

## BAB III

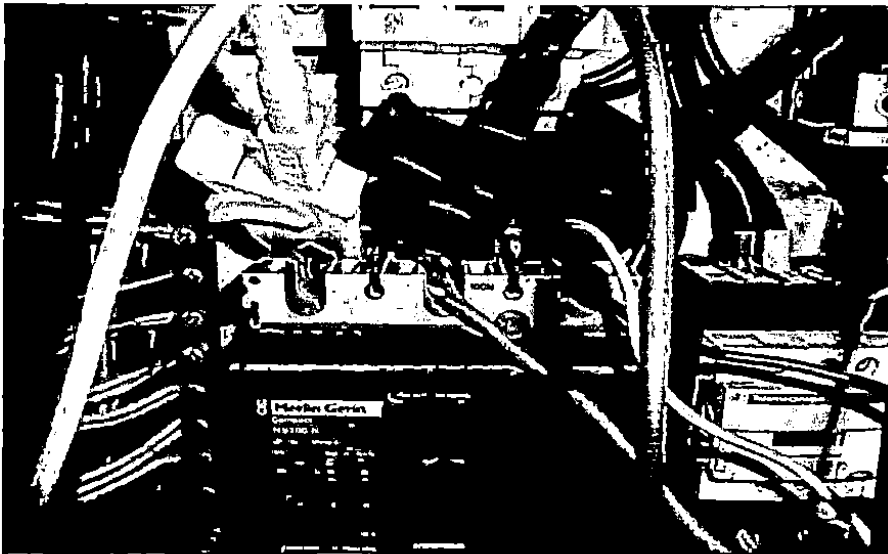
### METODE PENELITIAN

#### 3.1. Langkah Pengukuran

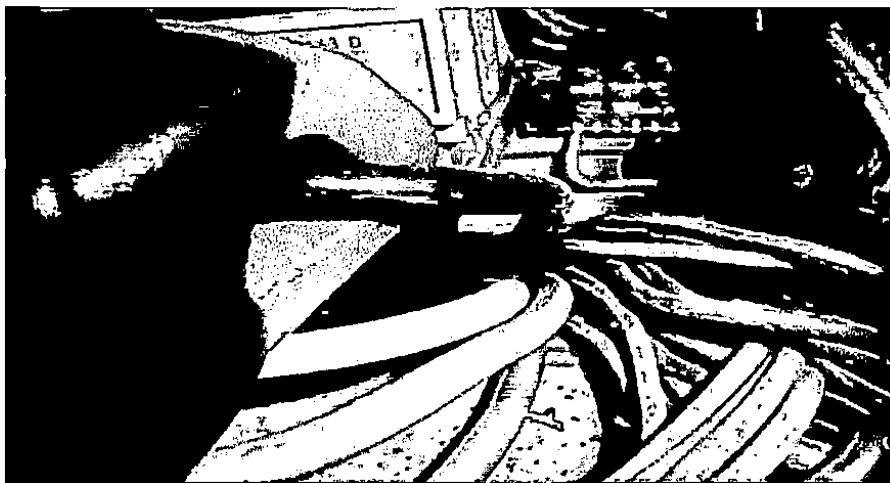
Dalam melakukan pengukuran harmonisa di Laboratorium Teknik Elektro Universitas Muhammadiyah Yogyakarta, langkah-langkah yang dilakukan antara lain :

1. Instalasi software *DataView* sebagai *Inter-face Three Phase Power Quality Analyzer 3949-B* pada laptop COMPAQ CQ42 melalui USB Serial DB9.
2. Menghubungkan MN93 pada masing-masing fasa R, S, T panel listrik Laboratorium Teknik Elektro Universitas Muhammadiyah Yogyakarta dengan pola warna yang sesuai.
3. Menghubungkan jamper tegangan pada fasa R, S, T serta *grounding* pada panel sesuai warna masing-masing, kemudian dikoneksikan pada alat ukur *Three Phase Power Quality Analyzer 3949-B*.
4. Konfigurasi *Three Phase Power Quality Analyzer 3949-B*.

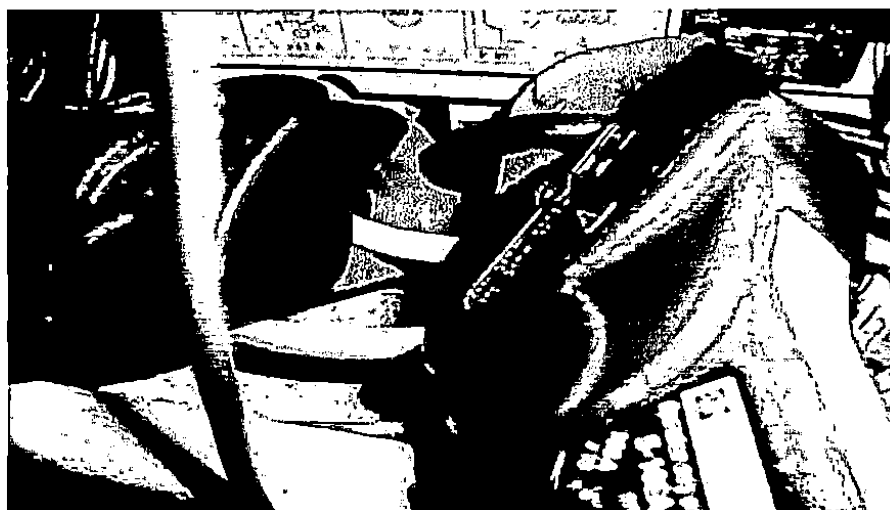
### 3.2. Metode Pengukuran



Gambar 3.1.a. Cara pemasangan jamper tegangan R, S, T pada panel listrik Lab



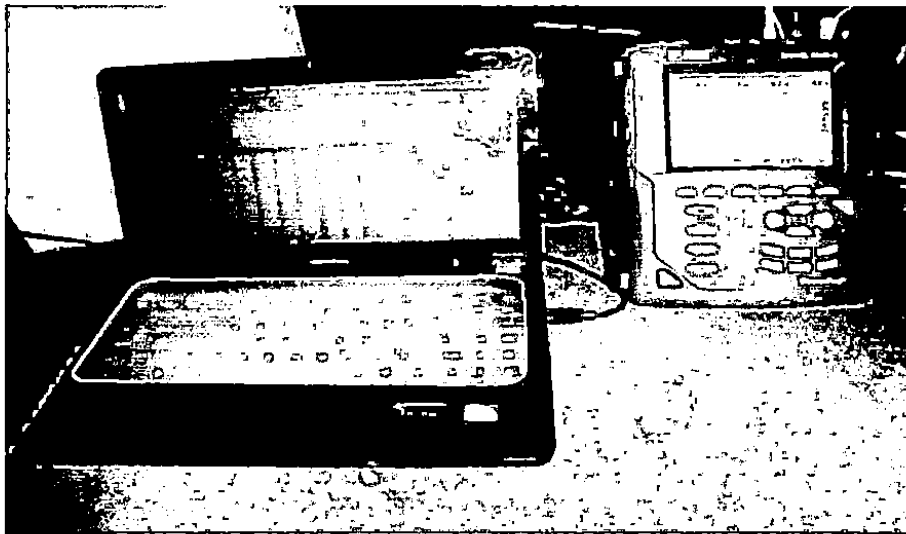
Gambar 3.1.b. Cara pemasangan MN93 pada panel listrik Lab



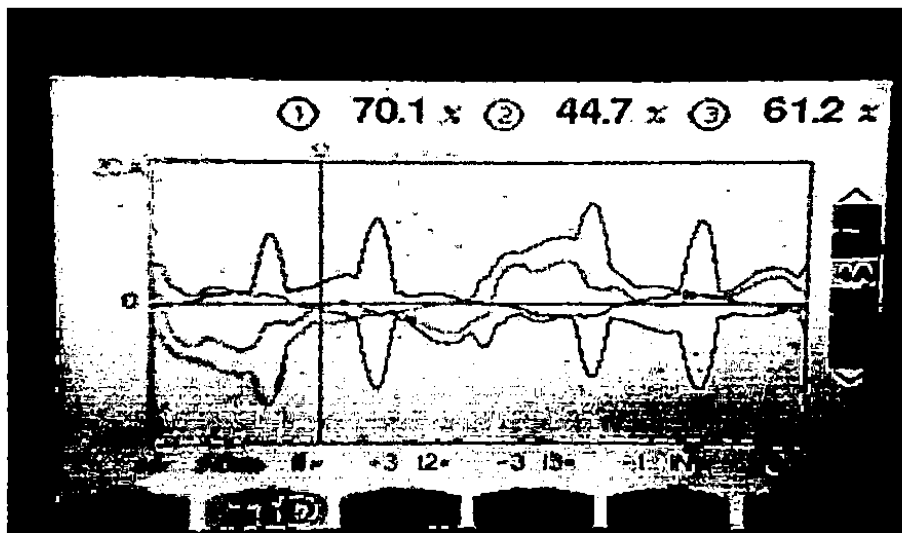
Gambar 3.1.c. Cara pemasangan MN03 pada panel listrik Lab



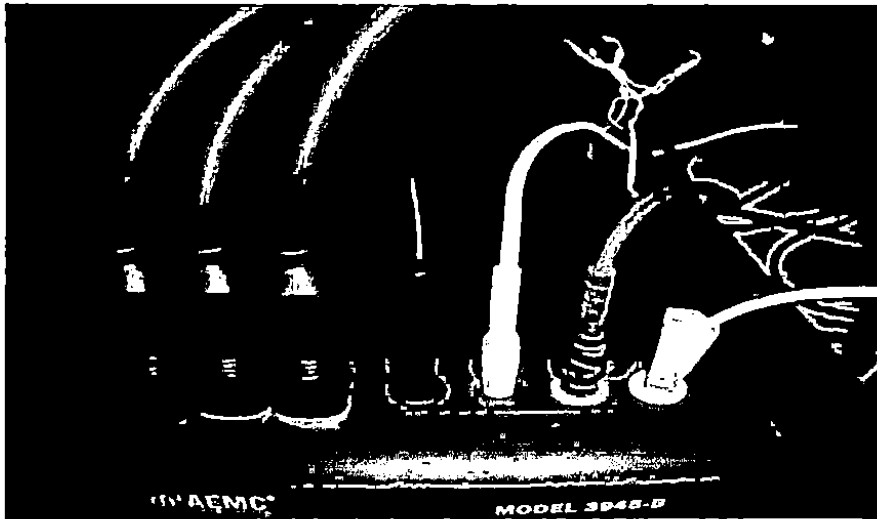
**Gambar 3.1.d.** Cara pemasangan MN93 pada panel listrik Lab



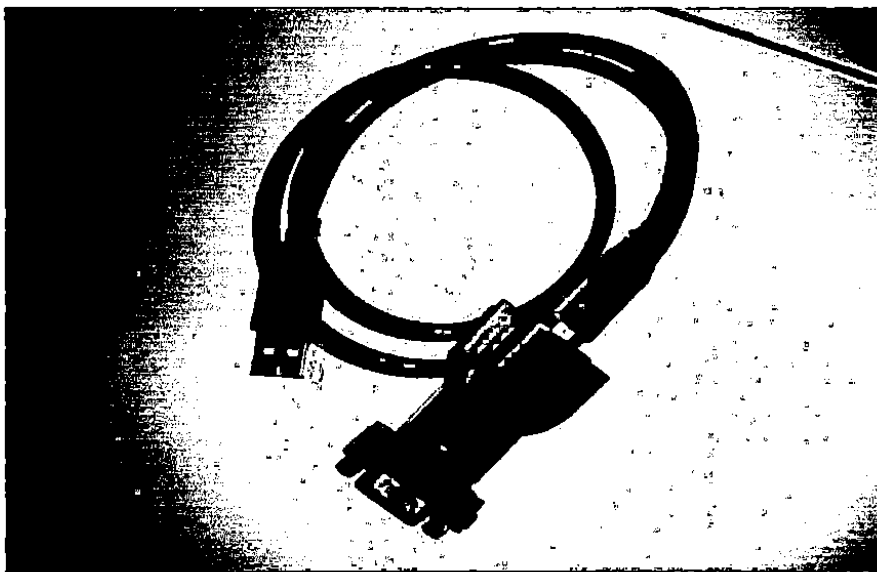
**Gambar 3.1.e.** Interface hasil pengukuran pada panel listrik Lab



**Gambar 3.1.f.** Hasil pengukuran yang ditampilkan pada instrument



**Gambar 3.1.g.** Cara pemasangan konektor arus dan tegangan



**Gambar 3.1.h.** Converter USB serial DB9

### 3.3. Jenis Alat Ukur

Alat ukur yang digunakan dalam penelitian harmonisa di panel listrik Laboratorium Teknik Elektro Universitas Muhammadiyah Yogyakarta adalah *Three Phase Power Quality Analyzer 3949-B*. Dalam pengukuran, *Three Phase Power Quality Analyzer 3949-B* mampu mengukur besaran arus, tegangan, daya, faktor daya *truve*, faktor daya *displacement*, *Total Harmonic Distortion* arus, *Total Harmonic Distortion* tegangan, diagram fasor arus, diagram fasor tegangan

### 3.5. Spesifikasi Alat Ukur *Three Phase Power Quality Analyzer 3949-B*

MODEL	3845-B		
<b>ELECTRICAL</b>			
Sampling Frequency	256 samples per cycle		
Data Storage	4MB partitioned for waveforms, transients, alarms and trend recording		
Voltage (TRMS)	Phase-to-Phase: 960V      Phase-to-Neutral: 480V		
Current (TRMS)	MN Clamp: 0 to 6A/120A or 0 to 240A      SR Clamp: 0 to 1200A MR Clamp: 0 to 1000Aac, 0 to 1400Aoc      AmpFlex <sup>®</sup> : 0 to 6500A <sup>1</sup>		
<b>MEASUREMENT</b>	<b>RANGE</b>	<b>RESOLUTION</b>	<b>ACCURACY</b>
Single-Phase RMS Voltages	15 to 480V	0.1V	±0.5% ± 2cts
Phase-to-Phase RMS Voltages	15 to 960V	0.1V	±0.5% ± 2cts
DC Voltage Component	15 to 680V	0.1V	±1% ± 2cts
Single-Phase Peak Voltages	15 to 680V	1V	±(1% + 5cts)
Phase-to-Phase Peak Voltages	15 to 1360V	1V	±(1% + 5cts)
Frequency (Hz)	40 to 69Hz	0.01Hz	±0.01Hz
Current Probes (Arms)			
MN Clamp	0 to 240A	0.1A	±(0.5% + 2cts)
SR Clamp	0 to 1200A	0.1A; 1A ≥ 1000A	±(0.5% + 2cts)
AmpFlex <sup>®</sup> Probe	10 to 6500A	0.1A; 1A ≥ 1000A	±(0.5% + 1A)
Active (Real) Power (kW)	0 to 9999kW	4 digits (10,000ct)	±1% ± 1ct @ PF ≥ 0.8
Reactive Power (kVAR)	0 to 9999kVAR	4 digits (10,000ct)	±1% ± 1ct @ PF ≤ 0.8
Apparent Power (kVA)	0 to 9999kVA	4 digits (10,000ct)	±1% ± 1ct
Power Factor (PF & DPF)	-1.000 to 1.000	0.001	±(1.5% + 0.01)
Active Energy (kWh)	0 to 9999MWh	4 digits (10,000ct)	±1% ± 1ct @ PF ≥ 0.8
Reactive Energy (kVARh)	0 to 9999MVARh	4 digits (10,000ct)	±1% ± 1ct @ PF ≤ 0.8
Apparent Energy (kVAh)	0 to 9999MVAh	4 digits (10,000ct)	±1% ± 1ct
Unbalance (V & A)	0 to 100%	0.1%	±1% ± 1ct
Phase Angle (V-A, A-A, V-V)	-179° to +180°	1°	±2° ± 1ct
Harmonics (1 <sup>st</sup> to 50 <sup>th</sup> ) F = 40 to 69Hz (V ≥ 50V, A > nom/100)	0 to 999%	0.1%	±1% + 5cts
Total Harmonic Distortion (V & A)	0 to 999%	0.1%	±1% + 5cts
K-factor (Kd)	1 to 99.99	0.01	±5% ± 1ct
Flicker (Psi)	0.00 to 9.99	0.01	--
Power Source	9.6V NiMH rechargeable battery pack AC supply: 110/230Vac ±20% (50/60Hz)		
Battery Life	≥8 hrs with display on; ≤35 hrs with display off (record mode)		
<b>MECHANICAL</b>			
Dimensions	9.5 x 7 x 2" (240 x 180 x 55mm)		
Weight	4.6 lbs (2.1kg)		
<b>DISPLAY</b>			
Display Type	1/4 VGA (320 x 240) color LCD		
<b>ENVIRONMENTAL</b>			
Operating Temperature	32° to 122°F (0° to 50°C)		
Storage Temperature	-4° to +122°F (-20° to +50°C)		
<b>SAFETY</b>			
Safety Rating	EN 61010-1, 600V Cat. IV <sup>2</sup> , Pollution Degree 2		
Double Insulation <input type="checkbox"/>	Yes		
CE Mark	Yes		

Comber 3.3 Spesifikasi Alat Ukur Three Phase Power Quality Analyzer 3949-B