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Electronic ignition circuit specification

OEZ43

for TEDOM co-generation units

1.12.2003

CONTENTS:

1. Device purpose

The four-cylinder electronic ignition circuit (hereinafter referred to as OEZ43) is designed to control ignition in four- and three-cylinder combustion engines 1.3 (1.4) l of TEDOM co-generation units.

2. Operating conditions

For proper operation of OEZ43 it is necessary to keep elementary operating conditions defined in the following chapters:

a) correct connection of input-output connectors
b) voltage within the given tolerance
c) correct adjustment of DIP switches and shorting links
d) keeping operating temperature of environment in the range 5-70°C

3. Mechanical structure

OEZ43 is placed in a metal box with the dimensions of 260x115x25mm. Four ∅ 4 mm holes in the distance of 240x88mm serve the purpose of mounting in the box KJ.

4. Electric structure

PA256/6-HO-C and PA256/8-HO-C slip-on connectors ensure the connection of OEZ43 inputs and outputs on superposed shorter sides of OEZ43.

4.1 Inputs

Title	Meaning	Working values
RES+	Differential input of reset sensor, RES+ may be used as open collector sensor input	Voltage ~(0.5-5V) Max. output current RES+ with open collector is 5mA Input impedance 1.56kohm
RES-		
CLK+	Differential input of crank sensor	Voltage ~(0.5-5V) Input impedance 1.56kohm
CLK-		
PGND	Ground for supply connection	U=12V (tolerance +10%, -25%) Imax=6A Imed=1.7A at 100 imp./s (tolerance 15%)
P+12V	Power supply	

4.2 Outputs

Title	Meaning	Working values
GND	Common ground for sensors and screening	
+5V	Supply voltage for sensor with open collector	Imax=50mA
GGND	Ground for speed input connection (reset)	Outputs are galvanically separated from OEZ43 Voltage level 0-5V
GRES	Output reset signal for speed input	
C1	Switching output for induction coil	Imax= 6A Timp=3.5ms
C2	Switching output for induction coil	
C3	Switching output for induction coil	
C4	Switching output for induction coil	

4.3 Connection using induction sensor

4.4 Connection using Hall probe

5. Functional description

Generating of the output signals is given by reset input signals (impulse each 720°), by crank signals (impulse each 180° for four-cylinder or each 120° for three-cylinder), and by the ignition timing on DIP switch.

If switch DIP8=OFF (four-cylinder), the ignition fires with the defined delay 90°-180° along the descending edge of the crank signal. The ignition shift angle is given by the formula 90°+ N × 0.703°.

If switch DIP8=ON (three-cylinder), the ignition fires with the defined delay 120°-180° along each odd descending edge of the crank signal. The ignition shift angle is given by the formula 120°+ N × 0.469°.

N is a number given by the DIP switch 1-7 as an aggregate of individual switches values in ON position according to the following table:

DIP	1	2	3	4	5	6	7
ON	1	2	4	8	16	32	64
OFF	0	0	0	0	0	0	0

The descending edge of the reset signal synchronizes the firing so that after the first following descending signal edge from the crank C1 plug fires (with the defined delay 90°-180°, or 120°-180°).

Firing period (output impulse period) is set fixedly on 3.5ms.

The advance angle is calculated from the periods of the two previous descending edges of the crank signals, corresponding with 180° or 120°. This also causes the possibility of advance error in case of dynamic changes of the assembly speed.

5.1 Variation of signals at DIP8=OFF

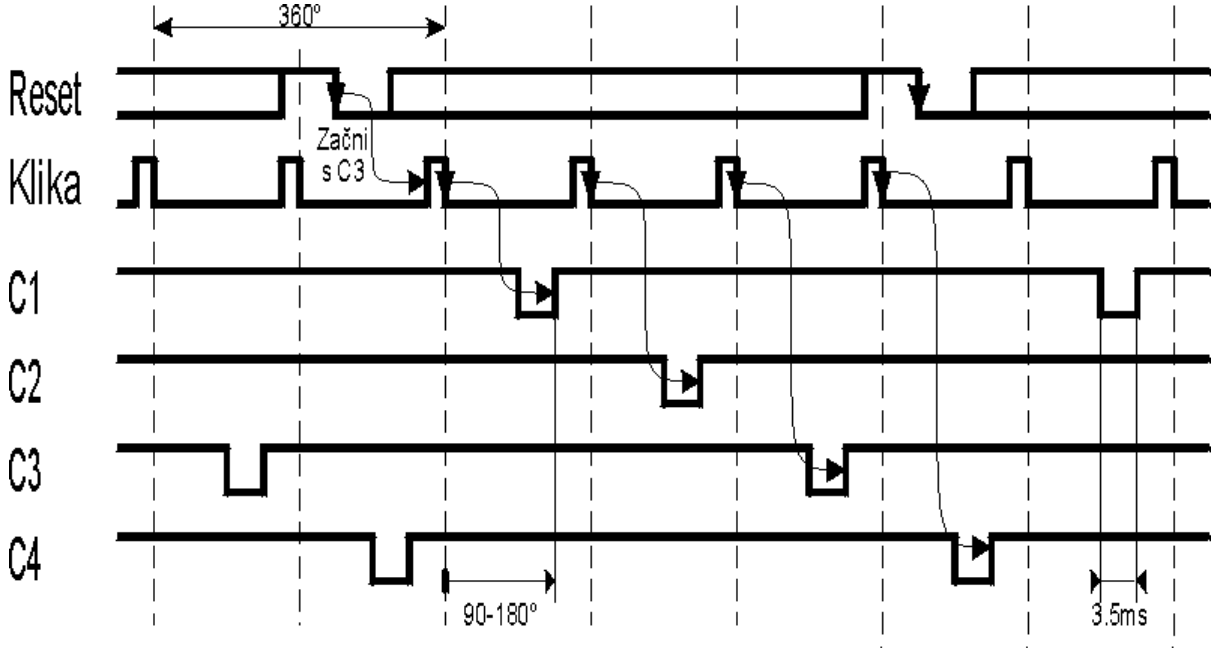
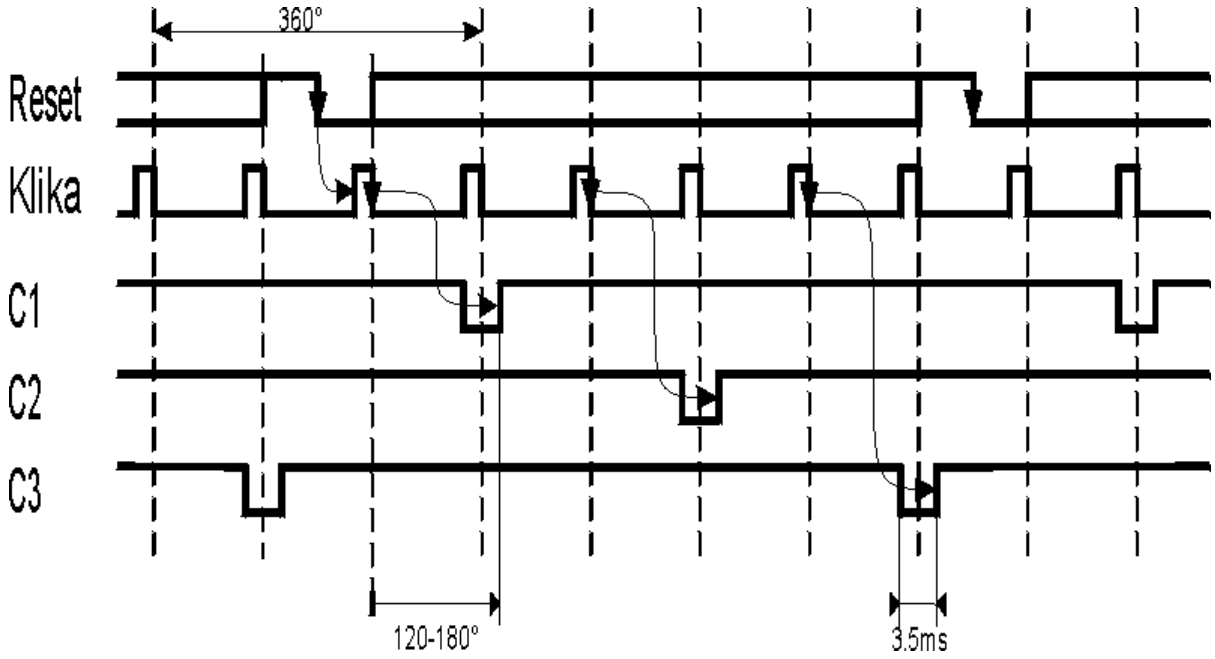


Fig. - Reset / Crank / Start with C3

5.2 Variation of signals at DIP8=ON



6. OEZ4 Tester

The tester OEZ4 ensures testing of OEZ43 and enables to adjust the ignition more easily. Information on OEZ43 status and input signals variations are transmitted from the tester by means of RS-232 to PC where they are analyzed. Due to high transmission speed (115200 bit/s) it is recommended to use as short communication cable as possible to interconnect the tester and PC (three-cable crossed connection is sufficient). The tester is supplied with 230V/50Hz.

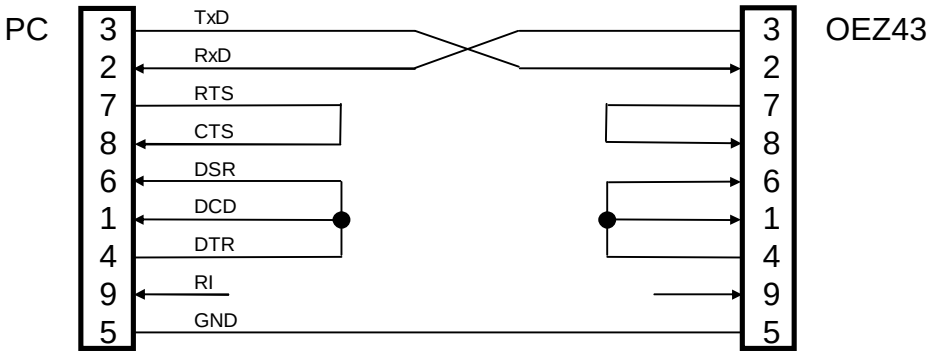
The ignition tester generates signals similar to those of four-cylinder or three-cylinder engine, therefore the ignition switch DIP8 must be in OFF position when connecting the tester.

On the tester face there is CANNON connector for PC connection, CUM/CUF connector where the tester generates service signals Res and Clk, and on the right there is a connector for OEZ43 connection with indicated orientation of the connector during interconnection. LED on the front panel indicates the supplying voltage, the power supply switch is on the back side of the tester.

6.1 Interconnection of OEZ, tester, and PC

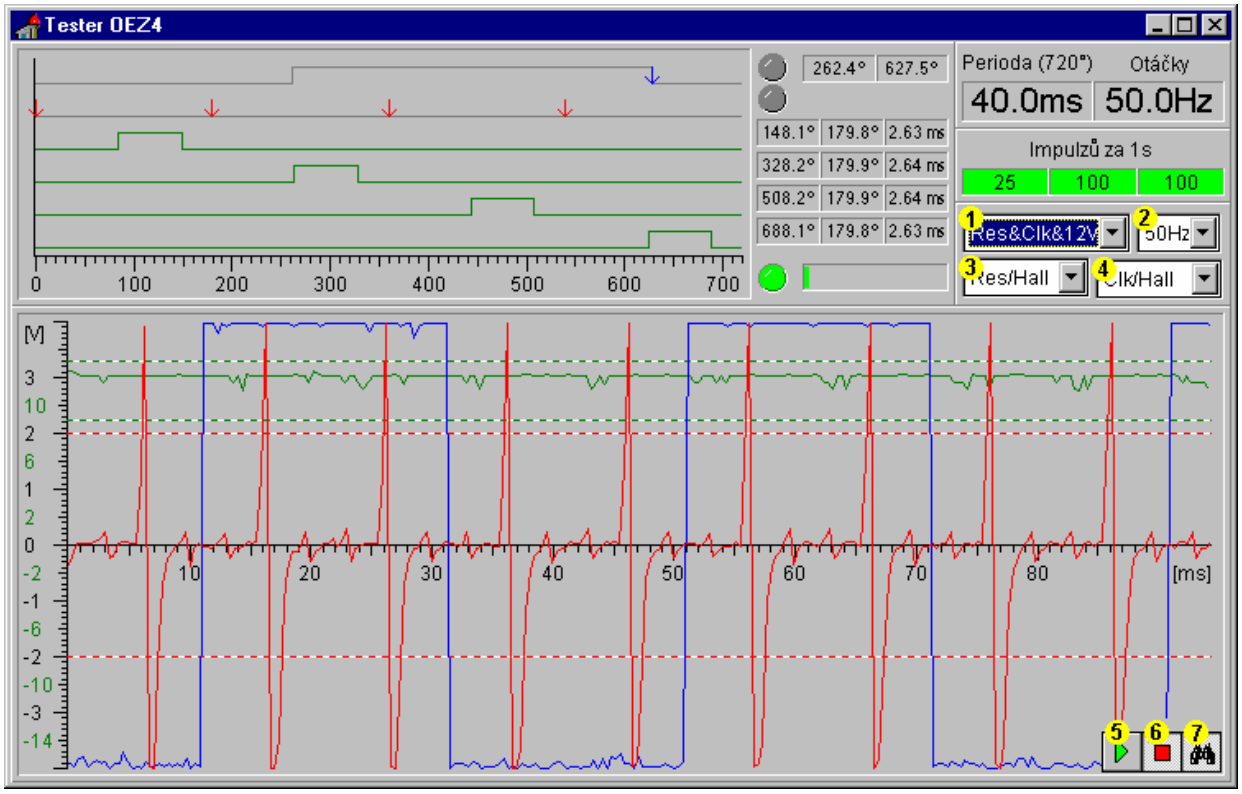
The tester may be connected to OEZ43 by means of a special connector on OEZ43:

Cable connection for connecting OEZ43 to PC:



6.2 Testing SW

For visualization and data measuring after RS-232 from OEZ4 tester there is the program „TST_OEZ4.EXE“. After the program start-up there appears a form with the measured parameters and control keys.



Control element		Options	Description
1	Display	Res&Clk&12V	Measured and displayed signals option. The number of measured variations influences the speed of signal lock-out (about 10kHz at 1 signal, 5kHz at two signals, 2.5kHz at three signals)
		Res&Clk	
		Res	
		Clk	
		+12V	
		+5V	
		-5V	
		Cycles	Measuring of the number of cycles without the given tolerance
2	Frequency	50Hz	Selection of the frequency of generating the service signals Res and Clk at the tester generator output
		25Hz	
3	Res type	Res/Induc.	Selection of the tester generator signal type (simulation of induction sensor or Hall probe)
		Res/Hall	
4	Clk type	Clk/Induc.	Selection of the tester generator Clk signal type (simulation of induction sensor or Hall probe)
		Clk/Hall	
5	Operation	On/Off	Push to start continuous operation of the oscilloscope.
6	Stop	On/Off	Push to stop continuous operation of the oscilloscope; the last variation measured stays on the display
7	Search	On/Off	Push to activate the supplying voltage decrease search function. If the function is on and there is a

			decrease in the supplying voltage under below 9V, the oscilloscope will be stopped (pushing the Stop button).

Measured values and variations:

- Ascending and descending phases (blue arrow) of the reset edge
- Clk impulses descending edges phase (red arrows)
- Impulses edges phase on coils (green variations), numerically is indicated the impulses descending edges (the firing point), phase shift from the previous coil firing, impulse length
- Firing cycles period (the period of two assembly cycles)
- Assembly frequency
- The number of impulses Res, Clk, and coils per 1 s (only during operation), if the field is highlighted in green, the number of impulses corresponds with the assembly frequency measured
- The blue diode indicates in the static mode the status of output reset signal
- The red diode indicates in the static mode the status of output Clk signal
- The green diode indicates the ignition operation
- The green signal on the oscilloscope optionally displays the variation of supplying voltage +12V and internal ignition voltage +5V or –5V, when displaying the signal +12V the green dashed lines limit the supplying voltage tolerance
- The blue signal on the oscilloscope displays the reset signal variation, the blue dashed lines limit the minimum signal amplitude
- The red signal on the oscilloscope displays Clk signal variation, the red dashed lines limit the minimum signal amplitude

In the display mode “Cycles” it is possible to measure the number of cycles that do not meet the defined tolerance.

The “Start” key may be used to start analyzing of the number of cycles without the tolerance (during continuous assembly operation), the “Stop” key stops the analyse. The “Reset” key may be used to reset the error cycles measured. In the database of error cycles there are saved values with the following meaning:

Value	Meaning
C1f	The phase of firing of the first plug with respect to the descending edge of the crank signal (0°)
C1d	Angle between firing C1 and C4
C2d	Angle between firing C2 and C1
C3d	Angle between firing C3 and C2
C4d	Angle between firing C4 and C3
C1t	C1 impulse period
C2t	C2 impulse period
C3t	C3 impulse period
C4t	C4 impulse period
Rf	Reset descending edge phase
T	Repetition period

7. Ignition timing procedure

The procedure of ignition timing with DIP8=OFF (four-cylinder):

1. Setting the assembly into the position where the first cylinder is in the top dead centre
2. Indexing the assembly by about 120° (exactly 90° + the required advance) counter to the running direction of the assembly
3. Placing a mark for the crank signal in the nearest possible hole from the sensor counter to the running direction of the assembly The angle between the nearest hole and the sensor position indicates approximate adjustment of DIP switch
4. Indexing the assembly counter to the running direction until the sensor registers the mark passing
5. Indexing the assembly by further 30-150° counter to the direction where the descending edge of the reset signal should be located
6. Placing another mark for crank signal monitoring into the that is opposite to the first mark (180°).

It is advisable to check the sequence of the reset descending edge and the crank signal by means of tester (graphic variations). Both of the edges should have sufficient distance from each other (min. 30°); in case they overlap an accidental firing shift by 180° might occur.

Fig. - Assembly running direction / Top dead centre / 2nd mark / Angle of holes for mark placing each 60° / Reset signal tolerance / 1st mark / Angle for rough setting of DIP