



We hereby inform that on 15th October 2013, the BOSMAL Automotive Research and Development Institute Ltd received the questions according to an open-tender procedure for the supply of Automotive Gearboxes Test Bench.

Details as below:

- 1) "The test bench shall simulate the function of the gearbox in the vehicle (car or light commercial vehicle) what means from one side the driving motor has to simulate engine **(SI or CI) characteristics** and from the other side - braking machines have to simulate road load conditions of a virtual vehicle: aerodynamic and rolling resistance, uphill resistance, vehicle inertia etc."

Can you tell me what you mean with "**(SI or CI) characteristics**" ?

Ad. 1 BOSMAL's explanation:

"SI" – Spark Ignition Engine

"CI" – Compression Ignition Engine

"Characteristics" – Full Load Performance. In short FLP. Engine torque as a function of engine rotational speed.

- 2) The test bench shall ensure the electrical energy recovery, with at least the following requirements satisfied:
 - standard EN 50160:2010,
 - **Ministry of Industry Regulation of 4 May 2007 on detailed conditions of electro-energetic systems running (Dziennik Ustaw pos. 623), chapter 10.**

We would need a German or English copy of the red signed regulation, Do you have that?

Ad. 2 BOSMAL's explanation:

Due to the transfer of electric energy from a dynamic brake to the power grid (energy recovery), the parameters of values such as voltage, frequency and harmonics shall meet the requirements specified in the REGULATION OF THE MINISTER OF ECONOMY of 4 May 2007 on Specific Conditions of Power System Operation (Journal of Laws 93/2007 item 623), Chapter 10, § 38, sub-par. 3.

Below you will find Ministry of Industry Regulation of 4 May 2007 on detailed conditions of electro-energetic systems running, chapter 10 in English language:

Chapter 10**The quality parameters of electric energy and the quality standards of customer service and complaint handling**

§ 38. 1. The following quality parameters of electric energy shall be determined for the entities categorised into the connection groups I and II when the grid operates without interruptions:

- 1) the average value of frequency measured for 10 seconds in connection points should be within the range:
 - a) 50 Hz \pm 1% (from 49.5 Hz to 50.5 Hz) for 99.5% of a week,
 - b) 50 Hz +4%/-6% (from 47 Hz to 52 Hz) for 100% of a week;

- 2) in every week, 95% from the set of 10-minute average root-mean-square (RMS) values of supply voltage should be within the range of deviations:

- a) $\pm 10\%$ of a rated voltage for the grid of rated voltages of 110 kV and 220 kV,
 b) $+5\%/-10\%$ of a rated voltage for the grid of a rated voltage of 400 kV;
- 3) during 95% of time during each week, the long-term flicker indicator P_{it} caused by supply voltage fluctuations should not exceed 0.8;
- 4) during each week, 95% from the set of 10-minute average root-mean-square (RMS) values:
 a) of the symmetrical component of negative-sequence supply voltage should be within the range of 0% to 1% of the component of positive sequence,
 b) for each supply voltage harmonic should be lower or equal to the values specified in the table below:

Odd harmonics				Even harmonics	
not multiplied by 3		multiplied by 3		harmonic number (h)	relative value of voltage in basic component per cent (u_h)
harmonic number (h)	relative value of voltage in basic component per cent (u_h)	harmonic number (h)	relative value of voltage in basic component per cent (u_h)		
5	2 %	3	2 %	2	1.5 %
7	2 %	9	1 %	4	1 %
11	1.5 %	15	0.5 %	> 4	0.5 %
13	1.5 %	> 21	0.5 %		
17	1 %				
19	1 %				
23	0.7 %				
25	0.7 %				
>25	$0.2 + 0,5 \cdot \frac{25}{h}$				

5) harmonic voltage distortion factor THD, taking into account higher harmonics on the level of 40, should be lower or equal to 3%;

6) consumption by a customer of active power not exceeding contractual power, with factor t_g not higher than 0.4 is a prerequisite for maintaining the supply voltage parameters within the range laid down in par. 1-5.

2. The quality parameters of electric energy supplied from the grid, referred to in par. 1, can be replaced for the entities categorised into the connection groups I and II, completely or in part, by other quality parameters of that energy agreed by the parties in an agreement for sale of electric energy or an agreement on providing the services of transmission or distribution of electric energy.

3. The following quality parameters of electric energy shall be determined for the entities categorised into the connection groups III - V when the grid operates without interruptions:

1) the average value of frequency measured for 10 seconds should be within the range:

- a) 50 Hz $\pm 1\%$ (from 49.5 Hz to 50.5 Hz) for 99.5% of a week,
- b) 50 Hz $+4\%/-6\%$ (from 47 Hz to 52 Hz) for 100% of a week;

2) in every week, 95% from the set of 10-minute average root-mean-square (RMS) values of supply voltage should be within the range of deviations of $\pm 10\%$ of a rated voltage,

3) during 95% of time during each week, the long-term flicker indicator P_{lt} caused by supply voltage fluctuations should not exceed 1;

4) during each week, 95% from the set of 10-minute average root-mean-square (RMS) values:

- a) of the symmetrical component of negative-sequence supply voltage should be within the range of 0% and 2% the component of positive sequence,
- b) for each supply voltage harmonic should be lower or equal to the values specified in the table below:

Odd harmonics				Even harmonics	
not multiplied by 3		multiplied by 3		harmonic number (h)	relative value of voltage in basic component per cent (u_h)
harmonic number (h)	relative value of voltage in basic component per cent (u_h)	harmonic number (h)	relative value of voltage in basic component per cent (u_h)		
5	6 %	3	5 %	2	2 %
7	5 %	9	1.5 %	4	1 %
11	3.5 %	15	0.5 %	> 4	0.5 %
13	3 %	>15	0.5 %		
17	2 %				
19	1.5 %				
23	1.5 %				
25	1.5 %				

- 5) harmonic voltage distortion factor THD, taking into account higher harmonics on the level of 40, should be lower or equal to 8%;
- 6) consumption by a customer of active power not exceeding contractual power, with factor tg not higher than 0.4 is a prerequisite for maintaining the supply voltage parameters within the range laid down in par. 1-5.

4. An energy enterprise to which grid the customers are connected can determine, for the individual connection groups, acceptable levels of disturbance of the quality parameters of electric energy not adversely influencing the parameters laid down in par. 1 and 3 or agreed in the agreement for sale of electric energy or an agreement on providing transmission services.

5. A rated voltage of a low voltage grid corresponds to the value of 230/400V.

6. The quality parameters of electric energy supplied from the grid for the connection group VI are laid down in the agreement on providing the services of transmission or distribution or in a universal agreement.

7. Entities connected to the grid of a rated voltage of 110 kV and higher should input to or absorb from that network reactive power with factor tg lower than 0.4.

§ 39. 1. The harmonic voltage distortion factor THD, referred to in § 8, shall be understood as the factor indicating total higher voltage harmonics (u_h), calculated by using the formula:

$$THD = \sqrt{\sum_{h=2}^{40} (u_h)^2}$$

where individual symbols mean:

THD — harmonic voltage distortion factor,

u_h — relative value of voltage in basic component per cent,

h — higher harmonic number.

2. The long-term flicker indicator P_{lt} , referred to in § 38, shall be understood as the indicator calculated on the basis of the sequences of 12 consecutive values of short-term flicker P_{st} (measured for 10 minutes) occurring for the period of 2 hours, by using the formula:

$$P_{lt} = \sqrt[3]{\sum_{i=1}^{12} \frac{P_{sti}^3}{12}}$$

where individual symbols mean:

P_{lt} — long-term flicker indicator,

P_{st} — short-term flicker indicator.

§ 40. 1. The following interruptions in delivery of electric energy shall be determined:

- 1) planned — resulting from the operation of the power grid; duration of such an interruption shall be counted from opening a circuit-breaker until restarting the delivery of electric energy;
- 2) unplanned — caused by power grid failure, whereas the duration of such an interruption shall be counted from the moment the energy enterprise providing the services of transmission or distribution of electric energy obtains information about such failure until restarting the delivery of electric energy.

