

Students please affix one of your self adhesive identification labels to this space. Do not obscure other parts of this page with the label. If you do not have a self adhesive identification label, please complete the following information. Write your name as it appears on your badge.

Your Name: _____

Participation Number:

Two letter state abbreviation. →

State code (0301, 0302, to 0350) ↑

Team member number (01, 02, 03, or 04) ↑

			0	3					0
--	--	--	---	---	--	--	--	--	---

Students please do not write or mark within this box.

Judges, after this skill sheet has been scored and double checked, write the total score for this activity in the blank below.

Skill Activity Score: _____

Judges Initials: _____

2013 National Agricultural Technology & Mechanical Systems Career Development Event

Processing Systems

Electrical Systems Skill Activity

Situation: You work as a maintenance technician for a food processing company and are replacing the motor on a vacuum pump. **The new motor must be wired for 230 volts and must rotate counter-clockwise (CCW).**

Directions: Complete each task as described:

1. Neatly **draw** the necessary wiring connections so the motor will operate at 230 V and turn CCW. (7 pts.)

Line 1 _____ GRD _____ Line 2 _____ Power cord wires	_____ T1 _____ T2 _____ T3 _____ T4 _____ T5 _____ T8  GRD Motor wires
--	---

2. Using the tools and supplies provided, **connect** the power cord and wire the motor for 230 volts and CCW rotation. (15 pts.)
3. **Answer** the following questions about the motor based on the motor nameplate:
 - A. What is the power rating (number and unit) of this electric motor? _____ (1 pt.)
 - B. What is the horizontal distance (in inches) from the bottom of the motor mount to the centerline of the motor shaft _____ (1 pt.)
 - C. Which of the following best describes the motor's cooling fan? (Put an "X" in correct blank.)
 _____ Internal fan _____ External fan _____ Not equipped with a cooling fan (1 pt.)
 - D. At rated load and 230 V, how much current (amps) will the motor draw? _____ amps (1 pt.)
 - E. How much can this motor be overloaded (as a percentage) on a prolonged basis without overheating?
 _____ (1 pt.)
 - F. What is the maximum current (amps) this motor should draw (at 230 volts) when it is overloaded to the point the motor shaft will not turn? _____ (2 pts.)

Contestants: Do not mark below this line.

Evaluation:

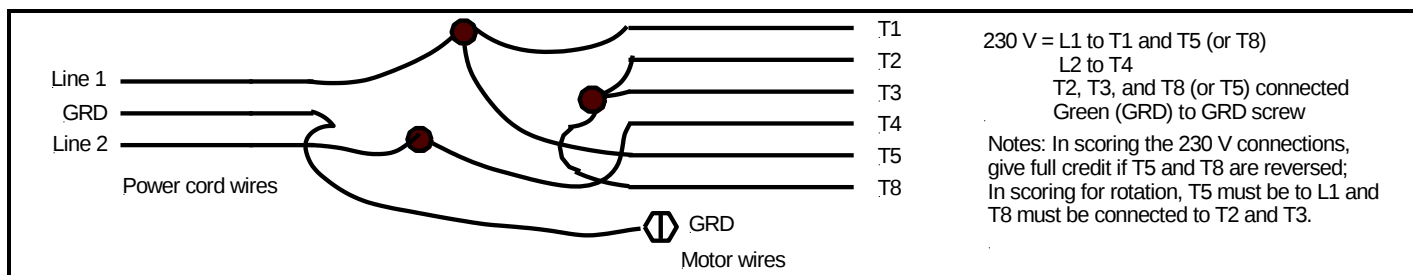
	Factor	Pts. possible	Pts. earned
1.	Participation	1	1
2.	Wiring Diagram		
	A. All 230 V wiring connections correct	4	
	B. CCW rotation connections correct	2	
	C. Equipment grounding connection correct	1	
3.	Motor Wiring Connections		
	A. 230 V wiring connections correct	6	
	B. CCW rotation connections correct	3	
	C. Equipment grounding connection correct	1	
	D. Connections electrically and mechanically sound	2	
	E. Safety	3	
4.	Nameplate Questions	7	
	Total:	30	

NEMA Table 430 -7(b). Locked-Rotor Indicating Code Letters (to be supplied on separate sheet)

Code Letter	Kilovolt-Amperes Per Horsepower With Locked Rotor
A	0 - 3.14
B	3.15 - 3.54
C	3.55 - 3.99
D	4.0 - 4.49
E	4.5 - 4.99
F	5.0 - 5.59
G	5.6 - 6.29
H	6.3 - 7.09
J	7.1 - 7.99
K	8.0 - 8.99
L	9.0 - 9.99
M	10.0 - 11.19
N	11.2 - 12.49
P	12.5 - 13.99
R	14.0 - 15.99
S	16.0 - 17.99
T	18.0 - 19.99
U	20.0 - 22.39
V	22.4 and up

Scoring Notes

1. All contestants are awarded 1-pt. for participation.
2. Score the wiring diagram according to the drawing and notes below. Award either 0-points or full points in each category, 2A-C (no partial credit).



3. Use the same criteria as in #2 above to score 3A-C and award either “0” points or full points (no partial credit). For 2D, if there is no obvious unsound connection, award 2-pts; if obvious unsound connection, award 0-pts. For 2E, award 0-pts for first minor safety violation and provide contestant with a warning; disqualify student for 2nd minor safety violation of 1st major safety violation.
4. Score this section based on the following answers:
 - A. 1/3-hp
 - B. $D = FR/16 = 56/16 = \underline{3.5\text{-in}}$
 - C. External fan
 - D. 3.3 A
 - E. 15%
- F. Based on kVA code letter “N” and the table provided, the motor should draw a maximum of 12.49 kVA per rated HP.

$$A = 12490 \text{ VA}/230\text{V} \times .33\text{-HP} = \underline{17.92 \text{ A}} (\pm 0.10 \text{ A})$$

(Note: if voltage is calculated as 240 V, then 17.2 A ($\pm 0.10 \text{ A}$) is accepted as correct answer.

Tools and equipment required per station

- A. 1, Ironhorse GP industrial motor w/nameplate
- B. 1, 240 V grounded plug-and-cord
- C. 5-6, solderless connectors (wire nuts)
- D. 1, Phillips screwdriver