

Using MCA™ to Determine If A Motor Is Good or Bad

What do you do when a motor fails or trips a drive? What tools do you currently use to determine if the motor is “good” or “bad”? If you are like most technicians, you probably use a Megohm Meter and a Digital Multi-meter.

Looking at an actual motor test on an installed motor where the drive had tripped. The electrician, using a Megohm Meter and Digital Multi-Meter, acquired these results.

	>999 MΩ
PHASE	Resistance (R)
1-2	14.2 Ω
1-3	14.2 Ω
2-3	14.2 Ω

So, what does this indicate about the condition of this motor? Based on these readings the problem is obviously, with the Drive and not the Motor, right? So, what would you replace the VFD or the Motor?

The service technician was relying on a megohm meter Insulation-to-Ground test which indicates that the ground wall insulation has no weaknesses to ground, and a Digital Multi-meter (Resistance test), which indicates there is continuity in the windings and all connections are good. The service technician was only looking at 2 factors that affect the motor. Both instrument measurements indicate that there is nothing wrong with the components tested but fails to provide a complete picture of the motor’s condition. As far as these instruments can tell this motor is in good condition.

These methods of testing are very reliable in determining if your motor is “alive” or “dead” (i.e., shorted to ground) or has connection issues, but will not give you the motor’s current state of health.

Did you replace the Drive or the Motor?

Using Motor Circuit Analysis™ (MCA™), this is what that same electrician found: by performing MCA™ testing. Phase angle (Fi) and Current/Frequency (I/F) both indicate no evidence of existing or developing winding shorts.

Megometer	>999MΩ	MCA	MCA	MCA
PHASE	Resistance (R)	Impedance (Z)	Phase Angle (Fi)	Current/Frequency Response (I/F)
1-2	14.2	412	64°	-29
1-3	14.2	421	63°	-28
2-3	14.2	427	64°	-29

If you replaced the motor, you cost your company time and money, both in the cost of the motor and the fact that you will have to replace the drive when it trips again.

Megger	>999 MΩ
PHASE	Resistance (R)
1-2	17.1 Ω
1-3	17.1 Ω
2-3	17.1 Ω

The same electrician had an identical motor trip the drive on a different line.

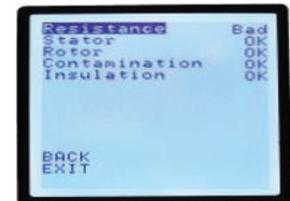
Now what? Is it the Drive or the Motor? If you said Motor, you are correct. Since these readings are the same as the on previous motor it would suggest that the motor is good so the fault must be in the drive.

The MCA™ instruments clearly shows unbalances in both phase angle and current frequency response which are indications of winding shorts. So in this case the fault is definitely in the motor.

Megometer	>999MΩ	MCA	MCA	MCA
PHASE	Resistance (R)	Impedance (Z)	Phase Angle (Fi)	Current/Frequency Response (I/F)
1-2	14.2	438	64°	-29
1-3	14.2	444	63°	-29
2-3	14.2	440	60°	-35

MCA™ instruments offer fast reliable answers to motors state of health.

- Fast test under 3-5 minutes.
- Easy on screen directions.
- Answers displayed on screen as GOOD, BAD, WARN.
- Available with phone APP or MCA™ Software suites.



What are your motor testing tools measuring?

	Ground Faults	Internal Winding Faults **	Open Connection	Rotor Faults	Contamination
Meg-Ohm-Meter	Yes	No	No	No	Yes
Volt/Ohm Meter	No	No	Yes	No	No

What is MCA™ technology? MCA™ (Motor Circuit Analysis) is a deenergized low voltage test method that exercises the motors winding insulation system to assess the health of the entire motor and the associated cabling.

	Ground Faults	Internal Winding Faults **	Open Connection	Rotor Faults	Contamination
MCA	Yes	Yes	Yes	Yes	Yes

** Winding coil faults: turn-to-turn & coil-to-coil.

	Power Quality	Controller	Connections	Cable	Stator	Rotor	Air Gap	Insulation
Off-Line (De-energized) Testing								
High Pot	-	-	-	-	-	-	-	X
Surge Test	-	-	-	-	X	-	-	-
Meg-ohm Meter	-	-	-	-	-	-	-	X
Ohm Meter	-	-	L	-	L	-	-	-
PI Testing	-	-	-	-	-	-	-	X
MCA Test	-	X	X	X	X	X	X	X

X = Yes, L = Late Stage Faults/Limited Detection, - = No
Controller = The controller includes anything in the motor controller or starter that could fail and adversely affect the operation of the motor.