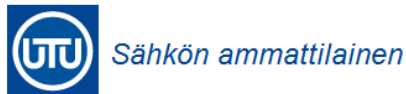


## ELECTRICAL INSTALLATION



Participant's name	Nationality

The judges	Nationality
Kari Kenttä	Finland
Gjermund Hansen	Norway
Gaspirovich Victor Valerievich	Russia

## Description of a job assignment

Your job is to install the equipment in accordance with the accompanying documents so that they are in a good working order. Appliances must be installed in accordance with electrical safety regulations in such a functional way that they can be measured and deployed within the time available.

The dossier of the task contains the following documents

- A coursework that includes the function description of the equipment
- electrical drawing
- installation diagram with dimensions
- main chart

A total of 6 hours is reserved for the actual installation work

## The evaluation of the competition task

The competition task is evaluated on a scale from 0 to 100 p.

- Work and electricity safety 14 p
- Commissioning, testing and operation 15 p
- The dimensions and appearance 25 p
- Attachment of devices and conductors 15 p
- Wiring and connections 12 p
- Customer service and documentation 11 p
- Sustainable development, entrepreneurship and attitude 8 p

In the evaluation all judges assess the following subjects: work and electrical safety, sustainable development, entrepreneurship and attitude. Other items of the evaluation will be divided so that the same judges will evaluate the same evaluation target from all the competitors.

If problems arise in your work, turn to the judges to go ahead with the task. Issues regarding arrangements, supply failures, or broken equipment do not affect the evaluation. Questions about the actual installation work and the requested advice will affect the evaluation.

The judge points out only once that the risk to electrical and occupational safety is compromised. If you repeatedly threaten electrical and occupational safety, the judge suspends your work immediately and your performance is rejected.

The competitor must be dressed in personal protective equipment throughout the competition task. The helmet is used as needed. A competitor must have at his disposal a personal measuring device suitable for detecting the no voltage release (NVR), which can ensure electrical safety in all the situations during the competition. In addition, the competitor must have his own personal hand tools.

A personal measuring device approved for this purpose must be used for the commissioning measurements.

## **Schedule**

### Wednesday 17.4.

from 8.45 to 9.30, judges and competitors will meet.

9.30 to 11.45 XX

12.15-13.00 Lunch

13.00-15.00 XX

at 15.00> free program

### Thursday 18.4

7.45-8.00 preparing for the competition

8.00 - 11.30 Compete starts (4,5 h)

11.30 - 12.30 Lunch

12.30 - 14:00 Competition will continue (1,5 h)

14.00 - 15.00 Judge working and evaluation of results

15.30 Awards Ceremony, Dinner

## **A coursework**

The task has been divided into three parts: lightning, heating - and the electric motor installation.

### **Group Center (GC)**

The center has been installed in the workspace beforehand and it is furnished. The installation mode group center supplies a level of lighting, heating and motor drive installations. Cable sheatings can enter the center inside max. 30 mm. A small change work must be done in the center. Group number three output circuit breakers must be replaced as suitable enclosures for motor output. On the table you will find the required 3xC10A circuit breakers. The alteration is done before starting the installation work.

Appliances must be installed in accordance with the electrical safety regulations in such a functional way that they can be measured and deployed. The cabling of the installation work is done so that the ends of the cables are connected to the center last.

### **The electric motor starter**

The electric motor is controlled by a flat circuit-type contactor enclosure.

The cables must be inserted perpendicularly to the contactors of the contactor housing. The motordrive is protected by a C10 3-phase circuit breaker that is placed in the group center.

### **Cables and conductors**

The cables and conductors are fastened and bundled according to a good installation method. The cables are fastened with nail and screw fasteners. Installation is done in surface installation and the motor supply cable must be protected by the industrial installation compartment with a protective tube.

In the motor installation the contactor housing for the electric motor is used with an MMJ cable that is protected by an aluminium tube. The cables from the group center must be installed as required by the main circuit diagram and the group short circuit protection.

### **Engine operation**

The engine condition must be measured before the installation and the results must be recorded on a separate form. The direction of rotation of the motor must be clockwise from the end of the shaft. The motor shaft is positioned horizontally in the wall direction.

### **Lighting**

The lighting installation includes one luminaire, which is controlled by wall-mounted switches. The cable must be connected to the luminaire neatly in accordance with the requirements for the surface installation and the enclosure category of the lamp must not be impaired.

### **Markings**

Installation assignments must include group entries in the center.

### **Documentation**

Documents related to installation work: drawings, installation instructions and measurement protocols must be handed over to the recipient of the work, complete with the changes marked.

### **The deployment measurements**

When the installation is completed before the job is handed over to the customer the equipment must be made a deployment measurement. During commissioning a continuity measurement of the protective conductor and insulation resistance measurement for the built-in equipment is carried out. The operation of the fault current switch should check the trip time, trip current and device operation with its own test button. The measurement result shall be recorded in the minutes to be handed to the customer.

## Usage guidance

Upon completion of the job, the client is provided with a hardware instruction manual that will allow the customer to cope with the basic use of the hardware and the most common malfunctions. The customer must be able to disconnect the power supply in emergency situations. The customer must also be reminded of the maintenance required by the hardware.

## Sustainable development, entrepreneurship and attitude

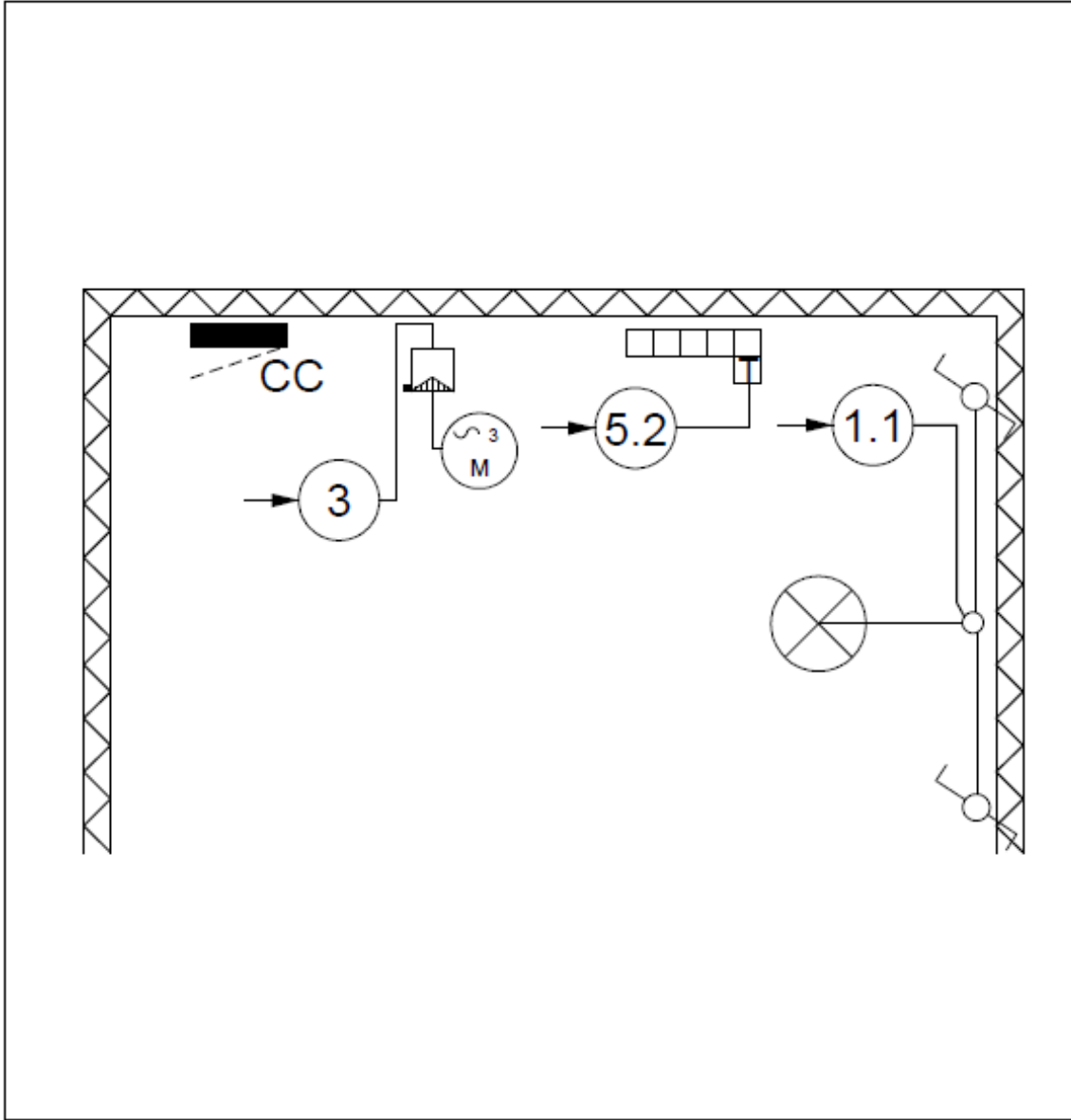
When carrying out the installation work, the principles of sustainable development must be taken into account insofar as they concern this work. This means handling materials and waste. In the case of work that maintains work capacity physical excess workload must be avoided.

Entrepreneurship and entrepreneurial attitudes are reflected in the quality of work and self-acting and self-motivated working, problem solving and self-assessment skills of one's own work. Prepare to present to the judge your own assessment of whether your work will be in a condition to be handed over to the customer.

### Equipment/Tools which the Participant must have with him/her

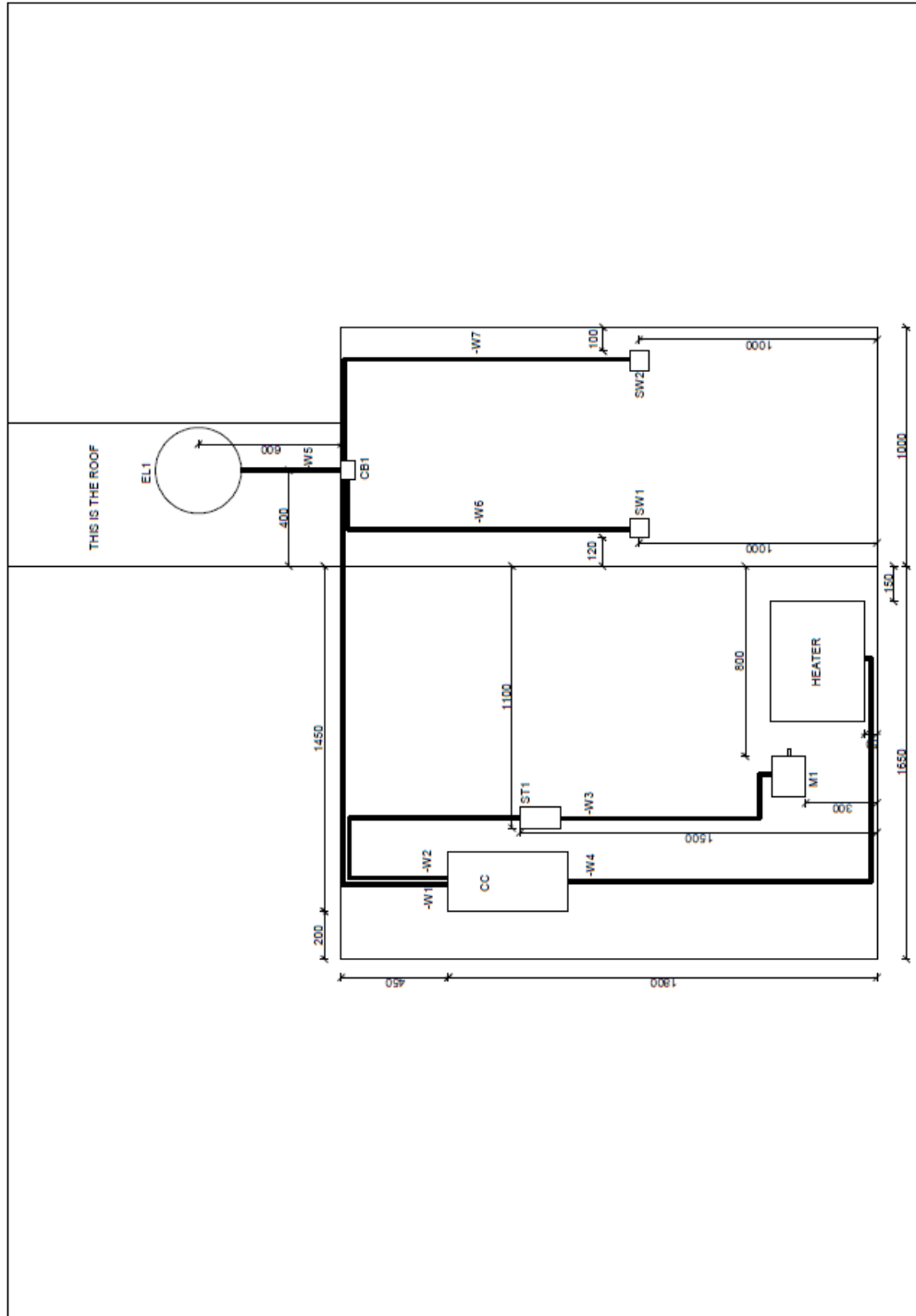
- Electricians' hand tools
- Cordless screwdriver with bits
- Multimeter, insulation resistance and continuity tester
- Work clothes, safety shoes and personal safety equipment including safety glasses
- Safety glasses - to be used at all time during the competition
- Spanner 13 mm for adjusting nuts
- Pipe cutter for aluminum or hacksaw

Electrical drawing



Kosa/Kyla	Korttel/Tila	Tontti/Nro	Viranomaisten merkintöjä varten		
Toimenpide			Pirstuslaji electrical drawing		Jutka. nro
Rakennuskohde Electrical Installations ArcticSkills 2018 Tornio Finland			Pirstuksen sisältö Final task of electric installations		Mitakaava 1/50
AMMATTIOPISTO LAPPIA TORNIIO FINLAND			Päiväys	Koodi	Muutos
			Työnumero Arctic skills	Pirstusn. nro SÄH Tesokuva	

Installation diagram with dimensions

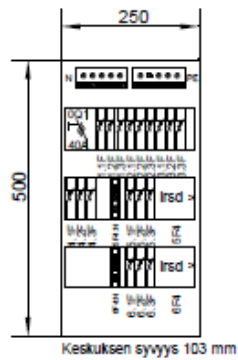


## Components of installation

<b>Component/object</b>	<b>Descrpition/Notes</b>
GC	Group center
ST1	Motor starter with contactor
M1	Three phase AC asynchronous induction motor
HEATER	heater Ensto TASO3
EL1	Electric lamp Ensto AVR 20.1 E27
SW1/SW2	Electric switches model 6 (control change)
CB1	Connection box for electrical wiring
-W1	Cable MMJ MMJ / PFXP 3*1,5 S
-W2	Cable MMJ MMJ / PFXP 5*1,5 S
-W3	Cable MMJ MMJ / PFXP 4*1,5 S
-W4	Cable MMJ MMJ / PFXP 3*1,5 S
-W5	Cable MMJ MMJ / PFXP 3*1,5 S
-W6	Cable MMJ MMJ / PFXP 5*1,5 S
-W7	Cable MMJ MMJ / PFXP 5*1,5 S



Main chart



EN 61 439-3	Sähkö n:o	3332325	Nimellinen tasotuskerroin	2-3 autom./vaihe 0,8
Malli	pointer 3418			4-5 autom./vaihe 0,7
R. / kW	I <sub>in</sub> / A	U <sub>n</sub> / V	P <sub>n</sub> / kW	6-9 autom./vaihe 0,6
Nimellispännite	U <sub>n</sub>	400 V	Nimellistaajuus	50 Hz
Apuplirin nimellispännite		- V	Suojaus sähköiskulta	Suojaeristys ja kotelointi
Nimellisenistyspännite	U <sub>i</sub>	400 V	Maadoitusjärjestelmä	TN-S järjestelmä
Nimellisvirta, keskus	I <sub>in</sub>	35 A	Ympäristöolot	Normaalit
Nimellisvirta, piirit	I <sub>in</sub>	- A	EMC-käyttöympäristö	A ja B
Terminen rajavirta	I <sub>in</sub> ta	< 10 kA	Paino	- kg
Dynaaminen rajavirta	I <sub>in</sub> pk	- kA		

**pointer**

UTU OY  
MADE IN FINLAND

MALLI pointer 3418

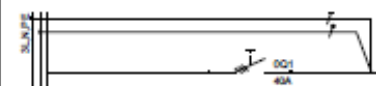
















I<sub>in</sub> 35 A EN 61 439-3

U<sub>n</sub> 400 V IP 30

F 50 Hz TYÖ N:O

<b>UTU OY</b> AHJONTE 1, 28400 ULVILA Puh. 02-550 800 www.utu.eu	Suunn.	JK	Pvm.	18.12.2012	KOKOONPANOKUVA	Lehti	1 / 2	Arkitistotunnus
	Tark.	TV	Muutos	TV/18.8.2018	Keskustunnus	Piir. n:o		
	Hyv.	PK	Suhde	1:10 (A4)				3332325

CAD6 13

KESKUS	NRO	NIMITYS	A/A	KW	JOHDOTUS
		MAIN SWITCH AND SUPPLY	40A		
	1.1	LIGHTING INSTALLATION	C10		MMJ 3*1,5 S
	1.2		C10		
	1.3		C10		
	2.1		C10		
	2.2		C10		
	2.3		C10		
	3	MOTOR	C10		MMJ 5*1,5 S
	4.1		C18		
	4.2		C18		
	4.3		C18		
	5.1		C10		
	5.2	HEATING	C10	0,3	MMJ 3*1,5 S
	5.3		C10		
	6.1		C18		
	6.2		C18		
	6.3		C18		

UTU OY

ARJONTEI 1, 20400 ULVILA  
Puh. 02-550 800  
www.utu.fi

Suunn. KK

Pvm. 18.12.2012

MAIN CHART

Lehti 2 / 2

Arkistotunnus

Tark. TV

Muutos KK/30.11.2017

Keskustunnus

Piir. nro

Hyv. PK

Suhde

CC

3332325

### Engine condition measurement

Measured motor phase winding resistances.

U1-U2 =

V1-V2 =

W1-W2 =

Perform the required insulation resistance measurements with the meter you selected and record the measurement results.

Measuring the voltage = \_\_\_\_\_ V

Insulation resistance results:

U1-PE =

V1-PE =

W1-PE =

U1-V1 =

V1-W1 =

W1-U1 =

Direction of rotation check \_\_\_\_\_ anticlockwise \_\_\_\_\_ clockwise

### Protective conductor inspection

The continuity of the protective conductor is checked for each point \_\_\_\_ YES \_\_\_\_ NO

Maximum measured protective conductor resistance \_\_\_\_\_  $\Omega$  the result was found in the group \_\_\_\_\_

### Insulating resistance check of installation

Measuring voltage = \_\_\_\_\_ Result of insulation resistance check = \_\_\_\_\_ M  $\Omega$

### Inspection of earth fault indicator

Trip time: \_\_\_\_\_ Trip current: \_\_\_\_\_

Check the operation of test button in earth fault indicator: \_\_\_\_\_

Installation inspection meets the required results and the installation can be put into operation

\_\_\_\_ YES

\_\_\_\_ NO

Date \_\_\_\_\_ / \_\_\_\_\_ 2018

Inspector: \_\_\_\_\_

Subtasks / Point Distribution		Maximum Points	Earned Points
<b>A</b>	Work and electricity safety	14	
<b>B</b>	Commissioning, testing and operation	15	
<b>C</b>	The dimensions and appearance	25	
<b>D</b>	Attachment of devices and conductors	15	
<b>E</b>	Wiring and connections	12	
<b>F</b>	Customer service and documentation	11	
<b>G</b>	Sustainable development, entrepreneurship and attitude	8	
Task Total		100	
Confirmed result			100
Signature of judges			
Date place			

	Description	Judging Criteria	Detracted Points	Max Points	Earned Points
<b>A</b>	<b>Work and Electricity Safety</b>				
<b>1</b>	Safe and orderly work environment checked every 1 h	1 shortage/objections = 1 point 2 shortages/objections = 0 point		<b>2</b>	
<b>2</b>	Use of personal protective equipment	Safety shoes and safety glasses all the time, ear protectors or ear plugs whenever you need it.		<b>2</b>	
<b>3</b>	Use of a screwdriver	Screws and furniture are intact, the machine does not beat empty when screwing, manual attachment of tools, not by rotating the machine.  1 shortage is -1 point		<b>2</b>	
<b>4</b>	Use of a warning sign and lock	The use of a warning sign 1 point and the lock 1 point		<b>2</b>	
<b>5</b>	Operation testing of the voltage tester	Operation tested 2 points, not tested 0 point		<b>2</b>	
<b>6</b>	No voltage release measurement before working	No voltage release measured 2 points, not measured 0 point		<b>2</b>	
<b>7</b>	Working order. Connecting group leads to the group center last while other installations are complete	All the group leads 2 points, two groups 1 point, otherwise 0.		<b>2</b>	
<b>Sub</b>	Participants total points for Work and Electricity Safety		sum	<b>14</b>	

	Description	Judging Criteria	Detracted Points	Max Points	Earned Points
<b>B</b>	<b>Commissioning, testing and operation</b>				
<b>1</b>	Continuity measurement of the protective conductor	Measured with a mounting tester 2 points, measured by a multimeter 1 point		<b>2</b>	
<b>2</b>	Measurement of the motor winding resistance before installation	Measured = 1 p		<b>1</b>	
<b>3</b>	Measuring the insulation resistance of the motor before installation	Measured against the frame 1 p and measured between coils 1 p		<b>2</b>	
<b>4</b>	The motor is properly connected Y/D	Right coupling 1p		<b>1</b>	
<b>5</b>	The direction of the rotation of the motor properly	The motor rotates clockwise from the end of the shaft 2 p, otherwise 0p		<b>2</b>	
<b>6</b>	Motor overload protection correctly adjusted	The motor thermal relay is set correctly 2p, otherwise 0p		<b>2</b>	
<b>7</b>	Test of the earth leakage protection from the button, commissioning with the tester RCD current flow and trip time measurement	Handle 1p, tripping current 1p, trip time 1p		<b>3</b>	
<b>8</b>	The lighting coupling works correctly	The lighting coupling works correctly 1p		<b>1</b>	
<b>Sub</b>	Participants total points for Commissioning, testing and operation		sum	<b>15</b>	

	Description	Judging Criteria	Detracted Points	Max Points	Earned Points
<b>C</b>	<b>The dimensions and appearance</b>				
<b>1</b>	The height of the engine's key box correctly, required 1500 mm	At the bottom of the housing 1503-1497 mm. Properly 2p, otherwise 0p Tolerance of the dimensions 6 mm, ie +/- 3 mm		<b>2</b>	
<b>2</b>	The distance between the motor housing and the correct distance from the right wall, required 1100 mm	To the top left of the casing 1103-1097 mm. Properly 2 p, otherwise 0p Dimensions of tolerance 6 mm, ie +/- 3mm		<b>2</b>	
<b>3</b>	In the engine the shaft is mounted in the direction shown	The shaft is mounted parallel to the wall		<b>2</b>	
<b>4</b>	Inputs of the push button housing in the middle of the cable center line	The cable comes into the via-hose directly on / off		<b>2</b>	
<b>5</b>	Mounting height of lighting switches, required 1000 mm	In the center of the switch 997-1003 mm is / no Dimensions of tolerance 6 mm, ie +/- 3mm		<b>2</b>	
<b>6</b>	Cables straight in brackets spaced	Mild eye perceptible deviation -1p, multiple deviation 0p		<b>2</b>	
<b>7</b>	From the corner of the heater 150mm to the right corner	The heater is mounted between 153 and 147 mm of the back of the booster The tolerances are 6 mm or +/- 3 mm		<b>2</b>	
<b>8</b>	Heater height from the floor, required 50 mm	The heater is mounted 47 to 53 mm from the floor Dimensions of tolerance 6mm ie +/- 3 mm		<b>2</b>	
<b>10</b>	The cable sheath does not come inside over 6mm	Exceeds 1 cable sheath = -1p		<b>2</b>	
<b>11</b>	Subjective assessment of the entire installation	Evaluated the cleanliness of the installation subjectively 1-6p		<b>6</b>	
<b>Sub</b>	Participants total points for The dimensions and appearance		sum	<b>25</b>	

	Description	Judging Criteria	Detracted Points	Max Points	Earned Points
<b>D</b>	<b>Attachment of devices and conductors</b>				
<b>1</b>	Motor cable protected with JAPP tube and JAPP tube used for terminal pieces	JAPP tube 1 p, end pieces at both ends 1 p		<b>2</b>	
<b>2</b>	The grommets are tight and the cable comes straight through	Inlets tight 1 p and cables straight through the inlets 1p		<b>2</b>	
<b>3</b>	Entries in the group center are correct	2 entries missing -1p 3 entries missing -2p		<b>2</b>	
<b>4</b>	Distance between TC brackets flat and required from 17 to 23 cm, from the devices from 5 to 7 cm	Deviations with one cable section -1p Two deviations -2p		<b>2</b>	
<b>5</b>	Cables installed vertically and horizontally	Deviations with one cable section -1p Two deviations of -2p		<b>2</b>	
<b>6</b>	To electricity furnishings the electrical cable imported into the inlet with sheating	Yes/ No		<b>1</b>	
<b>7</b>	The IP rating for the lamp remains unchanged after the installation	Yes / No		<b>1</b>	
<b>10</b>	The bending and fastening of the aluminum tube (JAPP) is done according to a good installation method	Not to be reminded 1p Remark – 1p		<b>1</b>	
<b>Sub</b>	Participants total points for Attachment of devices and conductors		sum	<b>15</b>	



	Description	Judging Criteria	Detracted Points	Max Points	Earned Points
<b>E</b>	<b>Wiring and connections</b>				
<b>1</b>	The tightness of the electrical center connectors is checked	Yes / No		<b>1</b>	
<b>2</b>	Wires securely attached to terminals, terminal screws and terminal blocks	The deviation, that is, one wire will be disconnected or is disconnected -1p, one loose connector-1p		<b>3</b>	
<b>3</b>	The group center Cu is not perpendicularly visible and there are no conductors over the DIN rail	Cu visible -1p Conductors over DIN rails which prevent the insertion of devices -1p		<b>2</b>	
<b>4</b>	Cables in the center of the sheathing within 10 – 30 mm	It's right 1 p not too long or short -1p		<b>1</b>	
<b>5</b>	The luminaires' connecting box is sufficient and the conductors in the box are intact	Yes / No		<b>1</b>	
<b>6</b>	A 3xc10A circuit breaker has been replaced to the group 3 in the group centre	Yes / No		<b>2</b>	
<b>7</b>	With an electric heater, the protective earth conductor is left unconnected and the wire is connected to the connector	Yes / No		<b>2</b>	
<b>Sub</b>	Participants total points for Wiring and connections		sum	<b>12</b>	

	Description	Judging Criteria	Detracted Points	Max Points	Earned Points
<b>F</b>	<b>Customer Service and Documentation</b>				
<b>1</b>	The measurement results are recorded in the minutes	Yes / No		<b>1</b>	
<b>2</b>	The measurement log is signed and dated	Yes / No		<b>2</b>	
<b>3</b>	The records of the measurement log are correctly made	Not to be reminded 2p one remark -1p two remarks -2p		<b>2</b>	
<b>4</b>	The documents are intact and neat	Yes / No		<b>1</b>	
<b>5</b>	In guidance, s/ he makes his / her case clear, calm and customer-oriented	Usage guidance is given so that the layman understands the matter		<b>1</b>	
<b>6</b>	Telling about the function of the main switch and circuit breakers	Yes / No		<b>1</b>	
<b>7</b>	Guidance on motor control functions and protective devices	Yes / No		<b>1</b>	
<b>8</b>	Delivery of equipment installation / operating instructions to the customer	Yes / No		<b>1</b>	
<b>9</b>	Reminding customers of the testing of a fault current protection	Yes / No		<b>1</b>	
<b>Sub</b>	Participants total points for Customer Service and Documentation		sum	<b>11</b>	

	Description	Judging Criteria	Detracted Points	Max Points	Earned Points
<b>G</b>	<b>Sustainable development, entrepreneurship and attitude</b>				
<b>1</b>	The economic use of materials	The amount of waste material is small 2p moderate 1p large 0p		<b>2</b>	
<b>2</b>	Load-tolerant working method (ergonomics, diligence)	The lack of working positions, body rotation, excessive bending, bad working positions 0p		<b>1</b>	
<b>3</b>	Waste sorting Cu / mixed waste	Yes / No		<b>1</b>	
<b>4</b>	Cleaning up the workplace self-initiated	Yes / No		<b>1</b>	
<b>5</b>	Entrepreneurial finished work quality	Yes / No (subjective evaluation at C8 3-4p = 1p) The judges will make a subjective assessment together		<b>1</b>	
<b>6</b>	Comprehensive evaluation skills of your own work quality	In the condition to be handed over to the customer 1p or correctly estimated work (although not in delivery condition) 1p		<b>2</b>	
<b>Sub</b>	Participants total points for Sustainable development, entrepreneurship and attitude		sum	<b>8</b>	