What's a good reading?

An insulation resistance measurement, in itself, is not necessarily indicative of anything in particular. As a general rule, the One-Megohm Rule (1MΩ per 1000 volts) is the widely-accepted absolute minimum insulation resistance value for normal electrical equipment.

However, actual minimum acceptable insulation resistance values are based on the type of insulating material being used, and on the physical and electrical characteristics of the equipment being evaluated.

When compared against a previously recorded baseline measurement, or a manufacturer's factory specification, an insulation resistance measurement may be able to assist you in both troubleshooting and preventative maintenance.

It is strongly recommended that periodic insulation resistance testing is performed, and the measurements are recorded, because persistent downward trends usually indicate that there is something occurring in the system which can prevent optimum performance. It is often a fair warning of impending trouble.

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Insulation resistance troubleshooting and preventative maintenance guidelines

Difference from Baseline*	Baseline*	20 MΩ	40 MΩ	60 MΩ	80 MΩ	100 MΩ	250 MΩ	500 MΩ	750 MΩ	1 GΩ	1.5 GΩ	2 GΩ	
	10 %	18 MΩ	36 MΩ	54 MΩ	72 MΩ	90 MΩ	225 MΩ	450 MΩ	675 MΩ	900 MΩ	1.35 GΩ	1.8 GΩ	With less than 25 % difference, the equipment is probably still operating acceptably.
	20 %	16 MΩ	32 MΩ	48 MΩ	64 MΩ	80 MΩ	200 MΩ	400 MΩ	600 MΩ	800 MΩ	1.2 GΩ	1.6 GΩ	
	30 %	14 MΩ	28 MΩ	42 MΩ	56 MΩ	70 MΩ	175 MΩ	350 MΩ	525 MΩ	700 MΩ	1.05 GΩ	1.4 GΩ	If there is a 25 % to 50 % difference, most professionals will recommend additional testing** and inspection to verify proper operation. (Check for potential environmental contamination.)
	40 %	12 MΩ	24 MΩ	36 MΩ	48 MΩ	60 MΩ	150 MΩ	300 MΩ	450 MΩ	600 MΩ	900 MΩ	1.2 GΩ	
	50 %	10 MΩ	20 MΩ	30 MΩ	40 MΩ	50 MΩ	125 MΩ	250 MΩ	375 MΩ	500 MΩ	750 MΩ	1.0 GΩ	
	60 %	8 MΩ	16 MΩ	24 MΩ	32 MΩ	40 MΩ	100 MΩ	200 MΩ	300 MΩ	400 MΩ	600 MΩ	800 MΩ	While equipment may operate at this level for extended periods of time, most professionals would view a change of more than 50 % in insulation resistance as indicative of potential problems somewhere in the system. Additional testing** and diagnostics are highly recommended to ensure continued, uninterrupted operation.
	70 %	6 MΩ	12 MΩ	18 MΩ	24 MΩ	30 MΩ	75 MΩ	150 MΩ	225 MΩ	300 MΩ	450 MΩ	600 MΩ	
	80 %	4 MΩ	8 MΩ	12 MΩ	16 MΩ	20 MΩ	50 MΩ	100 MΩ	150 MΩ	200 MΩ	300 MΩ	400 MΩ	
	90 %	2 MΩ	4 MΩ	6 MΩ	8 MΩ	10 MΩ	25 MΩ	50 MΩ	75 MΩ	100 MΩ	150 MΩ	200 MΩ	
	100 %	0 MΩ	0 MΩ	0 MΩ	0 MΩ	0 MΩ	0 MΩ	0 MΩ	0 MΩ	0 MΩ	0 MΩ	0 MΩ	

Directions: Determine the applicable baseline measurement for a piece of equipment, take an insulation resistance measurement and trace down the column from the baseline for the closest match to the new reading. Trace left for the % difference and right for guidelines.

* Baseline measurement could be: Manufacturer's factory specifications for insulation resistance, or the last recorded reading from regularly scheduled preventive maintenance. Resistance values can be affected by environmental conditions (humidity, temperature, particulate matter, etc.). For accurate comparisons, readings should be taken under roughly the same conditions (an inactive motor exposed to moisture may show a lower insulation resistance reading than a dry motor that has been running at normal operating temperature.).

** Additional testing could include: additional insulation resistance testing, inspecting for the presence of moisture, oil, dirt, or other environmental contaminates, temperature measurement, loop impedance testing, advanced motor circuit testing, or other manufacturer's recommended diagnostics.

Fluke Insulation Resistance Testers

- 1587 Insulation Multimeter P/N 2157271
- 1577 Insulation Multimeter P/N 2157280
- 1550B 5 kV MegOhmMeter P/N 2095847
- 1520 MegOhmMeter P/N 1556892

For additional guidelines on insulation testing in the field, reference these standards:

- NETA MTS-2001 Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems
- IEEE 43-2000 Recommended Practice for Testing Insulation Resistance of Rotating Machinery
- IEC 60034-18 Rotating electrical machines – Part 18: Functional evaluation of insulation systems
- IEC 61557-2 Electrical Safety in Low Voltage Distribution Systems up to 1000 V ac and 1500 V dc

For more information on insulation resistance test, visit **www.fluke.com/2-in-1** or call **1-800-44-Fluke**.