SOKEN

INVERTER HOT LINE COIL RESISTANCE METER

DAC-HRI-3

DAC-HRI-3 can measure resistances of the coil winding of a motor driven by inverter under energized. Conventionally, the motor temporarily must be turned off to measure the resistances.

However, the resistances come down naturally after turning off. The resistance could change to drop down promptly until the measurement finishes, and are not the same as the one under energized.

DAC-HRI-3 is introducing a state of the art inverter source filtering system and can know a *true* coil resistance of motors even under energized.

Test Materials

- EV Motor
- Brushless Motor
- Compressor Motor for Air-Conditioner

Rerated Standard

- JIS C4203 Single Phase induction motors
- JEC 2137 Induction motor
- JEC 60034-1 Rotating electrical machines - Part 1: Rating and performance

Principals

A DC-blocking capacitor is inserted to prevent flow of the DC measuring current into the AC power source, and the energizing AC voltage is applied to the coil, Lx, of the tested motor. A DC current from the DC constant current circuit of the Coil Resistance Meter is superimposed on the coil, Lx, and the voltage drop across the Lx is measured. The DC component of the measured voltage drop is extracted by using a low pass filter (LPF), and then the coil resistance is calculated and displayed. Because the LPF is composed of circuit elements, a CPU-based digital filter is used to eliminate inverter noises.

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Specifications

●Measuring range	:	0.2Ω Range	: 0-0.2000Ω (Superimposed Current DC100mA)
		2ΩRange	: 0-2.000Ω (Superimposed Current DC100mA)
		20ΩRange	: 0-20.00Ω (Superimposed Current DC10mA)
		200ΩRange	: 0-200.0Ω (Superimposed Current DC1mA)
		2000ΩRange	: 0-2000Ω (Superimposed Current DC0.1mA)
●Testing Voltage	:	Max AC450V* (50/60Hz)	
		*Max 700V type is available as option. (Model DAC-HRI-3 Type 700)	
●Frequency	:	10 - 400Hz	
●Resolution	:	Voltage Meter	: 0.1V
		Resistance Meter	: 0.1mΩ (0.2ΩRange)
●Display	:	Voltage Meter	: 4 digit
		Resistance Meter	: 4 digit 2000FS
●Accuracy	:	2Ω/20Ω/200Ω	: ±0.3% FS
		0.2ΩRange	: ±0.5% FS
●Input impedance	:	0.2Ω/2ΩRange	: Approx. 1.5kΩ
		20ΩRange	: Approx. 15kΩ
		200ΩRange	: Approx. 150kΩ
		2000ΩRange	: Approx. 1500kΩ
●Interface	:	RS232C	
●Analog output	:	DC0-2V	
●Power Source	:	AC100V-240V±10% 50/60Hz	
●Dimensions	:	W430×H200×D385mm Approx. 20kg	
●Accessories	:	1) 4-terminal probe (6m for HR)	
		2) AC Power cable (3P inlet cord with a ground terminal	
		3) Instruction manual	
		4) Inspection certificate (Test Report)	
●Option	:	DC Blocking Capacitors Box (C-BOX, 7A, 23A, 45A)	

Conversion to temperature

Usually, $1/\alpha_0 = 234.5$, where α_0 is the temperature coefficient at 0ºC, is used for the conversion to temperature as described in the following formula.

$$tc = \frac{R_t - R_{to}}{R_{to}}(235 + to) + to$$

$\Delta t = to\text{-}tc$

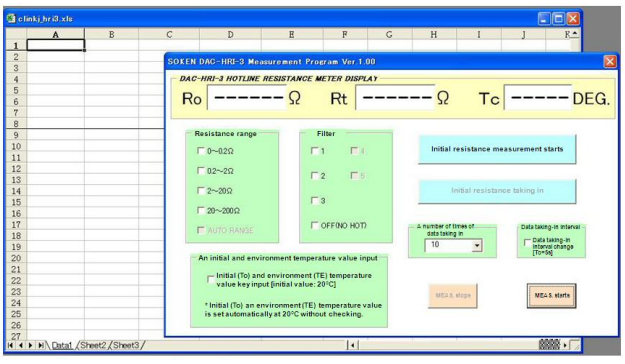
t_c = Converted temperature (T_c)

Δt = Temperature rise (ΔT)

R_t = Measured electrical resistance (R)

R_{t0} = Initial resistance (R_o)

t_0 = Initial temperature (T_o)



Conversion to Temperature is possible by input the Initial Resistance value and initial Temperature value through PC by using sample software. Measured values with time are saved and displayed in an Excel Sheet.

DC Blocking Capacitors Box

DC Blocking Capacitor must be required for measurement under energized. An appropriate capacitor must be selected in accordance with the rated current of specimen.

●Capacitor　:Electrolytic Capacitor
●Maximum-allowed-current value
:470μF　･･･ 2A
:4,700μF　･･･ 7A
:47,000μF　･･･23A
:330,000μF　･･･45A

Model DAC-C23AXC7A (For 3 Phase 3A/7A)

Front side

Rear side

Optional Capacitors for single phase, 3-phase, and large current specification etc, are also available.

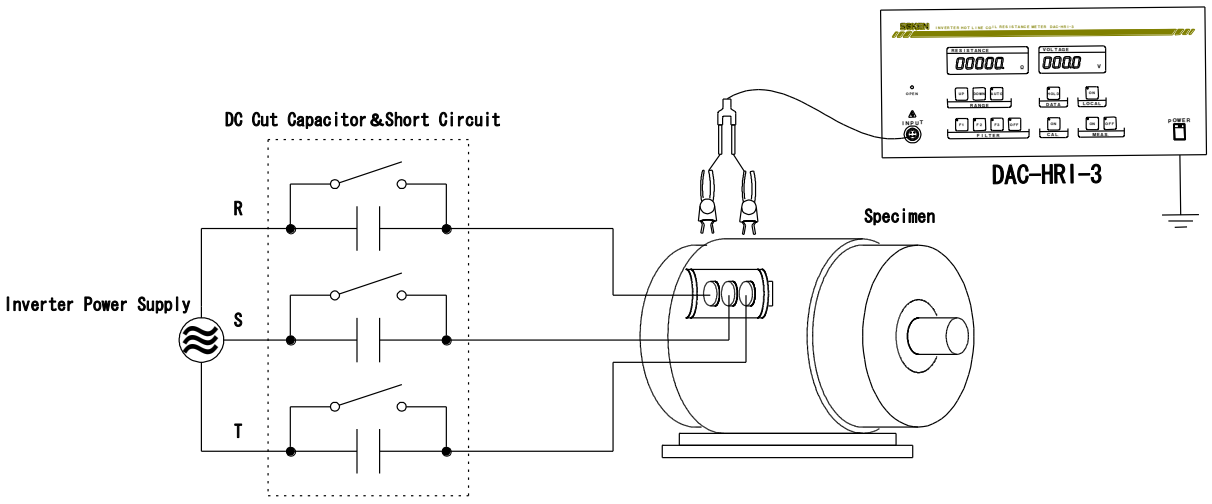
Necessity of Hot-Line resistance measurement

During the temperature rise test of a coil, in particular, a coil of small-size equipment cools rapidly once de-energized, and so its resistance changes considerably. In other words, it is very difficult to accurately measure the coil resistance of a running motor. In the case of the coil of a motor that is equipped with a fan, the motor exterior is cooled by the fan, but the temperature of the coil inside the motor can be much higher. In this case, the motor temperature that is measured externally with, for example, a thermistor, can be much different from the temperature of the coil. The traditional "measurement of coil resistance after shutdown" is based on the assumption that the temperature rises and falls in accordance with natural logarithm, but the assumption often fails for products of complicated structure, and differences or errors are inevitable in inferring the coil resistance under the energized state from that under the de-energized state. Therefore, hot-line resistance measurement is an ideal method for correct measurement of coil resistances.

Why superimpose a DC component on the AC line

It is not impossible to derive effective resistance from AC components under the energized state, but the derivation is associated with difficulties related to load conditions or separation of iron loss. In addition, pertinent electrical regulations stipulate that copper wire resistance must be DC measured. For this reason, this Coil Resistance Meter adopts the approach of superimposing a DC component on the AC line. The magnitude of the DC current to be superimposed, however, is made negligible to the AC current.

Connecting Diagram



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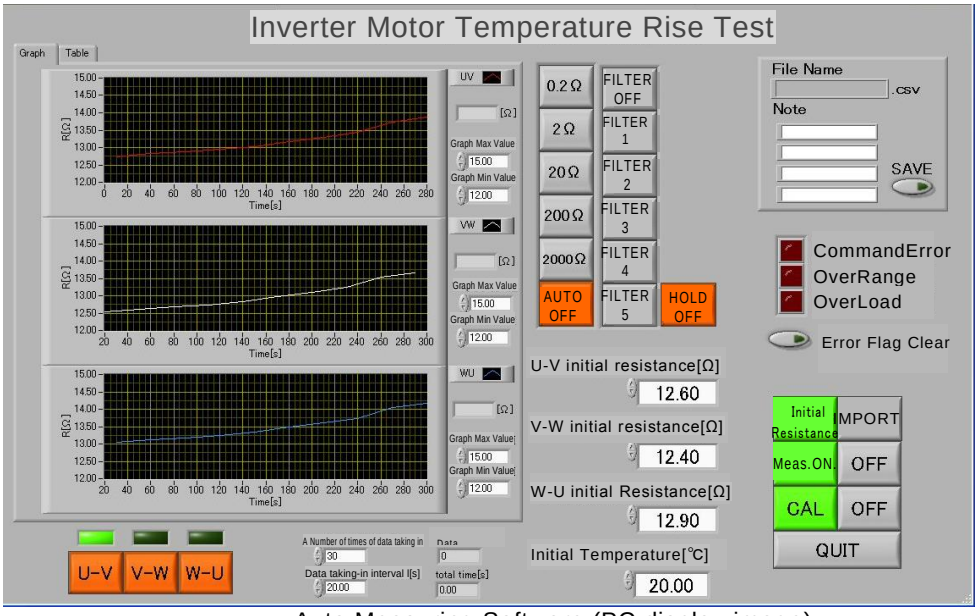
Option Switching Box with Software for AUTO 3-phase measurement

Automatic 3-phase measurement is available with option Switching Box.

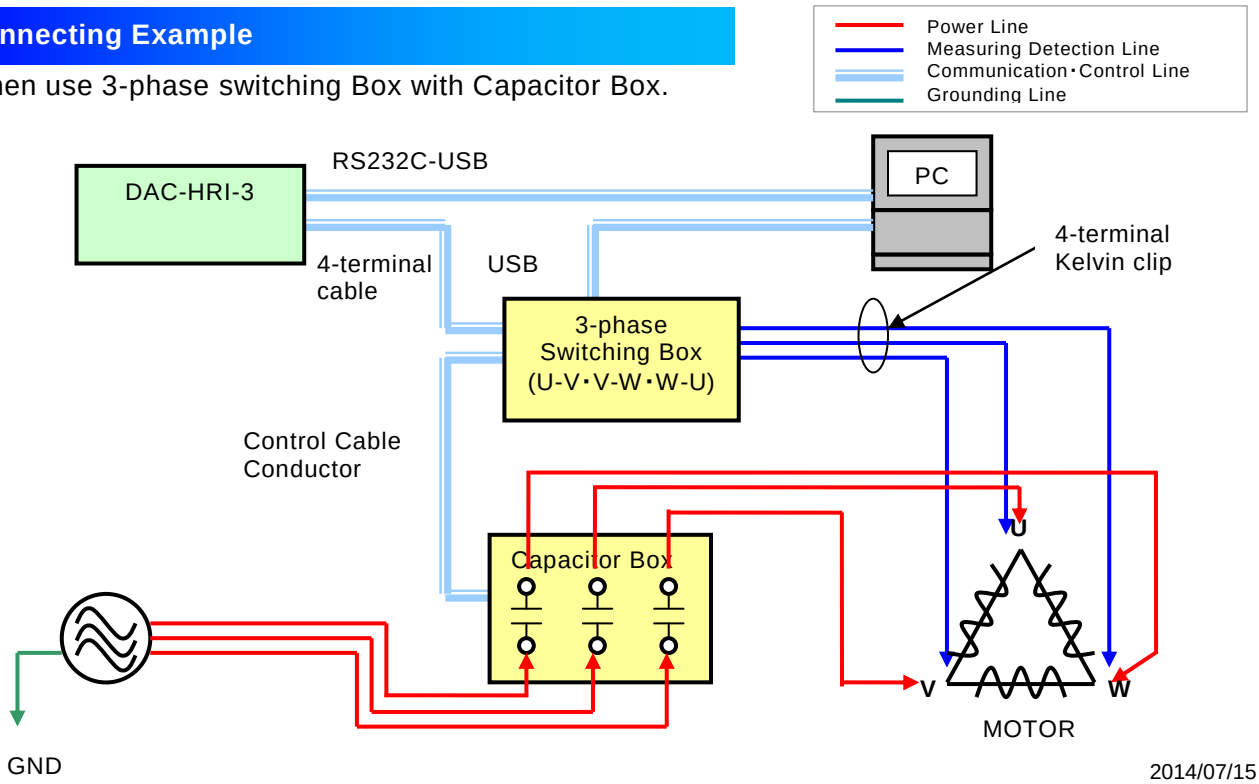


Auto Measuring Software (PC display image)

- Continuous Measurement to obtain Temperature Rise – Cooling Curve.
- Automatic switchover of 3-phase (U-V, V-W, U-W).
- Data acquisition of 1 selected phase at minimum sampling time.
- Time Interval and a number of times of import data are configurable.
- Conversion to Temperature only by input the Initial Resistance value and initial Temperature value.

Connecting Example

When use 3-phase switching Box with Capacitor Box.



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