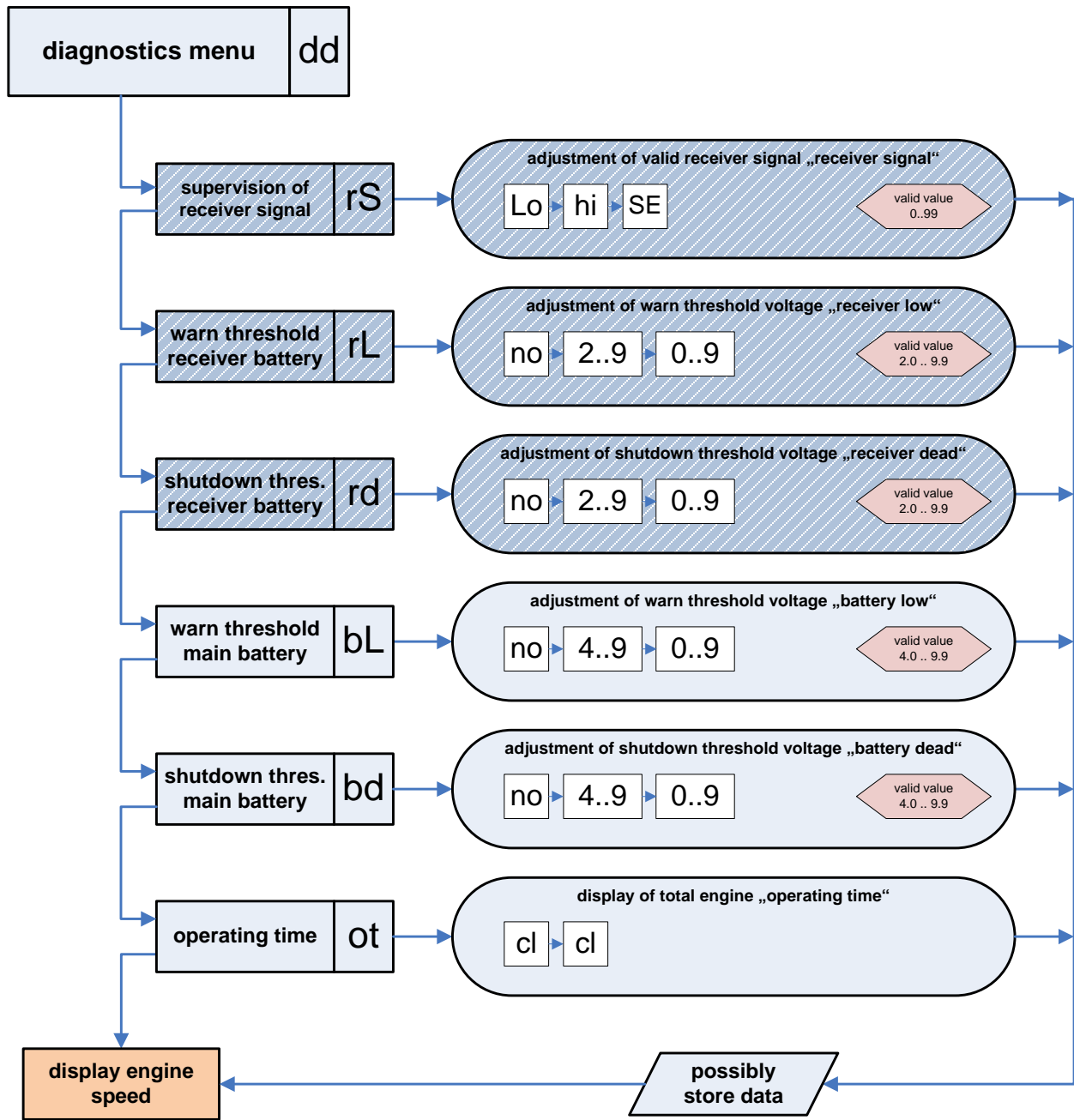
Overview status menu




only versions RC-i x2x

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Overview diagnostics menu



 only versions RC-i x2x

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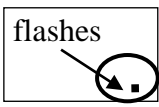
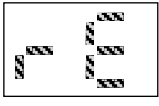


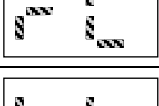

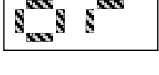
display

- **engine is running**
 - display shows the current engine speed
 - display shows current warnings and errors
- **engine halts**
 - display of maximum achieved engine speed or battery voltages alternately, depending on the chosen display options. (see menu „do“ in the diagnostics menu)
 - display of occurred warnings or errors alternately
 - the right decimal point will blink additionally if a warning or an error is pending

How to clear warnings or errors:

- restart engine OR
- interrupt and reconnect power supply of POWER SPARK (reset)

warn- and error messages

display	parameter	condition
	warning/ error is pending engine <u>cannot</u> be started	the value of a supervised signal is out of the valid range
	„rE“ receiver error ¹⁾	no receiver signal
	„rd“ receiver dead ¹⁾	receiver battery voltage has fallen below shutdown threshold
	„bd“ battery dead	main battery voltage has fallen below shutdown threshold
	„rL“ receiver low ¹⁾	receiver battery voltage has fallen below warning threshold
	„bL“ battery low	main battery voltage has fallen below warning threshold
	„oF“ kill switch off ¹⁾	engine shutdown due to „kill switch“ functionality / invalid receiver signal

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Programming

CONFIGURATION MENU



The configuration menu includes the following menu items

- a) ignition map menu**
selection of one of nine pre-programmed ignition maps
- b) ignition map individual**
configuration of one custom ignition map
- c) speed limit**
adjustment of engine speed limit (engine sputters)
- d) ignition energy**
selection of ignition energy
- e) sensor angle**
compensation of mechanical displacement of speed sensor
- f) check sensor**
check mechanical position of speed sensor
- g) configuration cylinder 2**
selection of endstage operation mode
- h) factory reset**
reset POWER SPARK to factory settings

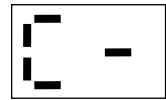
The configuration menu contains engine parameters, which shouldn't be manipulated thoughtless. To avoid an unintended changing the configuration menu can be called only in the following way:

nr.	action	Display
1	➤ interrupt voltage supply of POWER SPARK	
2	➤ approach programming magnet to the housing near the magnet sensitive element	
3	➤ turn on voltage supply	
4	➤ remove programming magnet	

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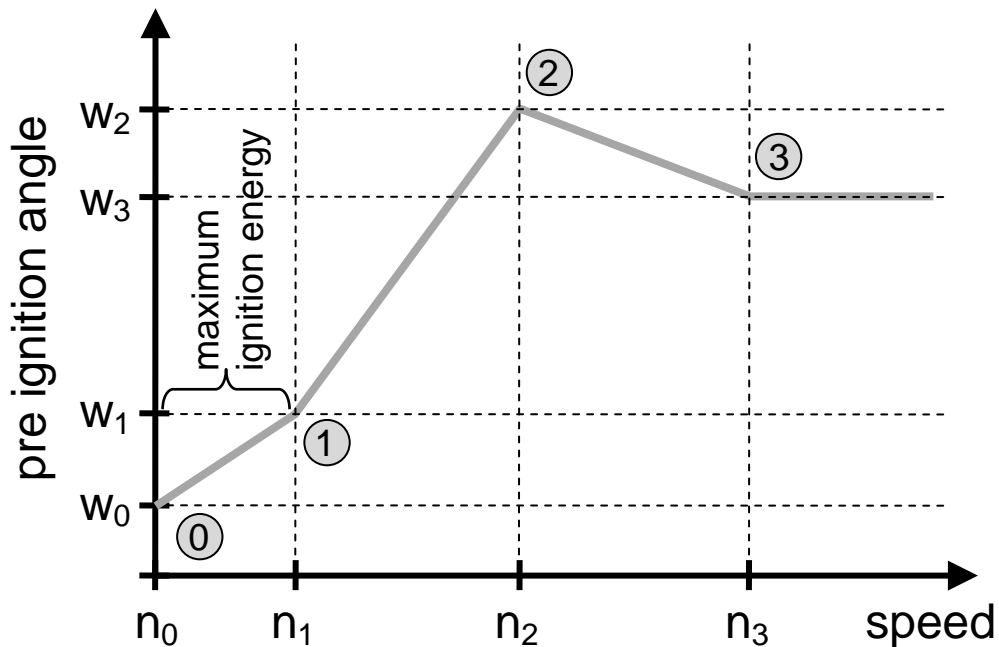
a) ignition map menu

selection of one of nine pre-programmed ignition maps
(factory setting: map <1>)



To enable a quick initial operation of the engine the POWER SPARK contains ten pre-programmed ignition maps. They serve as basic adjustment and starting point for a further optimization. For a specific adjustment to the engine you can use an individual created map.

The five individual ignition maps (10-14) are activated in the same manner as the pre-programmed maps. The adjustment of the individual ignition map is described in the next section.



map	①		②		③				
	n_0	W_0	n_1	W_1	n_2	W_2	n_3	W_3	
0	0	20	3000	20	6000	20	22000	20	basic map
1	0	25	3000	25	6000	30	22000	25	similar Zenoah
2	0	25	3000	20	6000	25	22000	20	
3	0	25	3000	20	6000	25	22000	25	
4	0	25	3000	20	6000	25	22000	30	
5	0	25	3000	20	6000	25	22000	35	
6	0	30	3000	20	6000	30	22000	25	
7	0	30	3000	20	6000	30	22000	30	
8	0	30	3000	20	6000	30	22000	35	
9	0	30	3000	20	6000	30	22000	39	
10..14	see individual map								

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Selection of a pre-programmed ignition map

example: ignition map „4“ shall be selected

nr.	action	display
1-4	➤ select configuration menu	
5	➤ wait until „C-“ flashes	
6	➤ actuate magnetic element	
7	display shows the current ignition map (for example map „1“)	
8	adjustable values of the tens flash one after another for 3sec (0-1)	
9	➤ wait until the desired figure for the tens flashes (for example „0“) ➤ actuate magnetic element	
10	➤ wait until the desired figure for the unit position flashes (for example „4“) ➤ actuate magnetic element	
11	display shows the new selected map (map „4“)	
12	display indicates that new values are stored	
13	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

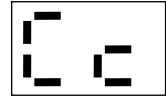
Please note:

The pre-programmed maps represent only a starting point or are derived from customer's experiences. Each engine has to be adjusted specifically depending of use. We apologize for any inconvenience, that we cannot be responsible for consequential damages by installing the pre-programmed ignition maps.

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b) ignition map individual

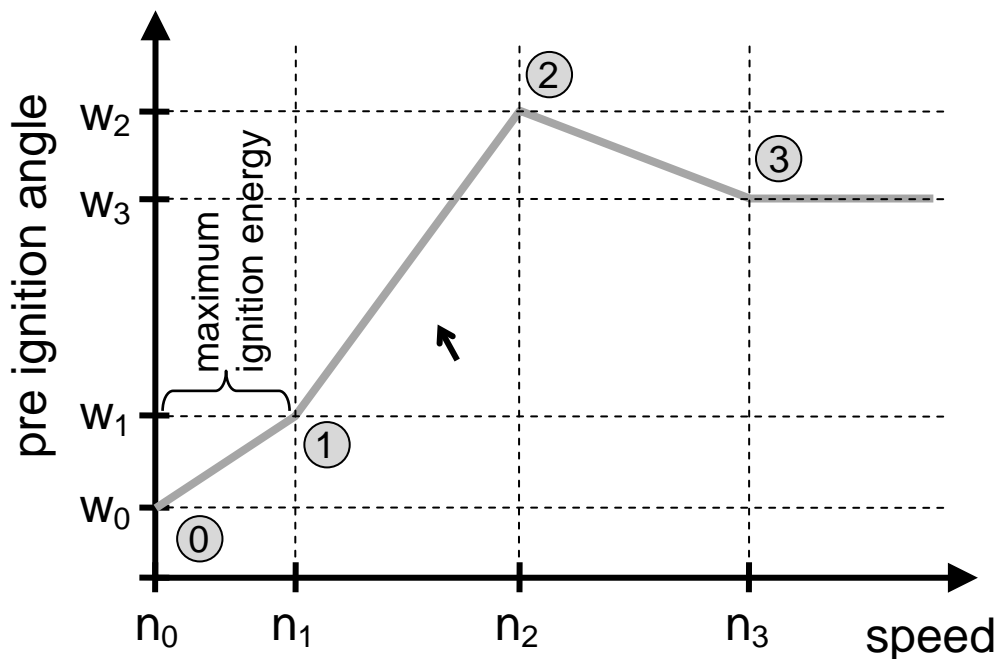
configuration of one custom ignition map



Five individual created ignition maps can be programmed with four pre-ignition angle and speed pairs. **The value of the speed n_0 cannot be modified; it is set constantly to 0rpm**

The creation of an individual map should result on experience with a pre-programmed map. Wrong adjustments can have negative effects on engine smoothness, responding behavior or also on mechanical components.

We are not responsible for consequential damages as a result of improper engine adjustments.



The speed values n_x can be adjusted in 100rpm- steps, the pre ignition angles in 1° -steps.

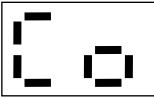
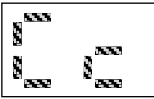


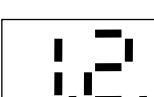

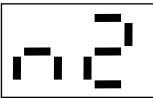
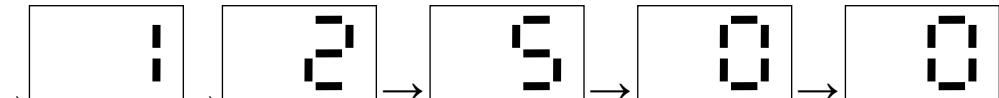
restrictions:

- $n_3 > n_2 > n_1 > n_0$
- $n_3, n_2, n_1 < 30000$
- $w_3, w_2, w_1, w_0 < 39^\circ$

Adjustment of the custom ignition map

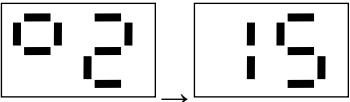




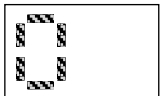
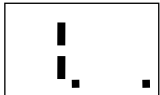


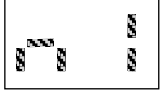

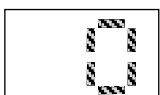
The adjustment of the custom ignition map is basically more complex than other menu adjustments. Before starting, please collect experience with the operation concept in other menu adjustments. Change primarily only few parameters and check the adjusted values, possibly note the values down.

In the following example the custom ignition map "12" is modified. The current ignition angle and speed pairs shall be unchanged, only angle w_0 shall be changed to 13° and speed n_2 to 21500 rpm.

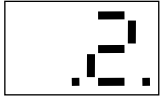
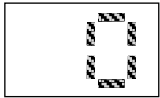

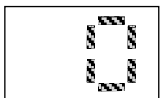
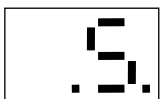

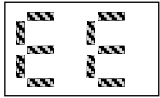

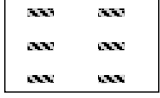

nr.	action	display
1-4	➤ select configuration menu	
5	➤ wait until „Cc“ flashes	
6	➤ actuate magnetic element	
7	adjustable parameters flash one after another for 3sec (10..14)	
8	➤ wait until the desired map for modification flashes (for example „12“) ➤ actuate magnetic element	
9	display shows the current speed values „n“ and the current angle values „°“ one after another $n_0 \rightarrow w_0 \rightarrow n_1 \rightarrow w_1 \rightarrow n_2 \rightarrow w_2 \rightarrow n_3 \rightarrow w_3$	
9a	The POWER SPARK has a two digit LED display. This is why the display of speed values occurs by sequentially displaying the figures. The display shows the speed figures one after another (here for example „n ₂ “=12500rpm). display:	 

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9b	display of pre-ignition angle: (here for example „w ₂ “=15°) 	
TIP	For a faster adjustment of the parameters the display of the values can be interrupted: ➤ wait, until any angle will be displayed (for example „w ₀ “) ➤ actuate magnetic element	
10	display shows „i“, an information, that the proper programming can start and inputs from the user are expected	
11	adjustable parameters flash one after another for 3sec: w ₀ → n ₁ → w ₁ → n ₂ → w ₂ → n ₃ → w ₃	
12	➤ actuate magnetic element to select the parameter for modifying. Example: the angle „w ₀ “ is selected for modifying	
13	adjustable values of the tens flash one after another for 3 sec (0-3)	
14	➤ wait until the desired figure flashes (for example „1“) ➤ actuate magnetic element	
15	adjustable values of the unit position flash one after another for 3 sec (0-9)	
16	➤ wait until the desired figure flashes (for example „3“) ➤ actuate magnetic element	
17	the remaining adjustable parameters flash one after another for 3 sec: n ₁ → w ₁ → n ₂ → w ₂ → n ₃ → w ₃	
18	➤ actuate magnetic element to select the parameter for modifying. Example: the speed „n ₂ “ is selected for modifying	
19	adjustable values of the ten thousands flash one after another for 3sec (0-2)	

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20	<ul style="list-style-type: none"> ➤ wait until the desired figure flashes (for example „2“) ➤ actuate magnetic element 	
21	adjustable values of the thousands flash one after another for 3sec (0-9)	
22	<ul style="list-style-type: none"> ➤ wait until the desired figure flashes (for example „1“) ➤ actuate magnetic element 	
23	adjustable values of the hundreds flash one after another for 3sec (0-9)	
24	<ul style="list-style-type: none"> ➤ wait until the desired figure flashes (for example „5“) ➤ actuate magnetic element 	
25	<p>the remaining adjustable parameters flash one after another for 3sec: $w_2 \rightarrow n_3 \rightarrow w_3$</p>	
26	<ul style="list-style-type: none"> ➤ wait until w_3 had flashed 	
27a	The error message „EE“ will be shown if wrong values are entered. The values before modification are retained.	
27b	<p>display shows the new (or retained) speed values „n“ and angle values „°“ one after another $n_0 \rightarrow w_0 \rightarrow n_1 \rightarrow w_1 \rightarrow n_2 \rightarrow w_2 \rightarrow n_3 \rightarrow w_3$ (also described in (9))</p>	
28	If all values are entered correctly and the described requirements are fulfilled, the values will be stored. Display indicates that the new values are stored.	
29	<p>POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)</p>	

c) Speed limit

adjustment of engine speed limit (engine splutters)
(factory setting: $n_L = \langle 59900 \text{rpm} \rangle$)





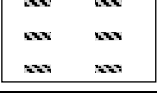



The engine can be protected against too high speeds with adjusting a speed limit. If the engine speed exceeds the adjusted speed limit the ignition will be interrupted, the engine splutters. The speed limit can be adjusted exactly to 100rpm. If this safety function is not needed a speed limit value higher than the maximum engine speed should be programmed.

For example: speed limit of „21500 rpm“ shall be adjusted

nr.	action	display
1-4	➤ select configuration menu	
5	➤ wait until „nL“ flashes	
6	➤ actuate magnetic element	
7	display shows the current speed limit by displaying the figures of the speed one after another. display scheme see section b) point 9a) (for example 2→0→0→0→0)	
8	display shows „i“, an information, that the proper programming can start and inputs from the user are expected	
9	adjustable values of the ten thousands flash one after another for 3 sec (0-5)	
10	➤ wait until the desired figure flashes (for example „2“) ➤ actuate magnetic element	
11	adjustable values of the thousands flash one after another for 3sec (0-9)	
12	➤ wait until the desired figure flashes (for example „1“) ➤ actuate magnetic element	

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13	adjustable values of the hundreds flash one after another for 3sec (0-9)	
14	<ul style="list-style-type: none"> ➤ wait until the desired figure flashes (for example „5“) ➤ actuate magnetic element 	
15	for confirmation the adjusted speed is shown	
16	display shows the new speed limit by displaying the figures of the speed one after another (for example 2→1→5→0→0)	
17	Display indicates that the new values are stored	
18	POWER SPARK returns to the normal operation mode. (display of engine speed and ignition standby)	

d) Ignition energy

selection of ignition energy (<2>)



The ignition energy of the POWER SPARK can be adapted to the engine. The stronger the spark is the safer is the ignition of the air fuel mixture; however the POWER SPARK consumes more electric power. To extend the operating time of the battery the ignition energy should be chosen not higher than needed for a smooth engine running. To improve the startup behavior the highest ignition energy is used between speed n_0 and n_1 .

Adjustment possibilities:

- setting „1“ low ignition energy
- setting „2“ medium ignition energy (factory setting)
- setting „3“ high ignition energy

nr.	action	display
1-4	➤ select configuration menu	
5	➤ wait until „IE“ flashes	
6	➤ actuate magnetic element	
7	display shows the current ignition energy (for example „2“)	
8	adjustable values flash one after another for 3 sec (1-3)	
9	➤ wait until the desired value flashes, (for example „3“) ➤ actuate magnetic element	
10	display shows the new selected ignition energy (here „3“)	
11	display indicates that the new value is stored	
12	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

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e) Sensor angle

compensation of mechanical displacement of speed sensor (<75>)



A small angular offset between the ideal trigger of the speed sensor (75° before top dead center) and the current value can be adjusted by setting the actual angle value between the speed sensor and the sensor magnet.

- Mark the angle between the trigger point of the speed sensor and the top dead center using menu „CS“ (see next page).

If you adjust angle values less than the nominal 75° the available computing time of the microcontroller will be shorter. For example, an adjustment of the sensor angle to 70° limits the use of high pre-ignition angles (≈35°) to engine speeds (<26500rpm).

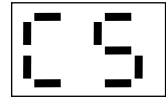
nr.	action	display
1-4	➤ select configuration menu	
5	➤ wait until „SA“ flashes	
6	➤ actuate magnetic element	
7	display shows the current sensor angle value (for example „75“)	
8	adjustable values of the tens flash one after another for 3 sec (4-7) ➤ wait until the desired figure flashes (for example „6“) ➤ actuate magnetic element	
9	adjustable values of the unit position flash one after another for 3 sec (4-7) ➤ wait until the desired figure flashes (for example „9“) ➤ actuate magnetic element	
10	display shows the new selected angle value (here: 69)	
11	display indicates that the new value is stored	
12	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

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f) Check sensor

check mechanical position of speed sensor



The speed sensor has to be positioned in a way that it is triggered by the sensor magnet **75° before reaching** the top dead center. With the help of this menu the adjustment can be done easily.
=> see also page 7 and page 30

If there is no further mechanical correction possible:

- measure the actual triggering angle (for example mark flywheel at the triggering point and at the top dead center with a pen and measure this angle).
- adjust the angle value in menu point „SA“ (page 30)

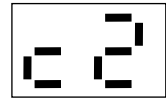
Important: Please note the constraints when adjusting the value of the sensor angle (p.31)!

nr.	action	display
1-4	➤ select configuration menu	
5	➤ wait until „CS“ flashes ➤ actuate magnetic element	
6	display shows permanently the first decimal point	
7	➤ turn flywheel in direction of rotation until the display shows „ii“ The sensor magnet of the flywheel is detected by speed sensor.	
8	➤ turn back flywheel until only the first decimal point is shown	
9	➤ repeat step 7 to adjust an angle of 75 ° between top dead center and trigger point	
10	after making the adjustment: ➤ actuate magnetic element	
11	POWER SPARK returns to normal operation mode (display of engine speed and ignition standby)	

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g) configuration cylinder 2²⁾

selection of endstage operation mode (<2>)



The second ignition endstage can be configured for engines in boxer or twin arrangement. Alternatively the second ignition endstage can be used as a switching output when the POWER SPARK is in one cylinder operation. In this configuration the switching output is either speed-dependent or error-dependent. (when engine is shut-off, see diagnostic menu, „rS“, „bd“, „rd“).

Adjustment possibilities:

- setting „F1“ boxer- engine: 0° ignition offset
- setting „F2“ twin-Motor: 180° ignition offset
- setting „F3“ speed-dependent switching output
- setting „F4“ error-dependent switching output “ON”
- setting „F5“ error-dependent switching output “flashing”

nr.	action	display
1-4	➤ select configuration menu	
5	➤ wait until „c2“ flashes	
6	➤ actuate magnetic element	
7	display shows the current function of the second ignition stage (for example „1“)	
8	adjustable values flash one after another for 3 sec (1-5)	
9	➤ wait until the desired value flashes, (for example „3“) ➤ actuate magnetic element	
10	display shows the new selected ignition energy (here „3“)	
10a	<ul style="list-style-type: none"> • proceed with page 35 point 13, if function „3“ is selected 	

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11	display indicates that the new value is stored	
12	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

Speed-dependent switching output „F3“

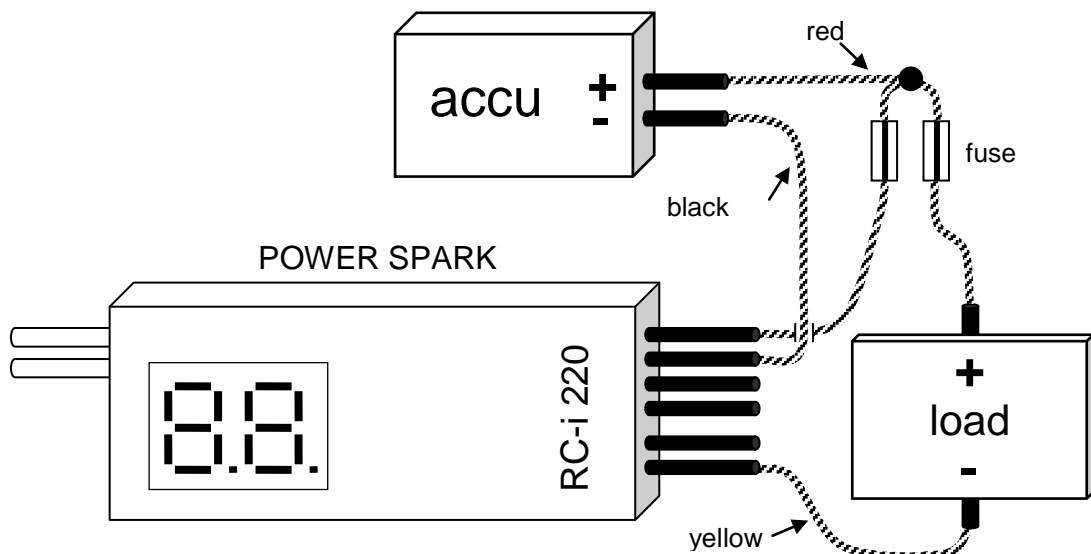
If the function „speed-dependent“ switching output is selected, the POWER SPARK switches the output of the second ignition endstage in dependence of the engine speed on and off. The ignition endstage switches the output to ground, that means the negative connection of a load must be connected to the POWER SPARK and the positive connection must be connected to the battery (=>use fuse). When exceeding the lower speed threshold n_6 the output is switched to ground, when exceeding the upper speed threshold n_7 the output is disabled (high impedance).

- the switching output is updated every 0,2sec
- the speed threshold values n_6 and n_7 can be adjusted in 100rpm- steps

restrictions:

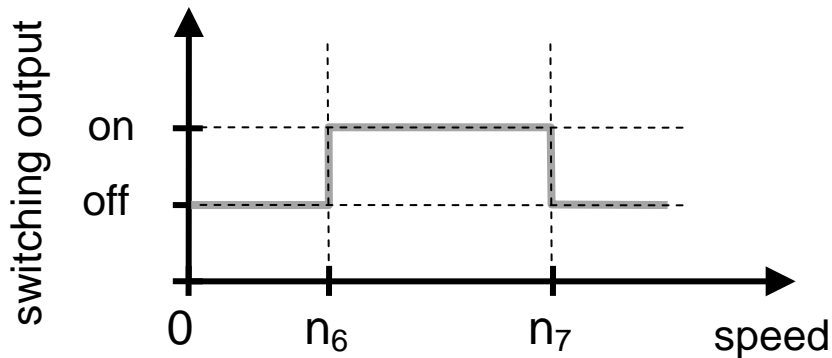
- $n_6 < n_7$
- $0 < n_6, n_7 < 59900$

Connection scheme when using the switching output



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function of the switching output


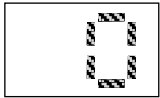

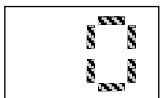
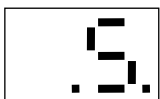
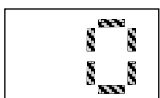
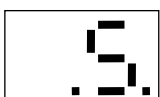

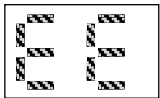

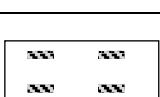



Adjustment of speed threshold values

For example: speed threshold $n_6 = „15500 \text{ rpm}“$ shall be adjusted

nr.	action	display
1-10	➤ chose function „3“ to enable the speed-dependent switching output, see points (1-10) on previous page	
13	display shows the current speed values „n“ one after another $n_6 \rightarrow n_7$	
14	The POWER SPARK has a two digit LED display. This is why the display of speed values occurs by sequentially displaying the figures. The display shows the speed figures one after another (here for example „ n_6 “=12500rpm). display: 	
15	display shows „i“, an information, that the proper programming can start and inputs from the user are expected	
16	adjustable parameters flash one after another for 3sec: $n_6 \rightarrow n_7$	

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17	<ul style="list-style-type: none"> ➤ actuate magnetic element to select the parameter for modifying. Example: the speed „n₆“ is selected for modifying 	
18	adjustable values of the ten thousands flash one after another for 3sec (0-5)	
19	<ul style="list-style-type: none"> ➤ wait until the desired figure flashes (for example „1“) ➤ actuate magnetic element 	
20	adjustable values of the thousands flash one after another for 3sec (0-9)	
21	<ul style="list-style-type: none"> ➤ wait until the desired figure flashes (for example „5“) ➤ actuate magnetic element 	
22	adjustable values of the hundreds flash one after another for 3sec (0-9)	
23	<ul style="list-style-type: none"> ➤ wait until the desired figure flashes (for example „5“) ➤ actuate magnetic element 	
24	the second adjustable parameter flashes for 3sec	
25	<p>if this speed value should be changed:</p> <ul style="list-style-type: none"> ➤ actuate magnetic element (input as described in point 18) 	
26a	The error message „EE“ will be shown if wrong values are entered. The values before modification are retained.	
26b	display shows the new (or retained) speed values „n“ one after another n ₆ → n ₇ (also described in (14))	
27	If all values are entered correctly and the described requirements are fulfilled, the values will be stored. Display indicates that the new values are stored.	
28	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

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h) Factory reset

reset POWER SPARK to factoryt settings








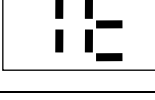




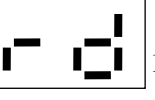


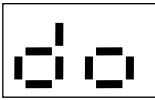
The POWER SPARK can be reset in the initial state with default values at any time.

WARNING: all stored settings get lost

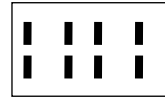
nr.	action	display
1-4	➤ select configuration menu	
5	➤ wait until „Fr“ flashes	
6	➤ actuate magnetic element	
7	„Fr“ flashes again for 3sec	
8	➤ within this time actuate magnetic element	
9	„Fr“ flashes again for 3sec	
10	➤ within this time actuate magnetic element	
11	display confirms the initialization with the factory settings	
12	display indicates that the values are stored	
13	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

- The next page shows the values of the factory setting.

default setting

main menu	menu	parameter	value
 configuration menu		ignition map	1 (0-9)
		individual ignition map	values of map 1
		sensor angle	75 (40..99)
		engine speed limit	59900 (0-59900)
		ignition energy	2 (1-3)
		operation mode of ignition endstage	2 (1-3)
 diagnostic menu	 ¹⁾	receiver signal supervision ¹⁾	no (no, 0..99)
	 ¹⁾	warn threshold low voltage receiver battery ¹⁾	no (no, 2..9,9)
	 ¹⁾	shutdown threshold low voltage receiver battery ¹⁾	no (no, 2..9,9)
		warn threshold low voltage main battery	no (no, 4..9,9)
		shutdown threshold low voltage main battery	no (no, 4..9,9)
		display options	0 (0..3)

¹⁾ Only versions with diagnostic functions RC-i x2x, ²⁾ only multiple cylinders versions RC-i 2xx & RC-i 4xx
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STATUS MENU

The status menu can only be selected when the engine halts.
It includes the menu items:

- a) **maximum engine speed „nh“**
display of maximum achieved engine speed
- b) **voltage of main battery „Ub“**
display of actual main battery voltage
- c) **voltage of receiver battery¹⁾ „Ur“**
display of actual receiver battery voltage
- d) **display options „do“**
selection of display content when engine halts

selection of status menu

nr.	action	display
1	POWER SPARK in normal operation mode	
2	➤ actuate magnetic element (by approaching the programming magnet to the housing near the magnet sensitive element)	
3	after 3sec the right figure „d“ flashes ➤ wait 3 sec to get to the status menu	
4	the selectable menu items flash one after the other for 3sec in the order: „nh“ → „Ub“ → „Ur“ ⁽¹⁾ → „do“	

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a) Display of maximum achieved engine speed „nh“ (n highest)

- value will be erased when removing the power supply
- value will be erased when starting the engine
- value is averaged over a period of 0.8sec

For example: the maximum achieved engine speed was $n_h = „25654 \text{ rpm}“$

nr.	action	display
1-4	➤ select status menu	
5	➤ wait until „nh“ flashes ➤ actuate magnetic element	
6	display shows the figures of speed one after another (for example 2→5→6→5→4)	
7	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

b) & c) Display of actual battery voltages

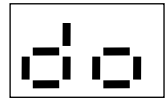
- „Ub“ (U battery)
- „Ur“ (U receiver)

nr.	action	display
1-4	➤ select status menu	
5	➤ wait until „Ub“ or „Ur“ flashes ➤ actuate magnetic element	
6	display shows the actual battery voltage (for example 5,6 Volt)	
7	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

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d) display options „do“

selection of display content when engine halts (<0>)



After an engine stop the POWER SPARK can automatically display the maximum achieved engine speed „nh“ and the voltage of the ignition battery „Ub“ and receiver battery „Ur“ alternately.

Adjustment possibilities:

- setting „o0“ no automatic display after engine stops
- setting „o1“ display: „nh“
- setting „o2“ display: „nh“ → „Ub“
- setting „o3“¹⁾ display: „nh“ → „Ub“ → „Ur“

The automatic display of the maximum engine speed is activated after an engine run for at least 4 seconds.

nr.	action	display
1-4	➤ select status menu	
5	➤ wait until „do“ flashes	
6	➤ actuate magnetic element	
7	display shows the current display function (here „1“)	
8	adjustable values flash one after another for 3 sec (0-3)	
9	➤ wait until the desired function flashes (for example „3“) ➤ actuate magnetic element	
10	display shows the new selected display function (here „3“)	
11	display indicates that the values are stored	
12	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

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DIAGNOSTICS MENU



General

The POWER SPARK provides several diagnostic functions to increase the reliability of the system.

- If the monitored voltage falls below the adjusted warning threshold ignition failures will be systematically generated **starting from the half maximum allowed engine speed.**
(=> engine splutters) to inform the user of a weak battery.
(adjustment of speed in menu item „nL“, p.28)
- If the monitored voltage falls below the switch-off threshold the engine will be shut down for safety.
(for example cable break of power supply on the RC-receiver)
- When receiving an illegal signal from the RC-receiver the engine will be shut down ¹⁾. (f.e. in case of failure of radio transmission)

A warning or shutdown is only triggered after a defined time (see table on page 44) when the monitored parameters have exceeded or under-run the permissible range of values. The warning or shutdown criteria are explained in the respective menus descriptions.





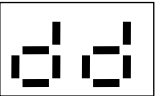
The diagnostic menu can only be selected when the engine halts. It includes the menu items:

- Supervision of receiver signal¹⁾ / “kill switch”¹⁾**
activation and adjustment of the valid receiver signal range
➔ engine shutdown
- Warning threshold receiver battery¹⁾**
activation and adjustment of warning threshold of receiver battery voltage
➔ engine splutters from speed nL/2 (S.28)
- Shutdown threshold receiver battery¹⁾** ➔ engine shutdown
activation and adjustment of shutdown threshold of receiver battery voltage
➔ engine shutdown
- Warning threshold main battery** ➔ engine splutters at nL/2
activation and adjustment of warning threshold of main battery voltage
➔ engine splutters from speed nL/2 (S.28)

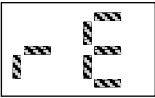
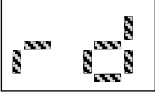
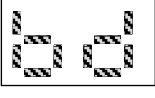
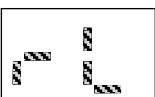

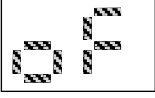
¹⁾ Only versions with diagnostic functions RC-i x2x, ²⁾ only multiple cylinders versions RC-i 2xx & RC-i 4xx
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- e) **Shutdown threshold main battery** → engine shutdown
activation and adjustment of shutdown threshold of main battery voltage
→ engine shutdown
- f) **Operating time**
display and reset of total operating time

selection of diagnostic menu

nr.	action	display
1	POWER SPARK in normal operation mode	
2	➤ actuate magnetic element (by approaching the programming magnet to the housing near the magnet sensitive element, remove after display shows “. .”)	
3	after 3sec the right figure „d“ flashes	
3b	during this time: ➤ actuate magnetic element (by approaching the programming magnet to the housing near the magnet sensitive element, remove after display shows “. .”)	
4	Diagnostic menu will be selected	

Shutdown criteria and display of diagnostic response

display	parameter	condition	result
	„rE“ receiver error¹⁾ supervision of receiver signal	no receiver signal	engine shutdown
	„rd“ receiver dead¹⁾ shutdown threshold receiver battery	battery voltage falls below shutdown threshold for minimum 2sec	engine shutdown
	„bd“ battery dead¹⁾ shutdown threshold main battery	battery voltage falls below shutdown threshold for minimum 5sec	engine shutdown
	„rL“ receiver low¹⁾ warn threshold receiver battery	battery voltage falls below warn threshold for minimum 5sec	engine splutters when reaching half allowed maximum engine speed
	„bL“ battery low¹⁾ warn threshold main battery	battery voltage falls below warn threshold for minimum 5sec	engine splutters when reaching half allowed maximum engine speed
	„oF“ killswitch off¹⁾	receiver signal out of the adjusted range	engine shutdown

- The valid input values of the shutdown or warning thresholds and the receiver signal shows the table „ technical data“ (last page)

PLEASE NOTE:

- After triggering a diagnostic function the occurred warning or error is displayed
- After switching off a restart of the engine is blocked for 5sec

How to clear warnings or errors:

- restart engine OR
- interrupt and reconnect power supply of POWER SPARK (reset)

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a) **Supervision of receiver signal¹⁾ / “kill switch”¹⁾**
activation and adjustment of the valid receiver signal range



The POWER SPARK can monitor the signal of a radio-control receiver. The engine is shut down if the received signal is above or below the adjusted threshold values, the sensitivity can be adjusted.

An appropriate signal for the supervision can be the „gas“-signal (to accelerate / slow down (reverse)). Alternatively any signal can be used (for example steering signal) or a signal that is exclusively reserved for supervision / shutdown.

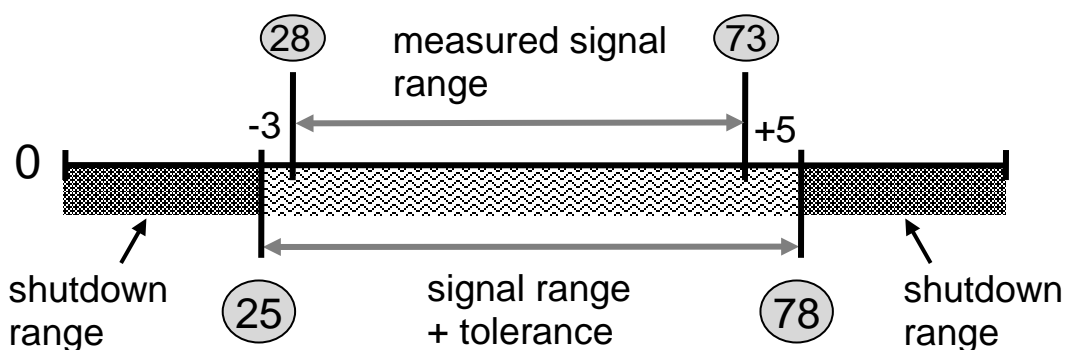
sequence of programming: The POWER SPARK displays the adjusted values, afterwards it displays the actual measured value of the receiver signal for 10 seconds. Following the thresholds can be modified; in the last step the new values are confirmed.

The nominal receiver signal range can be displayed within the 10-second time window by moving the gas-poti / switch at the remote control. To avoid an unintended shutdown of the engine caused by this diagnostic function a tolerance up to about 5-10% should be added (respectively subtracted) to the nominal values.

In the following example a signal range from „28“ – „73“ was determined. To avoid an unintended shutdown of the POWER SPARK, a tolerance value was added to the upper signal value respectively subtracted from the lower signal value.

=> The thresholds „25“ and „78“ are chosen.

receiver signal



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KILL SWITCH and FAILSAFE- functions

• KILL SWITCH with separate channel

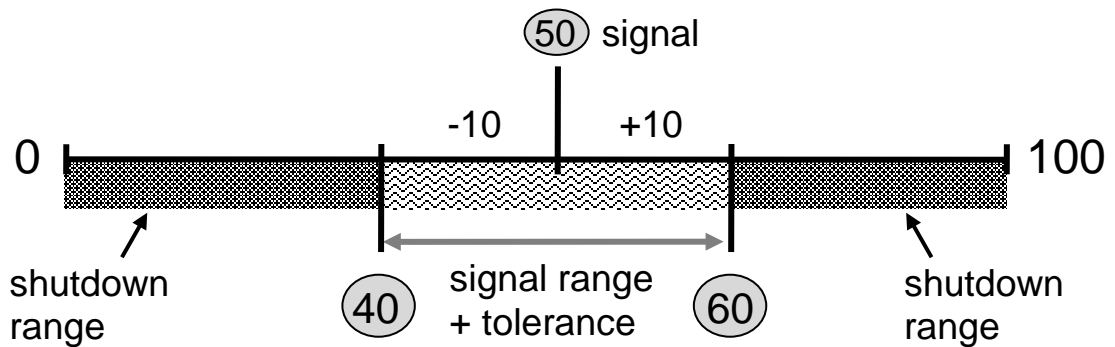
The POWER SPARK can act as a „KILL SWITCH“ and shut down the engine when a button on the remote control system is pushed:

- select a free channel on the remote control system and connect the signal to the POWER SPARK.
- identify signal values for „button on“ and „button off“
- enter the threshold values for the receiver signal supervision

Example: engine should shut down by pushing „button on“

The receiver provides for - „button off“ the value 50
- „button on“ the value 20

➔ chose the valid signal range from 40 to 60



• KILL SWITCH with gas signal

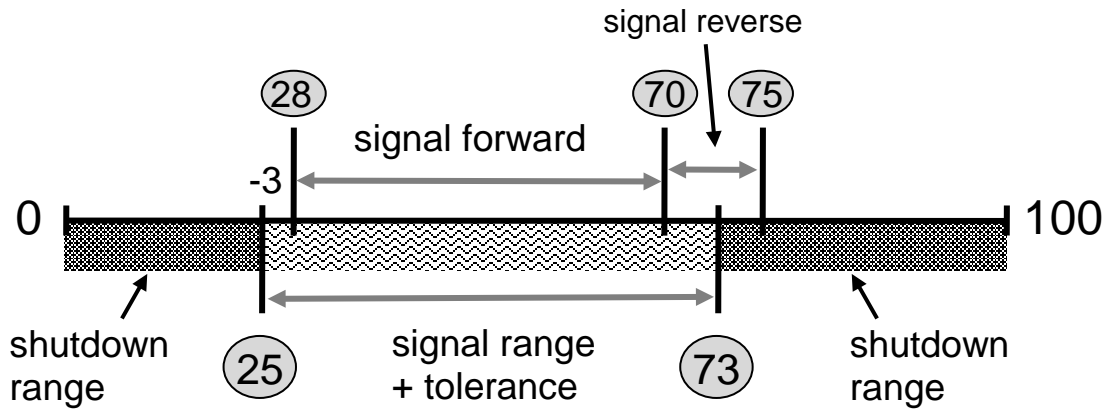
The POWER SPARK can act as a „KILL SWITCH“ and shut down the engine when a specific gas position (f.e. „reverse“) is reached:

- Adjust the according threshold of the receiver signal supervision to a value within the signal range of the desired shutdown criteria.

Example: engine should shut down by actuating „backwards“

The receiver provides for - „forward“ the values 28-70
- „reverse“ the values 70-75

➔ Chose the threshold of the receiver signal supervision in a way that it is not reached unintended or by too small tolerances. Here chosen: „73“

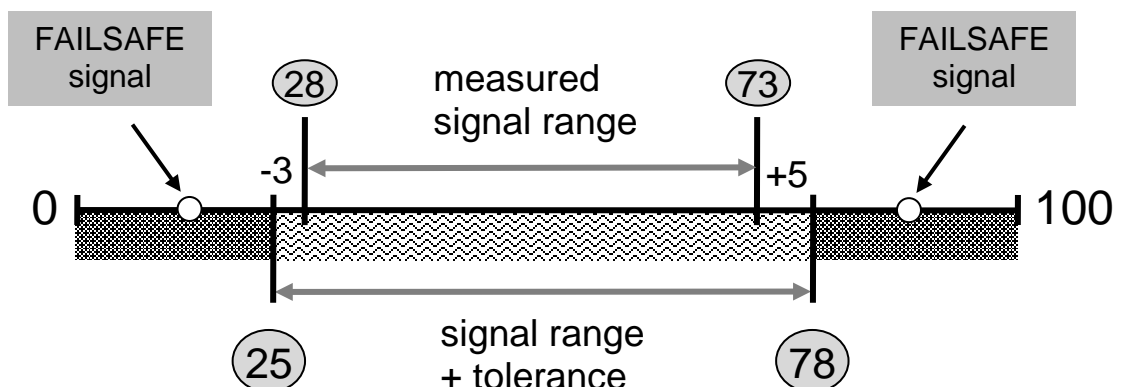


- **FAILSAFE:**

The POWER SPARK can react with an engine shutdown to a FAILSAFE signal of the remote control system:

- To enable this functionality a FAILSAFE-signal value outside the programmed threshold values for the receiver signal supervision has to be programmed to the remote control system.

Example: The receiver provides values between 28 and 73
 - the signal range including tolerances is chosen to 25-78
 - the FAILSAFE- values on the remote controller system are set to f.e. 20 or 85



sensitivity „SE“ <1>

The sensitivity for engine shutdown in case of loss of a valid receiver signal can be selected in three steps. The more sensitive the receiver signal monitoring is set, the faster the engine is shut off. However the possibility of a misdiagnosis increases and accordingly the tolerance against short glitches decreases.




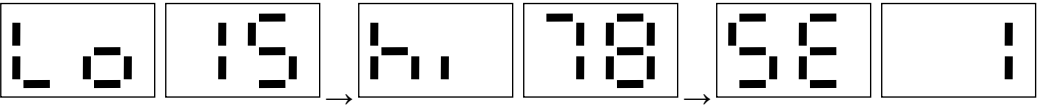
Adjustment possibilities:







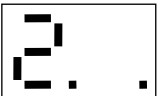
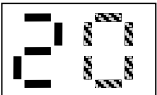
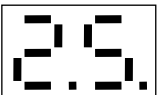

- setting „1“ low sensitivity (factory setting)
- setting „2“ medium sensitivity
- setting „3“ high sensitivity

Programming


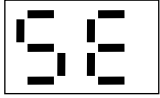
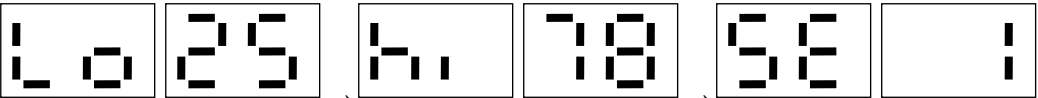
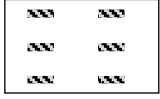

In the following example the limits „15“ and „78“ are selected.

- the lower limit should be changed to the value „25“.
- the upper limit should not be changed
- the sensitivity of the signal supervision should not be changed

nr.	action	display
1-4	➤ select diagnostic menu	
5	➤ wait until „rS“ flashes	
6	➤ actuate magnetic element	
7	display shows the actual values of the lower and upper limit: (here for example „lo“=15, „hi“=78, „SE“=1)	

8	<p>in the following 10 seconds the actual value of the receiver signal is displayed</p> <p>➤ during this time determine the lower and upper signal value of the receiver signal by moving the gaspoti in the end positions (on the remote-controller)</p>	
9	<p>➤ choose the values for the receiver signal supervision thoroughly (see introductory text)</p>	
10	<p>display shows „i i“, an information, that the proper programming can start and inputs from the user are expected</p>	
11	<p>The selectable parameters flash one after another for 3 sec - „lo“ (lower limit)</p> <p>- „hi“ (higher limit)</p> <p>- „SE” (sensitivity)</p> <p>lo → hi → SE</p>	
12	<p>➤ actuate magnetic element to select parameter for modifying</p> <p>here: the lower limit „lo“ is selected</p>	
13	<p>Adjustable values flash one after another for 3sec (no, 0-9)</p>	
13a	<p>To disable this diagnostic function:</p> <p>➤ actuate magnetic element</p>	
13b	<p>To enable this diagnostic function:</p> <p>➤ wait until the desired figure of the tens flashes (for example „2“)</p> <p>➤ actuate magnetic element</p>	
	<p>adjustable values of the unit position flash one after another for 3sec (0-9)</p>	
	<p>➤ wait until the desired figure flashes (for example „5“)</p> <p>➤ actuate magnetic element</p>	
14	<p>the remaining adjustable parameters flash one after another for 3 sec:</p> <p>hi → SE</p>	

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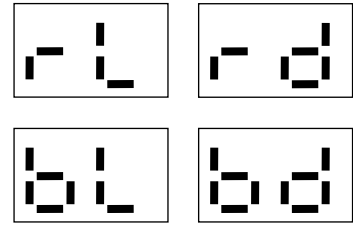
14a	if the upper limit „hi“ should be changed: ➤ actuate magnetic element • (input as described in point 13)	
14b	if the sensitivity „SE“ should be changed: ➤ wait until “SE” flashes ➤ actuate magnetic element • (input analog to point 13)	
15	display shows the new values of the lower and upper limit: (here for example „lo“=25, „hi“=78, „SE“=1) 	
16	Display indicates that the new values are stored.	
17	POWER SPARK returns to the normal operation mode (display of engine speed and ignition standby)	

PLEASE NOTE:

- To deactivate the receiver signal supervision
 - set the upper or lower threshold to „no“
- To activate the receiver signal supervision
 - set the upper and lower threshold to valid values
- The receiver signal supervision is activated 7sec after power up

b) - e) Voltage monitoring

activation and adjustment of warning or shutdown thresholds of main or receiver battery voltage



The following example shows exemplarily the deactivation / activation of the warning threshold for monitoring the voltage of the main battery. The adjustments of the other thresholds are identical.

nr.	action	display
1-4	➤ select diagnostic menu	
5	➤ wait until „bl“ flashes	
6	➤ actuate magnetic element	
7	display shows actual voltage value (for example „4.5“)	
8	adjustable values flash one after another for 3sec (no, 0-9)	
8a	To disable this diagnostic function: ➤ actuate magnetic element	
8b	To enable this diagnostic function: ➤ wait until the desired figure of the unit value flashes (for example „4“) ➤ actuate magnetic element	
9	➤ wait until the desired figure of the decimal place flashes (for example „0“) ➤ actuate magnetic element	
10	display shows the new voltage values (here „4.0“)	
11	Display indicates that the new value is stored	
12	POWER SPARK returns to normal operation mode (display of engine speed and ignition standby)	

¹⁾ Only versions with diagnostic functions RC-i x2x, ²⁾ only multiple cylinders versions RC-i 2xx & RC-i 4xx

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f) operating time

display and reset of total operating time



The POWER SPARK sums the total operating time of the engine with an internal resolution of 1min, the display shows it with a resolution of 1h. After displaying the operating time the user can reset the operating time counter.

nr.	action	display
1-4	➤ select diagnostic menu	
5	➤ wait until „ot“ flashes	
6	➤ actuate magnetic element	
7	the total engine operating time in hours is displayed (for example „06“)	
8	„cl“ (clear) flashes for 3sec	
8a	operating time counter should <u>not</u> be reset: ➤ wait	
8b	to reset the operating time counter: ➤ within this time actuate magnetic element	
9	„cl“ flashes again for 3sec	
10	➤ within this time actuate magnetic element again	
11	the reset of the operating time counter is confirmed	
12	Display indicates that the new value is stored	
13	POWER SPARK returns to normal operation mode (display of engine speed and ignition standby)	

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Technical data

feature	version			
	RC-i 1x0	RC-i 2x0	RC-i 4x0	
number of cylinders	1	2	3 & 4	
max. speed [rpm]	30000			
accuracy of speed measurement	+/- 1% (25°C)			
power supply	4-12V ³⁾			
detectable pulse width of receiver signal ¹⁾	0,8 .. 2,2ms			
min. signal level of receiver signal ¹⁾	1,6V			
warn threshold for low voltage main battery	4..9,9V			
shutdown threshold for low voltage main battery	4..9,9V			
warn threshold for low voltage receiver battery ¹⁾	2..9,9V			
warn threshold for low voltage receiver battery ¹⁾	2..9,9V			
reverse polarity protection with fuse	3A	5A	10A	
current consumption: ⁴⁾ energy 2: 6V	7500rpm 15000rpm	≈0,5A ≈1,0A	≈1,0A ≈2,0A	≈2,0A ≈4,1A
current consumption: ⁴⁾ energy 2: 9V	7500rpm 15000rpm	≈0,4A ≈0,7A	≈0,7A ≈1,3 A	≈1,4A ≈2,7A
current consumption: ⁴⁾ energy 2: 12V	15000rpm 30000rpm	≈0,5A ≈1,1A	≈1,1A ≈2,2A	≈2,2A ≈4,4A
dimensions [mm] (without flange)	82 x 42	82 x 42	82 x 82	
dimensions [mm] (with flange)	110 x 42	110 x 42	110 x 82	
height [mm]	18	18	18	
hole pattern [mm]	100 x 32	100 x 32	100 x 72 100 x 36	
weight [g]	~100	~110	~195	



³⁾ for multiple cylinders versions and high speed (>20000rpm) the supply should be min. 9V

⁴⁾ current consumption has a strong dependency on ignition coil, spark plug an wiring cross section

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