

Motordrive Analysis

with

Fluke MDA-550





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	DC-Bus
	Drive Output
	Drive Input
	Motor Input
	Motor Shaft

Analysis	Drive Input
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	Drive Input
	Motor Input
	Motor Shaft

Summary

General information	
Asset	Motor & Drive Demo Kit
Location	2345 Brunn am Gebirge Liebermannstr. F01
Fault description	Unusual noise
Technican	Martin Stastka
Test device	Fluke MDA 550 S/N: xxxxxxxx





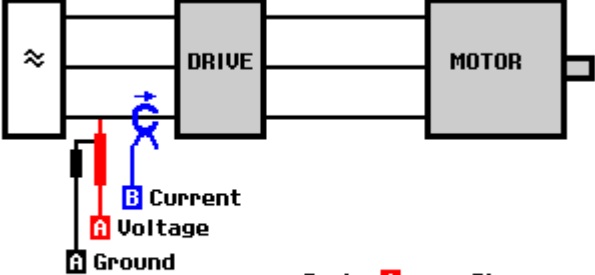
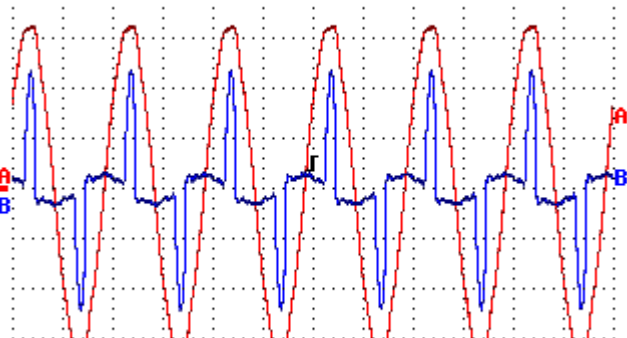
Drive Input	Voltage & Current	Phase-Phase	V / A / Hz	
			Vpk	
			Apk	
			Harmonics A (V)	
			Harmonics B (A)	
		Phase-Ground	V / A / Hz	
			Vpk	
			Apk	
			Harmonics A (V)	
			Harmonics B (A)	
	Voltage Unbalance		Unbalance	
			Peak	
			Harmonics A (L1-L2)	
			Harmonics B (L2-L3)	
			Harmonics C (L3-L1)	
	Current Unbalance		Unbalance	
			Peak	
			Harmonics A (L1)	
			Harmonics B (L2)	
			Harmonics C (L3)	
Drive DC-Bus			Voltage DC Level	
			Voltage AC Ripple	

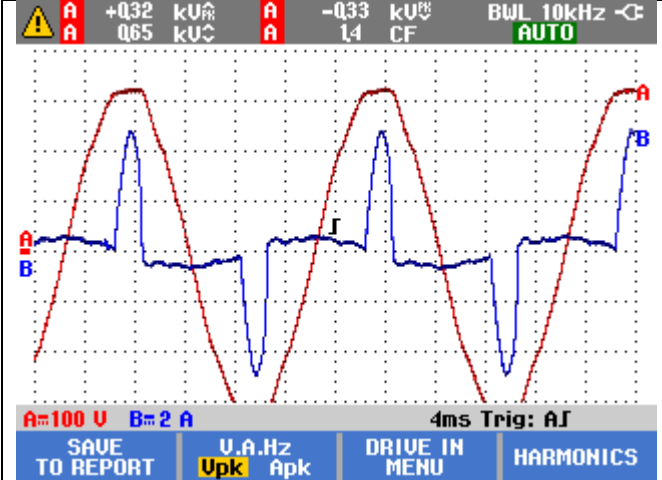
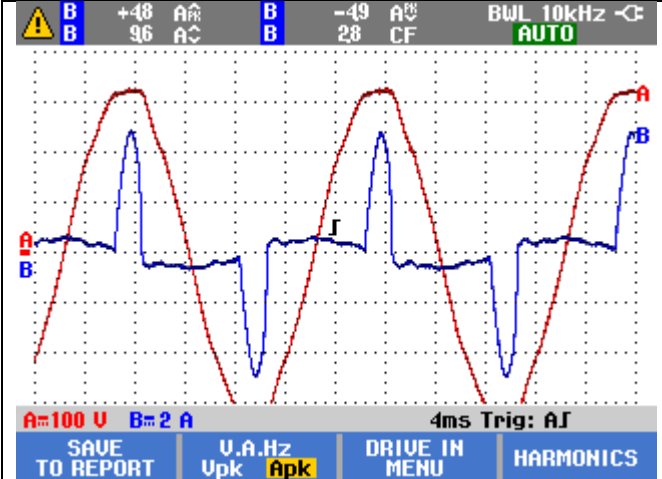


Drive Output	Voltage & Current		V / A / Hz	
			Vpk	
			Apk	
			Harmonics A (V)	
			Harmonics B (A)	
	Voltage Modulation	Phase-Phase	Signal (Z1)	
			Signal (Z1) Spectrum	
			Bursts (Z2) Pos	
			Bursts (Z2) Neg	
			Overshot (Z3) Peak	
			Overshot (Z3) Level	
		Phase-Ground	Signal (Z1)	
			Signal (Z1) Spectrum	
			Bursts (Z2) Pos	
			Bursts (Z2) Neg	
			Overshot (Z3) Peak	
			Overshot (Z3) Level	
		Phase-DC+	Signal (Z1)	
			Signal (Z1) Spectrum	
			Bursts (Z2) Pos	
			Bursts (Z2) Neg	
			Overshot (Z3) Peak	
			Overshot (Z3) Level	
		Phase-DC-	Signal (Z1)	
			Signal (Z1) Spectrum	
			Bursts (Z2) Pos	
			Bursts (Z2) Neg	
			Overshot (Z3) Peak	
			Overshot (Z3) Level	
	Voltage Unbalance		Unbalance	
			Peak	
			Harmonics A (L1-L2)	
			Harmonics B (L2-L3)	
			Harmonics C (L3-L1)	
	Current Unbalance		Unbalance	
			Peak	
			Harmonics A (L1)	
			Harmonics B (L2)	
			Harmonics C (L3)	



Motor Input	Voltage & Current		V / A / Hz	
			Vpk	
			Apk	
			Harmonics A (V)	
			Harmonics B (A)	
	Voltage Modulation	Phase-Phase	Signal (Z1)	
			Signal (Z1) Spectrum	
			Bursts (Z2) Pos	
			Bursts (Z2) Neg	
			Overshot (Z3) Peak	
			Overshot (Z3) Level	
		Phase-Ground	Signal (Z1)	
			Signal (Z1) Spectrum	
			Bursts (Z2) Pos	
			Bursts (Z2) Neg	
			Overshot (Z3) Peak	
			Overshot (Z3) Level	
		Phase-DC+	Signal (Z1)	
			Signal (Z1) Spectrum	
			Bursts (Z2) Pos	
			Bursts (Z2) Neg	
			Overshot (Z3) Peak	
			Overshot (Z3) Level	
		Phase-DC-	Signal (Z1)	
			Signal (Z1) Spectrum	
			Bursts (Z2) Pos	
			Bursts (Z2) Neg	
			Overshot (Z3) Peak	
			Overshot (Z3) Level	
	Voltage Unbalance		Unbalance	
			Peak	
			Harmonics A (L1-L2)	
			Harmonics B (L2-L3)	
			Harmonics C (L3-L1)	
	Current Unbalance		Unbalance	
			Peak	
			Harmonics A (L1)	
			Harmonics B (L2)	
			Harmonics C (L3)	
Motor Shaft			Motor Shaft Voltage	

Drive Input	Voltage & Current
	Phase-Ground
<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">PHASE-GROUND VOLTAGE AND CURRENT</p>  <p style="margin: 5px 0;"> A Voltage B Current A Ground </p> <p style="margin: 5px 0;"> Probe A on a Phase Clamp B on same Phase Ref. A on Ground </p> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> SAVE TO REPORT INFO DRIVE IN MENU NEXT </div> </div>	Setup
Phase-Ground	V, A, Hz
<div style="border: 1px solid black; padding: 5px;"> <div style="display: flex; justify-content: space-between; align-items: center; font-size: small;"> A 235 U_{rms} B 1.76 A_{rms} BWL 10kHz AUTO A 5000 Hz  <div style="display: flex; justify-content: space-between; align-items: center; font-size: x-small; margin-top: 5px;"> A=100 V B=2 A 10ms Trig: AJ </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> SAVE TO REPORT U.A.Hz DRIVE IN MENU HARMONICS </div> </div> </div>	single phase feed from bus duct Voltage within limit Current within limit *) see harmonic Frequency within limit

Drive Input	Voltage & Current
<p>Phase-Ground</p> 	<p>Vpk</p> <p>Detailed Voltage analysis</p> <p>Slight waveform deviation</p>
<p>Phase-Ground</p> 	<p>Apk</p> <p>Detailed current analysis</p> <p>Waveform deviations caused by DC-converter</p> <p>Current within limit</p> <p><i>High crest factor may cause wrong readings on other test equipment</i></p>

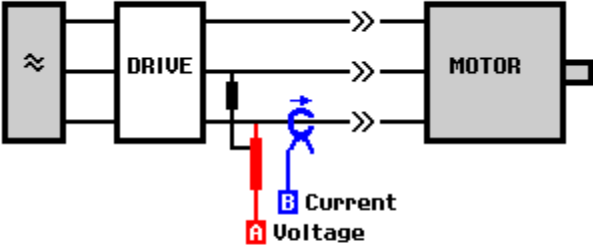
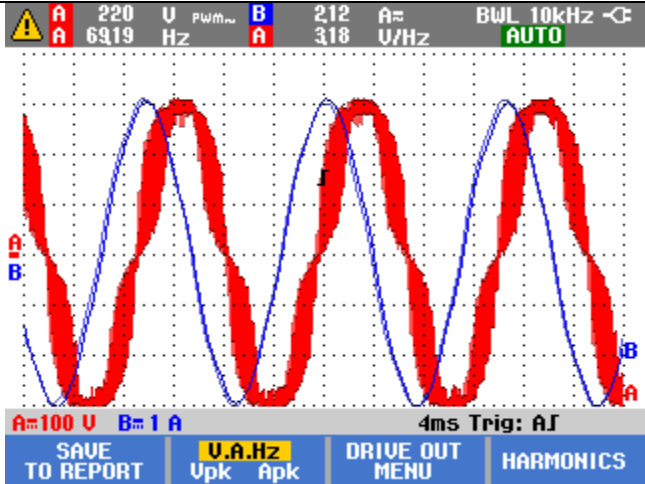


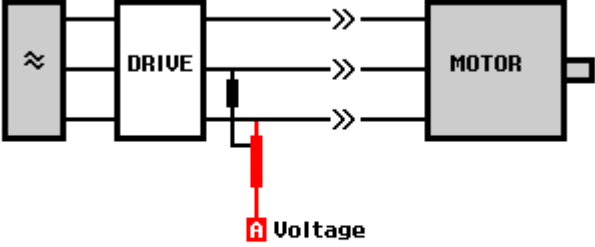
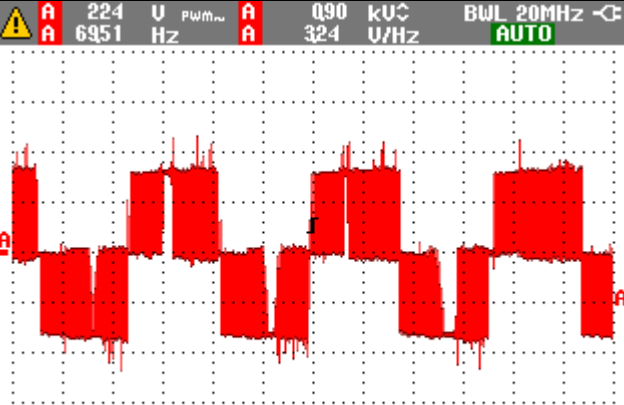
Drive Input	Voltage & Current	
Phase-Ground	Harmonics A (V)	
<p> ⚠ A 235 U_{ν} A 235 U H1 BWL 10kHz \rightarrow A 5000 Hz A 24 %THD AUTO </p>	Voltage Harmonics THD within limit <i>For VFDs THD<6% is recommended THD Limit according EN 50160 is 8%</i>	
Phase-Ground	Harmonics B (A)	
<p> ⚠ B 177 A_{ν} B 108 A H1 BWL 10kHz \rightarrow B 5000 Hz B 128.3 %THD AUTO </p>	Current Harmonics THD is quite high but due to the relatively low load no effects on other equipment on the grid is expected <i>If load rises, problems in the grid occur or sensitive loads are connected a %TDD analysis is recommended</i>	
Drive Input	Voltage Unbalance	
Drive Input	Current Unbalance	

Drive DC-Bus	
<p style="text-align: center;">DRIVE DC-BUS UDC</p>	<p>Setup</p>
	<p>Voltage DC Level DC-Bus Voltage</p> <p>Slightly lower voltage than input peak voltage most likely because of small fluctuations of grid voltage and different reading resolution</p>
	<p>Voltage DC Level Recording DC-Bus Voltage recording</p> <p>voltage drop during overload VFD Trip level not exceeded</p>



<p>Drive DC-Bus</p>	
	<p>Voltage AC Ripple DC-Bus Ripple Voltage</p> <p>Low voltage level indicates no overload</p> <p><i>Due to single phase bridge rectifier frequency is 2x grid frequency</i></p>
	<p>Voltage AC Ripple Recording DC-Bus Ripple recording</p> <p>voltage drop during overload VFD Trip level not exceeded</p>

Drive Output	Voltage & Current
<p>DRIVE OUTPUT VOLTAGE AND CURRENT (FILTERED)</p>  <p>Probe A on a Phase Clamp B on same Phase Ref. A on next Phase</p> <p>SAVE TO REPORT INFO DRIVE OUT MENU NEXT</p>	<p>Setup</p>
 <p>V, A, Hz</p> <p>VFD output voltage & current</p> <p>Output frequency during test was 70Hz Voltage and current within limits Slight deviation of current waveform leading to additional losses V/Hz Ratio unstable at different speeds - further investigation necessary</p> <p>SAVE TO REPORT U.A.Hz DRIVE OUT MENU HARMONICS</p>	

<p>Drive Output</p>	<p>Voltage Modulation</p>
<p>DRIVE OUTPUT PHASE-PHASE VOLTAGE MODULATION</p>  <p>Probe A on a Phase Ref. A on next Phase</p> <p>SAVE TO REPORT INFO DRIVE OUT MENU NEXT</p>	<p>Phase-Phase</p> <p>Setup</p>
<p>Phase-Phase</p>  <p>A=200 V 4ms Trig: AJ</p> <p>SAVE TO REPORT ZOOM 1 2 3 DRIVE OUT MENU SPECTRUM</p>	<p>Signal (Z1)</p>



Drive Output	Voltage Modulation
Phase-Phase	Bursts (Z2) Pos
	<p>VFD Out Voltage & Burst Analysis</p> <p>Slightly lower voltage level than DC-Bus voltage - most likely because of small fluctuations of grid voltage and different reading resolution</p> <p>470V Burst Voltage peaks – needs further investigation but within limits of motor insulation</p>
Phase-Phase	Overshot (Z3) Peak
	<p>VFD Out Voltage overshoot analysis</p> <p>$\Delta U/\Delta t$ within limits of motor insulation</p> <p>44% overshoot of nominal voltage – needs further investigation Usual 50% is the limit</p>
Drive Output	Voltage Modulation
Phase-Ground	
Drive Output	Voltage Modulation
Phase-DC+	
Drive Output	Voltage Modulation
Phase-DC-	
Drive Output	Voltage Unbalance
Drive Output	Current Unbalance



Motor Input	Voltage & Current	
Motor Input	Voltage Modulation	
Phase-Phase		
Motor Input	Voltage Modulation	
Phase-Ground		
Motor Input	Voltage Modulation	
Phase-DC+		
Motor Input	Voltage Modulation	
Phase-DC-		
Motor Input	Voltage Unbalance	
Motor Input	Current Unbalance	
Motor Shaft		
	Motor Shaft Voltage	



Summary

As this is just a demo analysis everything is how it should be.