

3-Phase Induction Motor Winding Resistance Reference

Typical phase-to-phase resistance (Ω) at ~20-25 °C, 1/8 HP – 250 HP, 208 / 230 / 460 / 480 V | Indicative field-check values

HP	kW	Approx. FLA @ 460 V (A)	208 V R_{pp} (Ω)	230 V R_{pp} (Ω)	460 V R_{pp} (Ω)	480 V R_{pp} (Ω)	Max. imbalance (suggested)	Suggested instrument
1/8	0.09	0.35	8.7 – 17	11 – 21	43 – 85	46 – 93	$\leq 5\%$	Standard DMM ok
1/4	0.19	0.65	4.6 – 9.3	5.7 – 11	23 – 45	25 – 49	$\leq 5\%$	Standard DMM ok
1/3	0.25	0.85	3.4 – 6.9	4.2 – 8.4	17 – 34	18 – 37	$\leq 5\%$	Standard DMM ok
1/2	0.37	1.1	2.9 – 5.9	3.6 – 7.2	14 – 29	16 – 31	$\leq 5\%$	Standard DMM ok
3/4	0.56	1.6	2.0 – 4.0	2.4 – 4.8	9.7 – 19	11 – 21	$\leq 5\%$	Standard DMM ok
1	0.75	2.1	1.5 – 2.9	1.8 – 3.6	7.1 – 14	7.7 – 15	$\leq 5\%$	Standard DMM ok
1.5	1.12	3	0.95 – 1.9	1.2 – 2.3	4.6 – 9.3	5.1 – 10	$\leq 5\%$	Standard DMM ok
2	1.49	3.4	0.86 – 1.7	1.1 – 2.1	4.2 – 8.4	4.6 – 9.2	$\leq 5\%$	Standard DMM ok
3	2.24	4.8	0.56 – 1.1	0.68 – 1.4	2.7 – 5.4	3.0 – 5.9	$\leq 5\%$	Standard DMM ok
5	3.73	7.6	0.31 – 0.62	0.38 – 0.75	1.5 – 3.0	1.6 – 3.3	$\leq 5\%$	Standard DMM ok
7.5	5.59	11	0.19 – 0.37	0.23 – 0.45	0.91 – 1.8	0.99 – 2.0	$\leq 5\%$	Standard DMM ok
10	7.46	14	0.14 – 0.28	0.17 – 0.34	0.67 – 1.3	0.73 – 1.5	$\leq 5\%$	Milliohm meter
15	11.2	21	0.080 – 0.16	0.098 – 0.20	0.39 – 0.78	0.43 – 0.85	$\leq 3\%$	Milliohm meter
20	14.9	27	0.059 – 0.12	0.072 – 0.14	0.29 – 0.57	0.31 – 0.62	$\leq 3\%$	Milliohm meter
25	18.6	34	0.042 – 0.083	0.051 – 0.10	0.20 – 0.41	0.22 – 0.44	$\leq 3\%$	Milliohm meter
30	22.4	40	0.033 – 0.067	0.041 – 0.082	0.16 – 0.33	0.18 – 0.36	$\leq 3\%$	Milliohm meter
40	29.8	52	0.023 – 0.046	0.028 – 0.057	0.11 – 0.23	0.12 – 0.25	$\leq 3\%$	4-wire micro-ohmmeter
50	37.3	65	0.017 – 0.034	0.021 – 0.041	0.082 – 0.16	0.090 – 0.18	$\leq 3\%$	4-wire micro-ohmmeter
60	44.8	77	0.014 – 0.027	0.017 – 0.033	0.067 – 0.13	0.073 – 0.15	$\leq 3\%$	4-wire micro-ohmmeter
75	56.0	96	0.0098 – 0.020	0.012 – 0.024	0.048 – 0.096	0.052 – 0.10	$\leq 3\%$	4-wire micro-ohmmeter
100	74.6	124	0.0069 – 0.014	0.0085 – 0.017	0.034 – 0.068	0.037 – 0.074	$\leq 3\%$	4-wire micro-ohmmeter
125	93.2	156	0.0051 – 0.010	0.0063 – 0.013	0.025 – 0.050	0.027 – 0.055	$\leq 2\%$	4-wire micro-ohmmeter
150	111.9	180	0.0043 – 0.0086	0.0052 – 0.010	0.021 – 0.042	0.023 – 0.046	$\leq 2\%$	4-wire micro-ohmmeter
200	149.2	240	0.0030 – 0.0059	0.0036 – 0.0073	0.015 – 0.029	0.016 – 0.032	$\leq 2\%$	4-wire micro-ohmmeter
250	186.5	302	0.0021 – 0.0043	0.0026 – 0.0052	0.010 – 0.021	0.011 – 0.023	$\leq 2\%$	4-wire micro-ohmmeter

How to use this table

- **R_{pp}** = resistance measured between any two motor leads (T1-T2, T2-T3, T1-T3) with the motor cold, disconnected from the starter/VFD and leads isolated. For a Y or Δ stator the three readings should be nearly equal.
- **% imbalance** = (largest deviation of any reading from the average $\div$ average) $\times$ 100. Example: 1.02, 1.00, 0.98 $\Omega \rightarrow$ average 1.00 Ω , max deviation 0.02 $\Omega \rightarrow$ 2%.
- **Voltage columns:** for the same HP, winding resistance scales roughly with V^2 (a 230 V winding is about $\frac{1}{4}$ of the 460 V value). 208 V values apply to 208-230 V rated windings. 480 V values assume a dedicated 480 V design; many motors are simply labelled 460 V and run on 480 V, in which case use the 460 V column.
- **Dual-voltage motors (9/12-lead):** reading depends on how the leads are connected. Measure each individual winding (e.g., T1-T4) and compare to the high-voltage-connection value; the low-voltage connection (parallel) will read about $\frac{1}{4}$ of the high-voltage value.
- **Temperature correction (copper):** $R_{T_2} = R_{T_1} \times (234.5 + T_2) \div (234.5 + T_1)$. Roughly +0.39% per $^{\circ}\text{C}$. Always compare readings taken at the same temperature.
- **Measurement quality:** below $\sim 0.1 \Omega$, ordinary DMM lead resistance and contact error will swamp the imbalance reading. Use a 4-wire (Kelvin) micro-ohmmeter; also keep the test current well below rated so the winding does not heat during the test.

Interpreting results

- **Within the suggested limit and within the typical range:** no resistance-related concern. Follow up with insulation resistance (megger) and, where applicable, polarization index tests; resistance alone does not prove winding health.
- **Imbalance above the limit:** suspect shorted turns, a loose/corroded lead connection or a high-resistance joint. Re-check connections and re-measure before condemning the winding.
- **Open circuit / infinite on one pair:** broken winding or lead. **Much lower than the range on all three pairs:** check the connection scheme (dual-voltage) or the HP/voltage rating assumed.
- **Always prefer** the manufacturer's nameplate/test-report value, or the motor's own baseline from commissioning, over this table.

Basis and limitations

There is no industry standard table of winding resistance by HP and voltage: values depend on manufacturer, frame, efficiency class (IE1-IE4 / NEMA Premium), pole count, and winding design, and can differ by a factor of two or more between motors of the same rating. The ranges here are **engineering estimates** derived from NEC Table 430.250 full-load currents (4-pole, 60 Hz) and typical stator copper-loss fractions, giving $R_{pp} = 2 \times P_{cu} \div (3 \times I^2)$, then widened to about $0.7\times - 1.4\times$ of the central estimate. FLA for $\frac{1}{8} - \frac{1}{3}$ HP is typical rather than from a table. The % imbalance limits are common field-practice guidance ($\approx 5\%$ is the usual ceiling; tighter limits are suggested for larger, low-resistance windings) and are not set by NEMA or IEEE. Use for sanity-checking only, not as a pass/fail acceptance standard.