

ELECTRICAL SIGNATURE ANALYSIS RESULTS

4. BCN-13B

PERFORMANCE SUMMARY

Bottom Line

- ☐ This induction motor is operating normally, no action is required.
- ☒ This induction motor exhibits suspicious operation, trending of the induction motor is warranted.
- ☐ This induction motor exhibits abnormal indications, action is warranted, NOW.

Power Factor Commentary

- ☒ Power factor exceeds 0.85.
- ☐ Power factor is below 0.85, see detailed report.

Current Commentary

- ☒ Current variation is within normal limits.
- ☐ Current variation is beyond normal limits, see detailed report.

Voltage Commentary

- ☒ Voltage variation is within normal limits.
- ☐ Voltage variation is beyond normal limits, see detailed report.
- ☐ RMS voltage differs from nameplate by more than 5%.

Load Commentary

- ☒ Load on the induction motor is consistent with nameplate values.
- ☐ Load on the induction motor exceeds nameplate values, see detailed report.
- ☐ Load on the induction motor is less than 25%.

Phase Connection Commentary

- ☒ Connections are normal.
- ☐ Voltage ground reference is NOT neutral.
- ☐ Loose connection.

Rotor Commentary

- ☐ Rotor bar health is normal.
- ☒ Rotor bar health is questionable, see detailed report.
- ☐ Load is insufficient to determine rotor bar health, at this time.

Stator Commentary

- ☒ Stator health is normal.
- ☐ Stator mechanical health is questionable. (Matching RB and SS peaks in high freq.spectrum).
- ☐ Turn to turn short.

Rotor/Stator Air-gap Characteristics

- ☐ Dynamic or static eccentricity indications do not exist.
- ☒ Indications of static eccentricity exist (Matching RB and SS peaks in high freq.spectrum).
- ☐ Indications of dynamic eccentricity exist.

Harmonic Distortion Commentary

- ☒ There is no evidence of harmonic distortion.
- ☐ There is evidence of harmonic distortion, see detailed report.

Misalignment and / or unbalance Indications

- ☒ There are no indications of mechanical problems like misalignment or unbalance.
- ☐ There are indications of mechanical problems like misalignment / unbalance. Perform vibr. survey to identify and correct the cause.

Bearing Commentary

- ☒ There is no evidence of bearing problem.
- ☐ Indications of potential bearing problems, perform vibration survey to verify.

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INPUT SUMMARY

		Units
Manufacturer	****	
Serial Number	****	
Model Number	****	
Tested Equipment	Induction	
Power	315.0	KW
RPM	1488.0	Rpm
Poles	4	
Phases:	3	
Voltage	3300.0	Volt
Full Load Current	67.50	Amp
No Load Current	3.00	Amp
Number of rotor bars	52	
Number of stator slots	60	
Torque	2020	N.m
CT Ratio	100.000	
PT Ratio	30.000	
Duty Cycle	****	
Service Factor	115	
Frame Size	****	
Insulation Type	****	
Motor efficiency	-1.000	
Power factor	-1.000	
Wound motor	NO	
Slip-ring motor	NO	
Reciprocating equipment	NO	

Description:

Impedance	= Complex Impedance = v_i/c_i
CF	= Crest Factor = (waveform peak)/(waveform rms)
VFD	= Variable Frequency Drive
Slip %	= SRSS sum of slip and harmonic "levels" divided by RMS level of RMS DEMOD spectra between 0 and 65 Hz.
THDF	= Transformer Harmonic De-rating Factor = $\sqrt{2}/CF$, %
Upper sb	= dB level of upper slip sideband of power line peak
Lower sb	= dB level of lower slip sideband of power line peak
Se, fund	= Location of pole pass frequency fundamental, Hz
Se, harm	= Number of pole pass frequency harmonics
Rotor bar health	= Estimate of the percent of broken or cracked rotor bars
RB Hlt Index	= Rotor bar health index
VDF	= Voltage De-rating Factor = $100 - (\text{voltage unbalance, \%})^2$, %
Level	= Sum of spectral amplitudes of pole pass frequency fundamentals and harmonics
Thd	= Total harmonic distortion
+Ve	= Positive sequence harmonic
-Ve	= Negative sequence harmonic
Zero	= Zero sequence harmonic

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Detailed Calculations

Running Speed = 24.841 Hz [1490 RPM]

Pole pass frequency = 0.549 Hz [33 RPM]

Load = 62.3 %

Time			
	RMS	Peak	CF
Current 1	42.000	62.957	1.499
Current 2	41.800	63.500	1.519
Current 3	41.600	63.100	1.517
Average	41.800	63.186	1.512
% dev	0.5	0.5	0.8

THDF = 93.6

Time			
	RMS	Peak	CF
Voltage 1	3285.000	4666.400	1.421
Voltage 2	3288.000	4684.400	1.425
Voltage 3	3276.000	4603.300	1.405
Average	3283.000	4651.400	1.417
% dev	0.2	1.0	0.8

VDF = 100.0

			App. Power	Real Power	Reac. Power
	Power factor	Impedance	kVA	kW	kVARs
Phase 1	0.876	78.214	79.473	69.600	38.364
Phase 2	0.868	78.660	79.341	68.880	39.377
Phase 3	0.870	78.750	78.585	68.340	38.798
Avg/Total	0.871	78.542	237.400	206.820	116.540
% dev	0.5	0.4			

Demand Pwr = 206.8 KW

Load:62.3 %

Motor Eff.:94.8 %

Output Pow.:193.32 KW

Output Trq.:1237.5 N.m

Summary of Rotor Bar Health				Power line dB diff.		RB Hlt Index
	Se, fund	Se, harm	Level %	Upper SB	Lower SB	
Measured	0.549	1	-	-27.882	-28.281	11.375
Severity level	Rotor Condition Assessment			Recommended Corrective Action		
7	Multiple broken rotor bars and end rings very likely. Severe problems throughout.			Overhaul at the earliest		

Bearing condition					
Location	Bearing No.	IR	OR	T/C	BS
Drive end	SKF NU230	OK	OK	OK	OK
Opposite end	SKF 6230	OK	OK	OK	OK

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Harmonic Distortion Results:

Voltage input, from 49.988 Hz harmonics

	THD Odd %	THD Even %	+ve%	-ve %	Zero %	THD All %
Current 1	0.755	0.599	0.491	0.822	0.111	0.964
Current 2	***	***	***	***	***	0.000
Current 3	***	***	***	***	***	0.000
Voltage 1	0.291	0.025	0.159	0.204	0.137	0.292
Voltage 2	***	***	***	***	***	0.000
Voltage 3	***	***	***	***	***	0.000

Harmonic distortion table – Peak values, voltage is phase to phase						
Hz	Cur1	Vlt1	Cur2	Vlt2	Cur3	Vlt3
50	59.9	4649	***			
100	0.2	1	***			
150	0.1	2	***			
200	0.3	0	***			
250	0.4	8	***			
300	0.0	0	***			
350	0.1	5	***			
400	0.0	0	***			
450	0.0	5	***			
500	0.0	0	***			
550	0.1	5	***			
600	0.0	0	***			
650	0.0	5	***			
700	0.0	0	***			

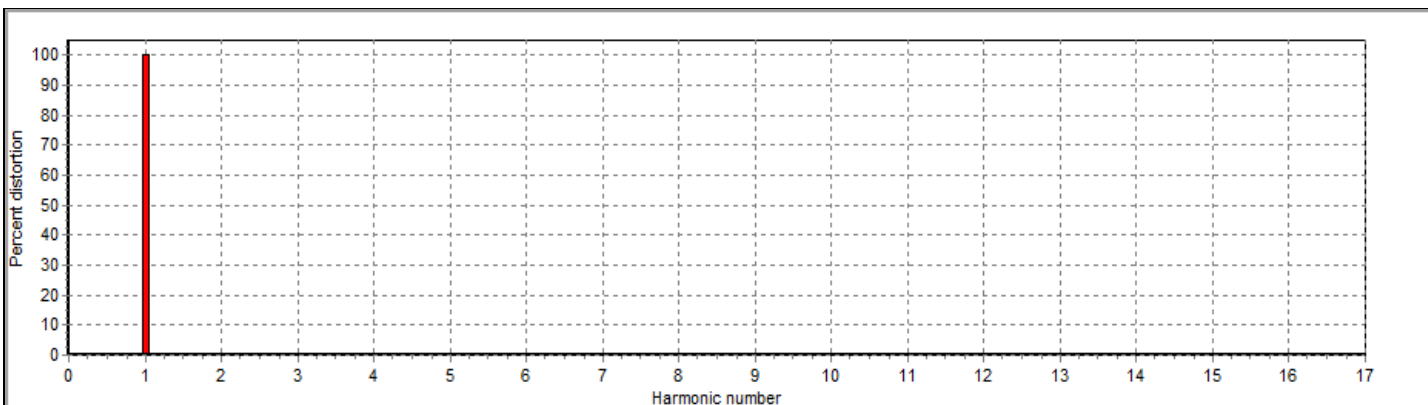


Figure 1: Current harmonic distortion plot

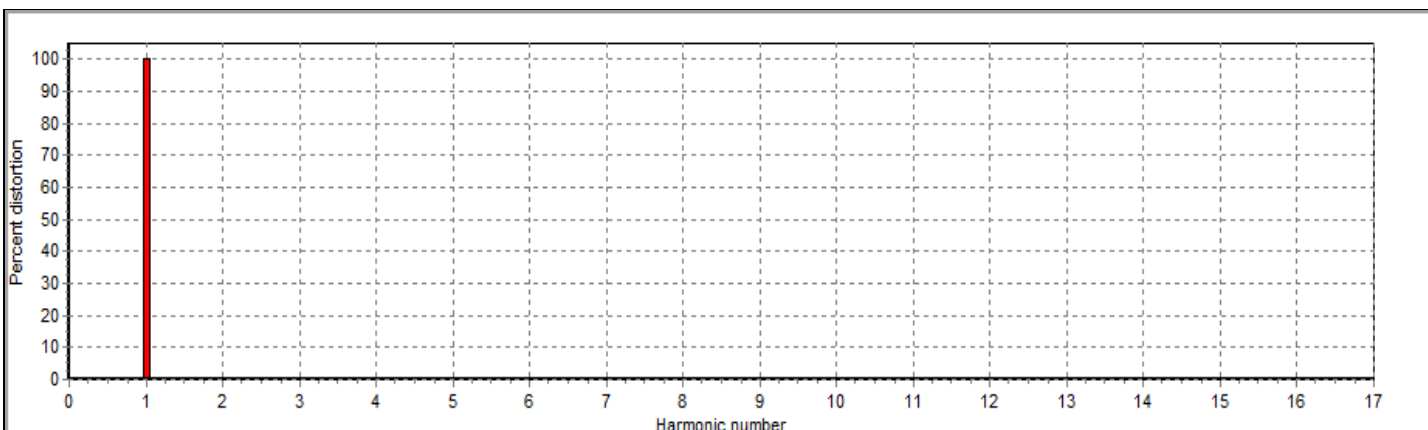


Figure 2: Voltage harmonic distortion plot

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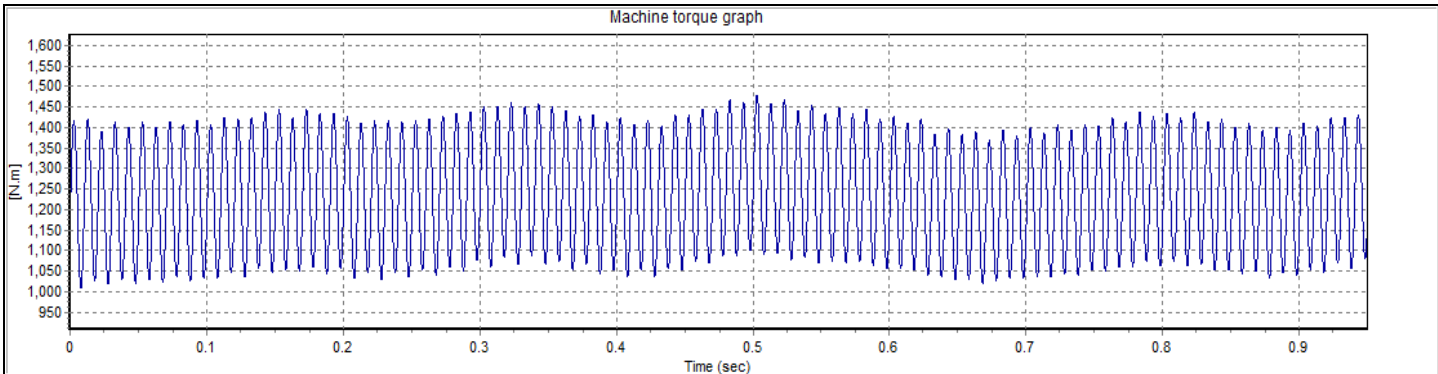


Figure 3: Motor output

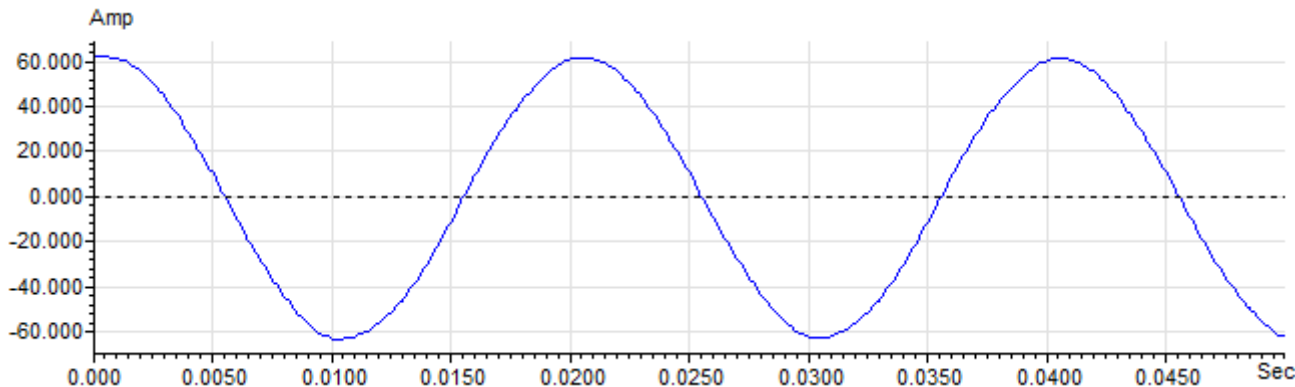


Figure 4: Raw Current

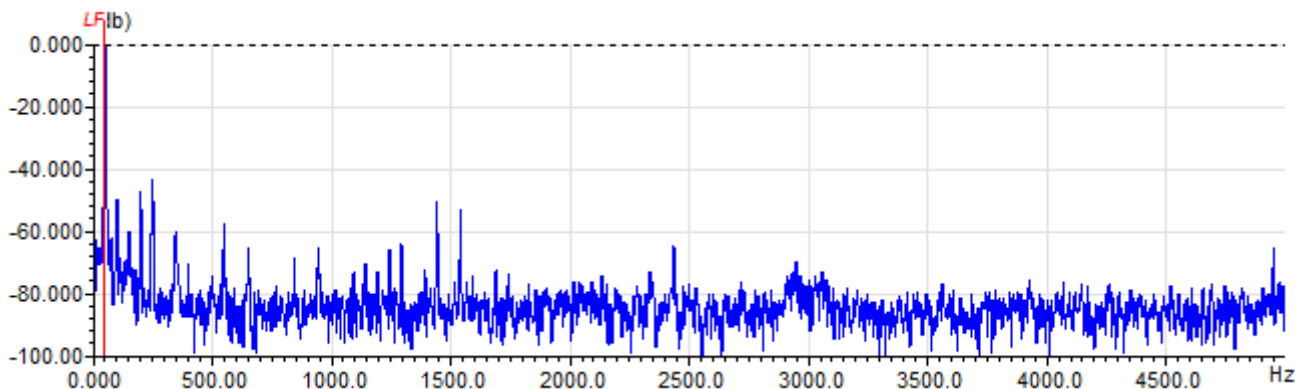


Figure 5: Raw Current Frequency spectrum

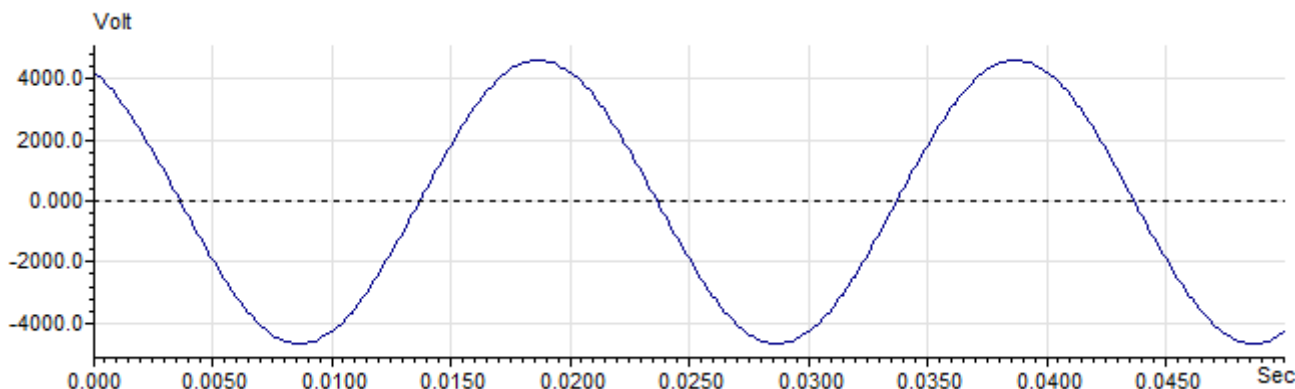


Figure 6: Raw Voltage

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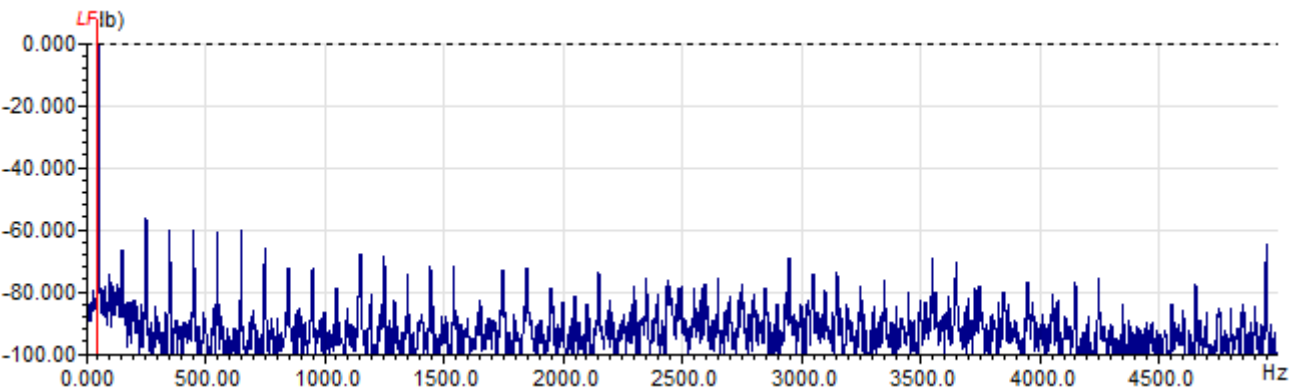


Figure 7: Raw Voltage Frequency spectrum

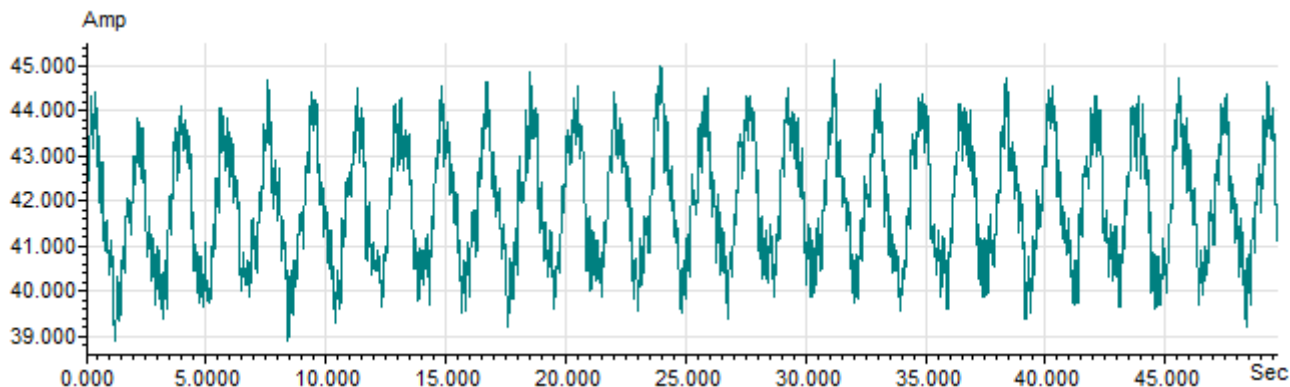


Figure 8: Demodulated current trace

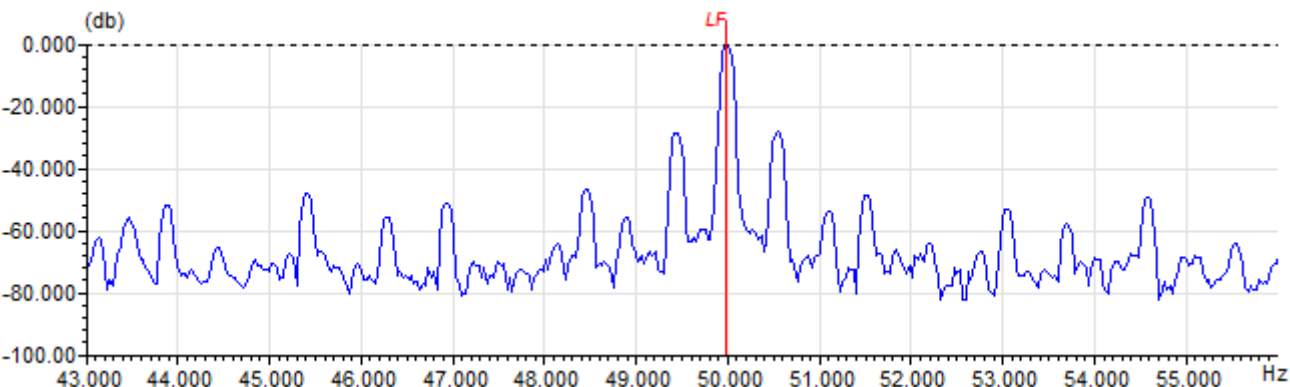


Figure 9: Raw current spectrum

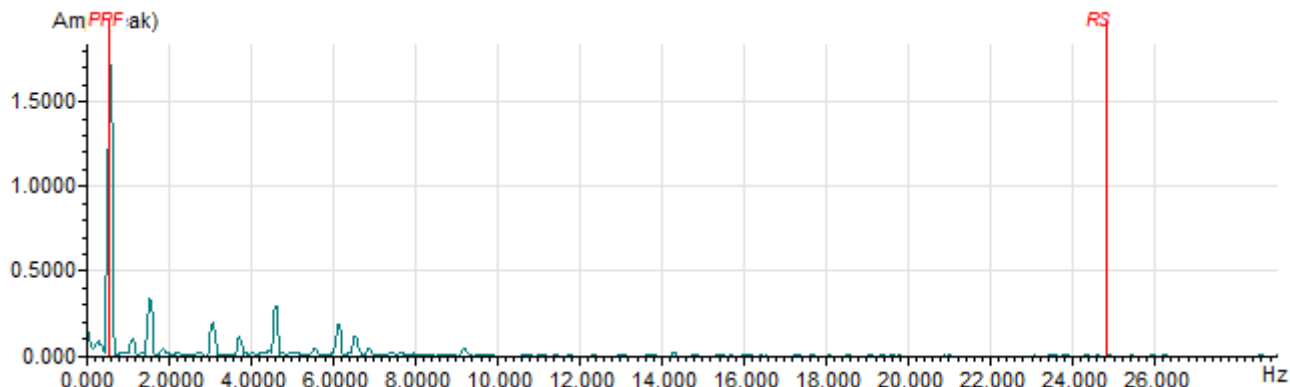


Figure 10: Demodulated current spectrum