11-SDMS-05

Rev.0

SPECIFICATIONS

FOR

CONTROL CABLES LINKS WITH TERMINAL LUGS FOR ECB & SMART METER

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Revision History

#	Date	Revision No.	Major Revision Description

1. SCOPE

This SEC Distribution Materials Specification specifies the minimum technical requirement for design, engineering, manufacturing, inspection, testing, and performance of single core Copper control cables, PVC insulated single core control cables rated up to 750V, suitable for installation in ducts or in air within ECB and Smart Meters to be used in the low voltage system of Saudi Electricity Company (SEC), Saudi Arabia.

2. CROSS REFERENCES

2.1. This specification shall be read in conjunction with SEC General Specification 01-SDMS-01 (latest revision) titled “General Requirements for all Equipment / Materials”, 37-SDMS-05 Rev0.1 tilted “Specification for External Circuit Breaker”, 40-SDMS-02A Rev .09 titled “Specification for Electronic Revenue CT and CT/VT Meter” and 40-SDMS-02B Rev .08 titled “Specification for Electronic Revenue Whole Current Meter” considered as an integral part of this specification

2.2. This specification shall also be read in conjunction with COMPANY purchase order requirements.

3. APPLICABLE CODES AND STANDARDS

The latest revision of the following Codes and Standards shall be applicable for the equipment/material covered in this SDMS. In case of conflict, the vendor/manufacturer may propose equipment/material conforming to one group of Codes and Standards quoted hereunder without jeopardizing the requirements of this SDMS

Standard #	Title
IEC 60228	Conductors of Insulated Cables
IEC 60502-1	Cables for Rated Voltages of 1kV (Um=1.2KV) and 3KV (Um=3.6KV)
IEC 60227	Polyvinyl Chloride Insulated Cables Of Rated Voltages Up To And Including 450/750V
ASTMB545	Standard Specification for Electrodeposited Coatings of Tin

Table 1: List of applicable standards

4. DESIGN AND CONSTRUCTION REQUIREMENTS

4.1. GENERAL

4.1.1. Cables shall meet or exceed the requirements of this Specification in all respects.

4.1.2. Manufacturer's drawings, as required by 01-SDMS-01 latest revision, shall show the outline of the cables, together with all pertinent dimensions. Any variations in these dimensions due to manufacturing tolerances shall be indicated.

4.2. DESIGN CRITERIA

4.2.1. Unless otherwise specified, the cable shall be manufactured and tested in accordance with the referred standards.

4.2.2. Cables shall be designed for ambient temperature conditions specified in 01-SDMS-01 latest revision.

4.2.3. The cable shall be designed for a maximum permissible continuous temperature of 90°C, emergency loading temperature of 105°C and maximum conductor short circuit withstand temperature of 250°C.

4.2.4. The ratings and dimensions shall be as indicated in Data Schedule.

4.3. MATERIALS

4.3.1. CONDUCTOR

4.3.1.1. The conductor shall be uncoated annealed copper class 2 as per IEC 60228 and shall be compacted and stranded.

4.3.1.2. Copper control cable shall be soft drawn multi-strands with minimum number of strands as specified in the relevant IEC. The conductor size, shape and material shall be as specified in Data Schedule and shall be as shown in Table 2 below:

Conductor Size (mm^2)	Material	Design	Insulation	Shape	Colour	Length	Qty.
2.5	Copper	Single core	PVC	Round	Grey	1.5 m	2
2.5	Copper	Single core	PVC	Round	Red	1.5 m	1
2.5	Copper	Single core	PVC	Round	Black	1.5 m	1

Table 2: Cable type overview

4.4. LUGS/TERMINALS

All cables shall be delivered to SEC with the terminal lugs as following:

4.4.1. The terminals /lugs shall be Tin plated electrolytic copper as per ASTMb545.

4.4.2. All terminal lugs should be insulated with polycarbonate or similar material, self-extinguishing material.

4.4.3. All terminal lugs shall be compiled with SEC specification (12-SDMS-02) latest revision.

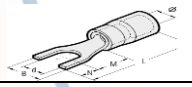
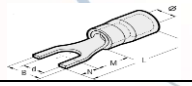
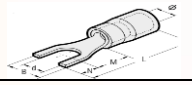
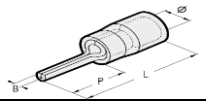
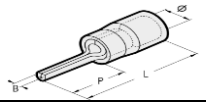
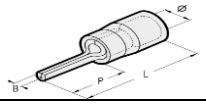
Lugs/terminals	Material	Insulation	Cond. Size(mm2)	Colour	Qty	Dimensions (B&d/p)mm	Diagram
Fork/Spade	Copper tin plated	Polycarbonate	2.5	Red	1	5.5 & 3.2	
Fork/Spade	Copper tin plated	Polycarbonate	2.5	Black	1	5.5 & 3.2	
Fork/Spade	Copper tin plated	Polycarbonate	2.5	yellow	2	5.5 & 3.2	
Pin	Copper tin plated	Polycarbonate	2.5	Red	1	2.7 & 9.8	
Pin	Copper tin plated	Polycarbonate	2.5	Black	1	2.7 &9.8	
Pin	Copper tin plated	Polycarbonate	2.5	yellow	4	2.7 & 9.8	

Table 3: Lugs/Terminals type overview

4.5. INSULATION

4.5.1. The nominal minimum insulation thickness of control cables shall be according to the relevant standard. The average insulation thickness shall not be less than the specified nominal value.

4.5.2. The minimum thickness of the insulation at any point shall not fall below the nominal value by more than 0.1 mm + 10% of the specified nominal value.

4.5.3. Inner covering in control cables shall be according to the relevant standard.

4.5.4. Thickness in control cables shall be according to the relevant standard.

4.6. FABRICATION

All cables shall be free of material and manufacturing defects, which would prevent it from meeting the requirements of this Specification.

4.7. MARKING

The jacket for all cables shall be marked by embossing at intervals not exceeding one meter with the following minimum information:

4.7.1. The manufacturer's name (in English, Arabic or trademark)

4.7.2. Voltage designation (in English)

4.7.3. Type of insulation

4.7.4. Conductor size and material (in English and Arabic)

4.7.5. Year of manufacture (in English and Arabic)

4.7.6. Cumulative length at every one meter with the highest length mark on the outer end of the cable.

4.7.7. All cables shall be marked with "Property of Saudi Electricity Company" in both Arabic and English.

4.7.8. All marking/numbering shall be indelible, marking by matrix print shall not be acceptable.

5. WIRE CONNECTION ARRANGEMENT

5.1. CONNECTION A TYPE

5.1.1. The A type ECB has 3 terminals (**S1**, **S2** and **NC**). S1 & S2 are for 230V and NC for Smart meter connection. The connections are shown in the following diagrams

a. DRAWING No. SEC/ECBCONTROLCABLE-S-01

b. DRAWING No. SEC/ECBCONTROLCABLE-S-02

c. DRAWING No. SEC/ECBCONTROLCABLE-S-03

d. DRAWING No. SEC/ECBCONTROLCABLE-S-04

5.2. CONNECTION B TYPE

5.2.1. The B type ECB has 4 terminals (**S1**, **S2** and **NC**, and **C**). S1 & S2 are for 230V and NC and C are for Smart meter connections. The connections are shown in the following diagrams

a. DRAWING No. SEC/ECBCONTROLCABLE-S-05

b. DRAWING No. SEC/ECBCONTROLCABLE-S-06

c. DRAWING No. SEC/ECBCONTROLCABLE-S-07

d. DRAWING No. SEC/ECBCONTROLCABLE-S-08

6. TESTS

6.1. GENERAL

6.1.1. All cables shall be tested in accordance with the latest standards and as specified herein. Supplier shall provide all test results for review and acceptance by SEC.

6.1.2. The full range of Routine, Sample and Type tests specified in IEC 60502-1.

6.1.3. Routine and/or special tests shall be carried out in the supplier's factory. Type test report/certificate from SEC approved independent testing laboratory shall be submitted to SEC.

6.2. ROUTINE TESTS

The following routine tests shall be carried out on all finished cables:

6.2.1. ELECTRICAL RESISTANCE OF CONDUCTORS

Resistance values shall be in accordance with IEC 60228.

6.2.2. AC VOLTAGE TEST

Cable shall be tested for 5 minutes at the following voltages:

a. Phase to ground = 3.5kV for single core cable

6.2.3. SAMPLE TESTS

Conductor Examination shall be in accordance with IEC 60228.

Dimensional Check shall be in accordance with IEC 60502-1, clauses listed below:

a. For insulation, clause 4.
b. For outer sheath, clause 12.3

6.3. TYPE TESTS

Complete tests (electrical and non-electrical) shall be carried out as per the relevant IEC Standards.

7. PACKING AND SHIPPING

In addition to the applicable items per 01-SDMS-01, packing shall be matching with the new requirements and usage of cables.
The items shall be packed in a box/envelope as a complete unit and shall be delivered as mentioned in table 2 and table 3.

8. GUARANTEE

The Supplier shall guarantee the cables against all defects arising out of faulty design or workmanship, or of defective material for a period of five (5) years from the date of delivery.

9. SUBMITTALS

Submittals required with the tender:

a. The supplier shall complete and return one copy of the attached Data Schedule for every type of cable offered b. Guaranteed Ex-works delivery date
c. Type test certificates
d. Dimensional cross-sectional drawings of each cable and cable drum along with technical data and catalogs shall be submitted by the supplier to facilitate the evaluation of the offer

Submittals required following the award of contract:

a. Details of manufacturing and test programs
b. Factory test reports

All of the above required shall be in hard and soft copy.

10.TECHNICAL DATA SCHEDULE

SEC Inquiry No: Item No:

No	Description	SEC Specified Values	Vendor proposed values**
1	Reference manufacturing standard	IEC 60502/IEC 60227-7	
2	Max. permissible continuous conductor temperature	90°C	
3	Max. Permissible continuous temp. of outer sheath (°C)	*	
4	Rated voltage (control)	750/1000 V	
5	No. of cores	As per Table 2	
6	Conductor material	CU	
7	Shape of conductor	Round	
8	Conductor cross-section (mm^2)	*	
9	Approximate diameter of conductor (mm)	*	
10	No. of strands of conductor	As per IEC	
11	Insulation material	PVC	
12	Nominal thickness	As per IEC	
13	Diameter over insulation	*	
14	Filler material	*	
15	Outer sheath material	PVC	
16	Thickness of outer sheath	As per IEC	
17	Color of outer sheath	Black/Red/Yellow/Gray	
18	Marking embossed as specification	Yes	
19	Overall diameter of the cable	*	
20	Conductor DC resistance at 20°C (ohms/km)	*	
21	Conductor AC resistance at operating temp. (ohms/km)	*	
22	Inductance (Mh/km)	*	
23	Inductive reactance (ohms/km)	*	
24	Conductor impedance at maximum continuous operating temperature (ohms/km)	*	
25	Capacitance	*	
26	Short Circuit Rating of Cable Based on maximum Conductor Operating Temp. 1 sec. (kA)	*	

Table 4: Control cables links with terminal lugs– Design and Construction Requirements

SEC Inquiry No: Item No:

No	Description	SEC Specified	Vendor proposed
1	Length of cable (m)	1.5 meters	
2	Dimensions (m)	*	
3	Gros weight (kg)	*	
4	Net weight (kg)	*	
5	Marking as per the Specification	Yes	

Table 5: Control cables links with terminal lugs – Packing and Shipping

SEC Inquiry No: Item No:

No	Description	SEC Specified	Vendor proposed
1	All submittals as per the Specification	Yes	

Table 6 : Control cables links with terminal lugs – Submittals

(*) – Values to be provided/proposed by the Vendor
(**) – Please provide explanation for deviations, if any

Control Cables Links with Terminal Lugs for ECB & Smart Meter

SEC Inquiry No: Item No:

g. Additional Technical Information or Features Specified by SEC

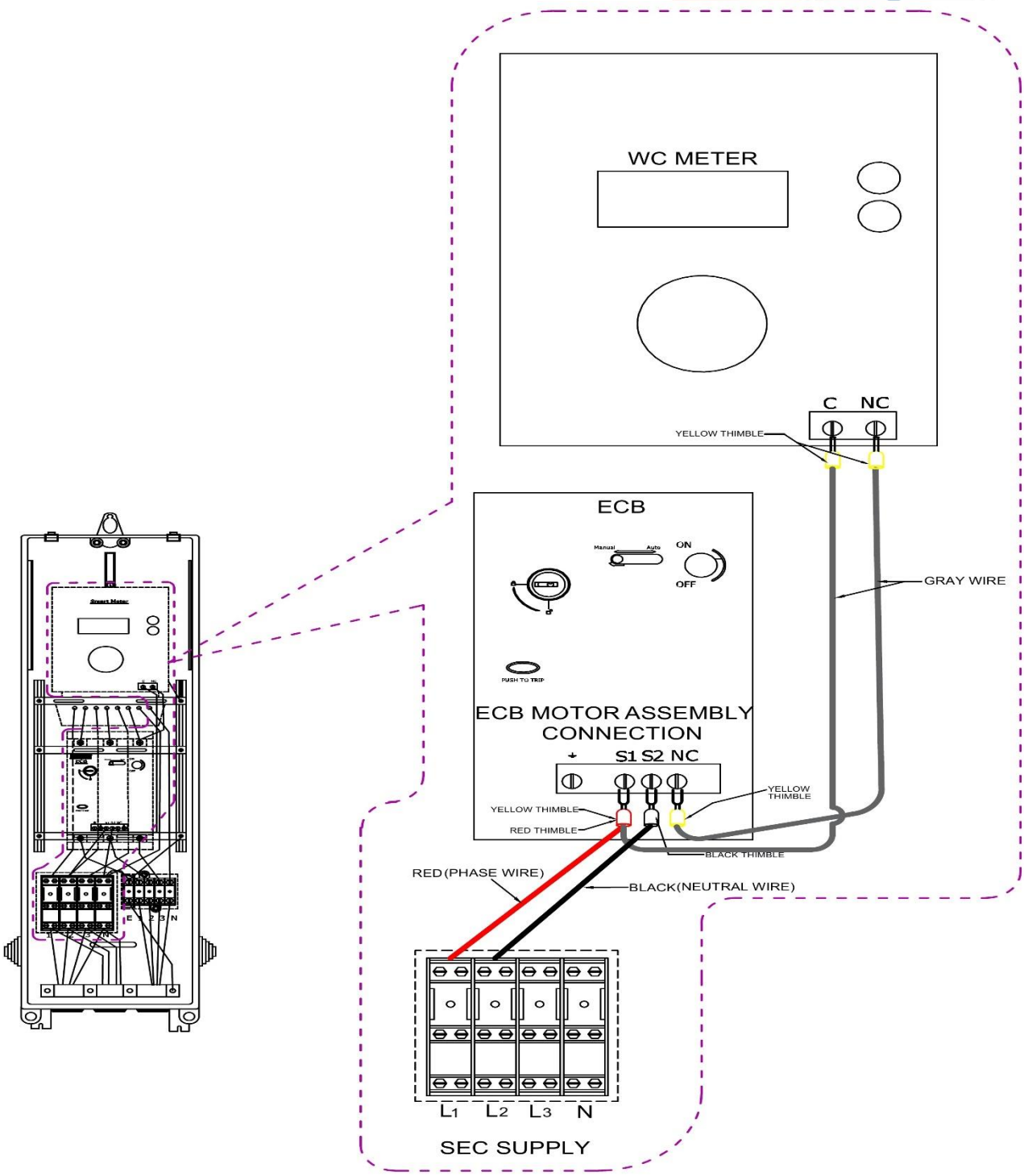
h. Additional Supplementary Data or Features Proposed by Bidder/Vendor/Supplier.

i. Other Particulars to be filled-up by the Bidder/Vendor/Supplier.

j. List of Deviations and Clauses to which exception is taken by the Bidder/Vendor/Supplier. (Use separate sheet, if necessary).

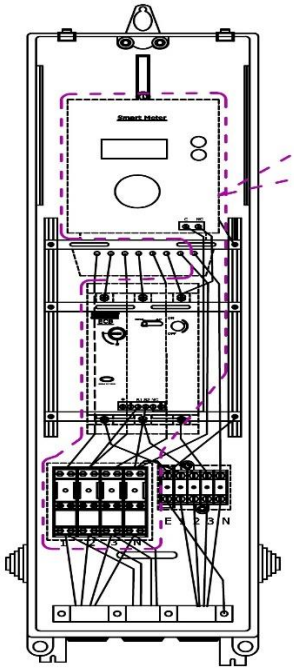
Description	Manufacturer of Material/Equipment	Vendor/Supplier
Name of Company		
Location and Office Address		
Name and Signature of Authorized Representative with Date		
Official Seal / Stamp		

11.CONNECTION DIAGRAMS



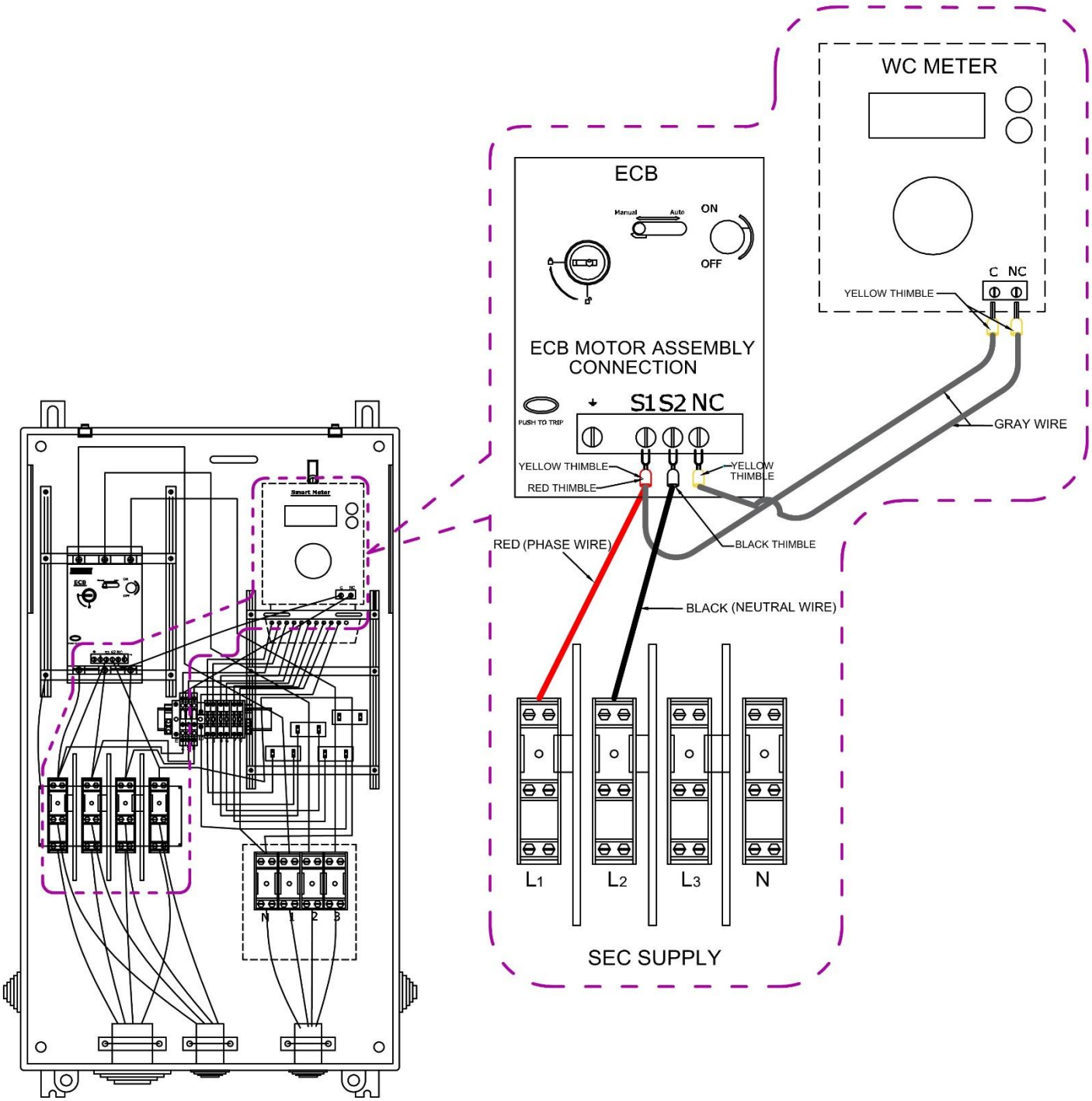
3 PHASE 4 WIRE WC METER AND ECB CONNECTION "A" TYPE ARRANGEMENT FOR 133/230V NETWORK

DRAWING No. SEC/ECBCONTROLCABLE-S-01



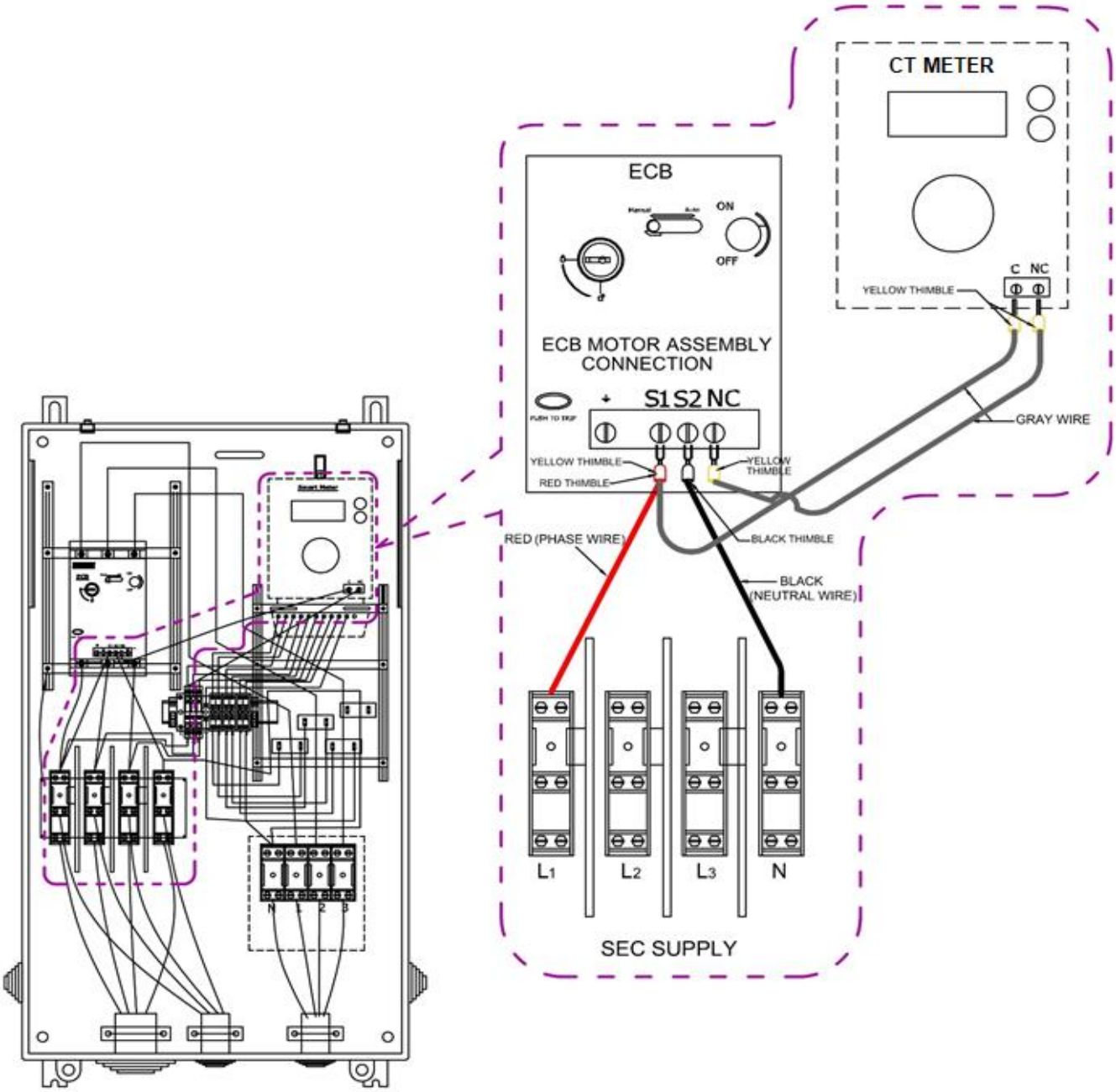
3 PHASE 4 WIRE WC METER AND ECB CONNECTION "A" TYPE ARRANGEMENT FOR 230/400V NETWORK

DRAWING No. SEC/ECBCONTROLCABLE-S 02



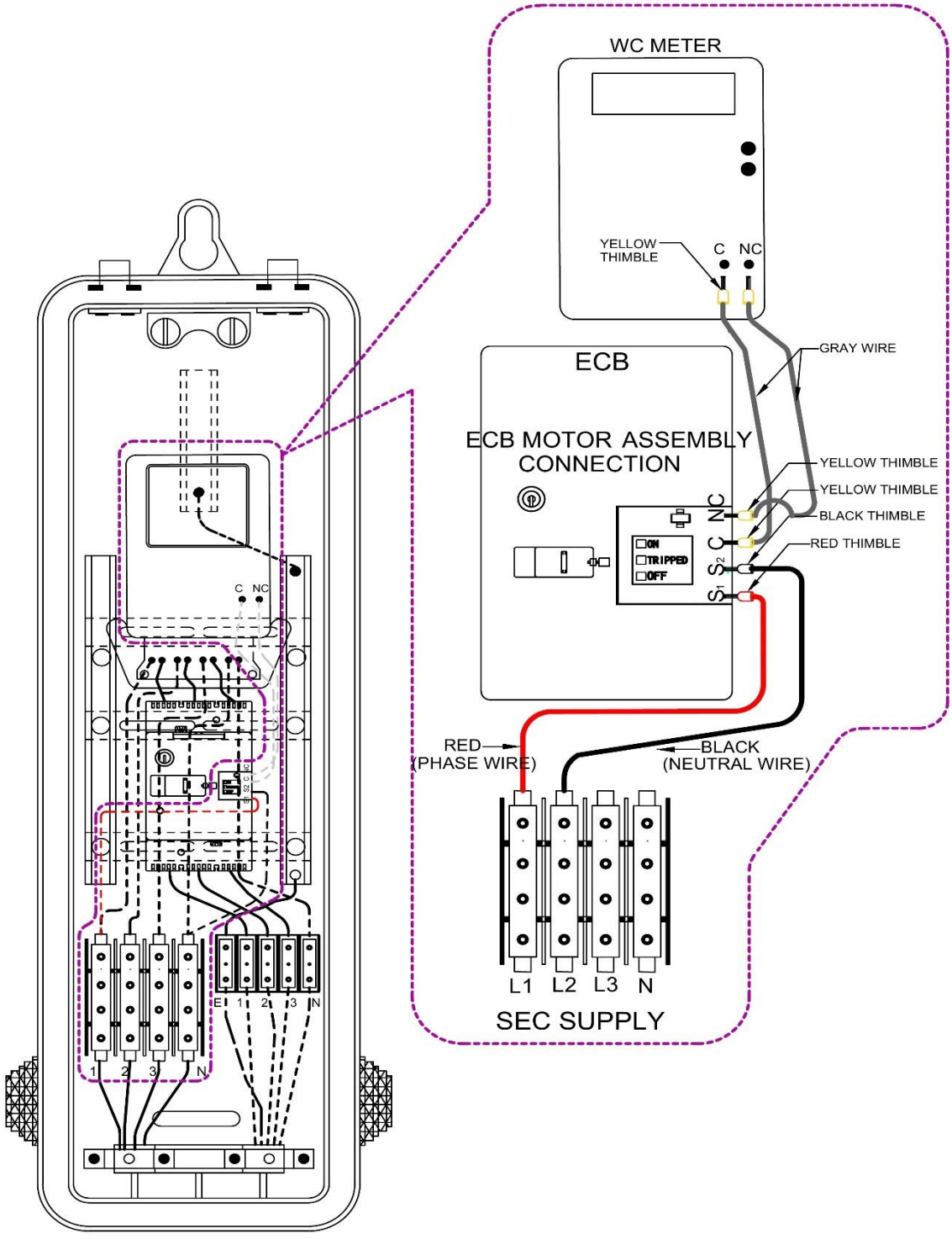
3 PHASE 4 WIRE CT OPERATED METER AND ECB CONNECTION "A" TYPE ARRANGEMENT FOR 133/230V NETWORK

DRAWING No. SEC/ECBCONTROLCABLE-S-03



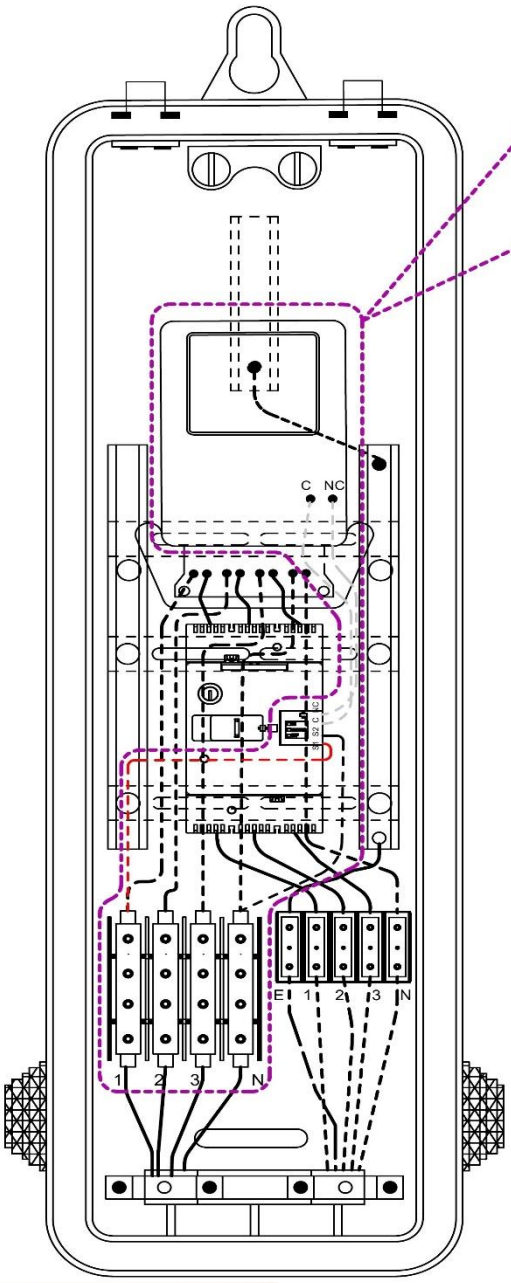
3 PHASE 4 WIRE CT OPERATED METER AND ECB CONNECTION "A" TYPE ARRANGEMENT FOR 230/400V NETWORK

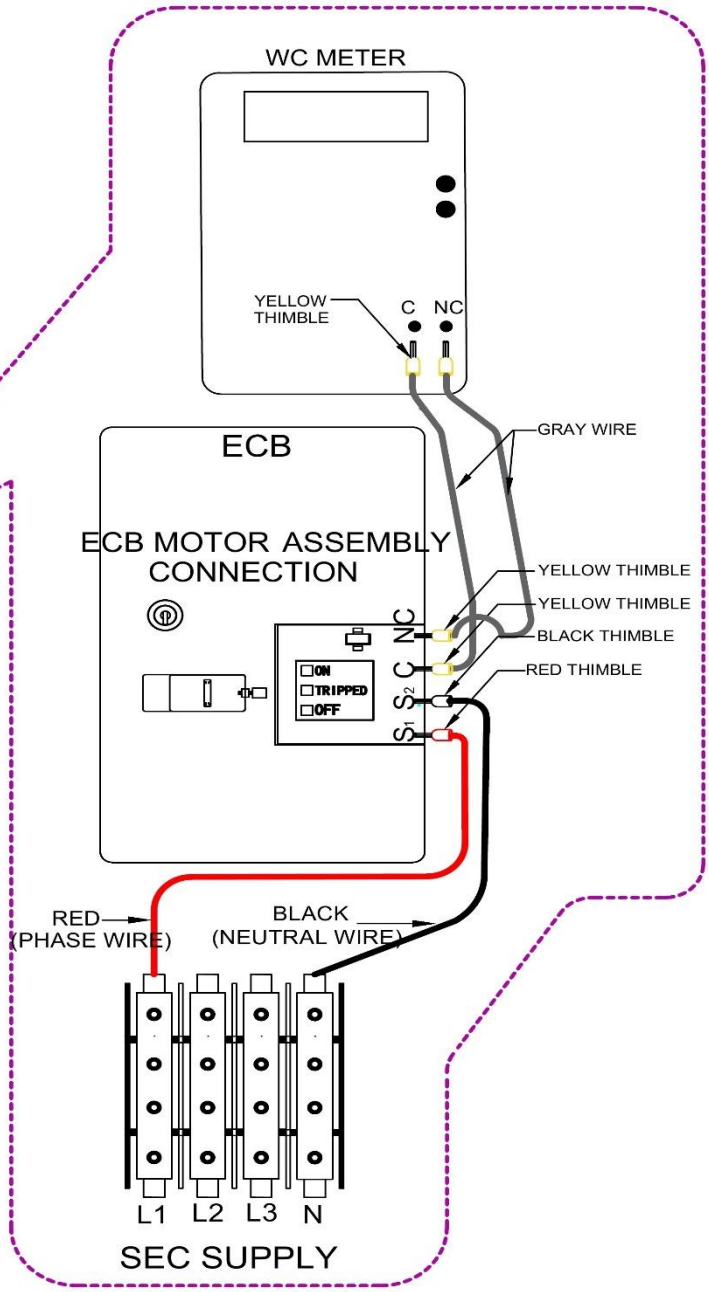
DRAWING No. SEC/ECBCONTROLCABLE-S-04



3 PHASE 4 WIRE WC METER AND ECB CONNECTION ARRANGEMENT "B" TYPE FOR 133/230V NETWORK

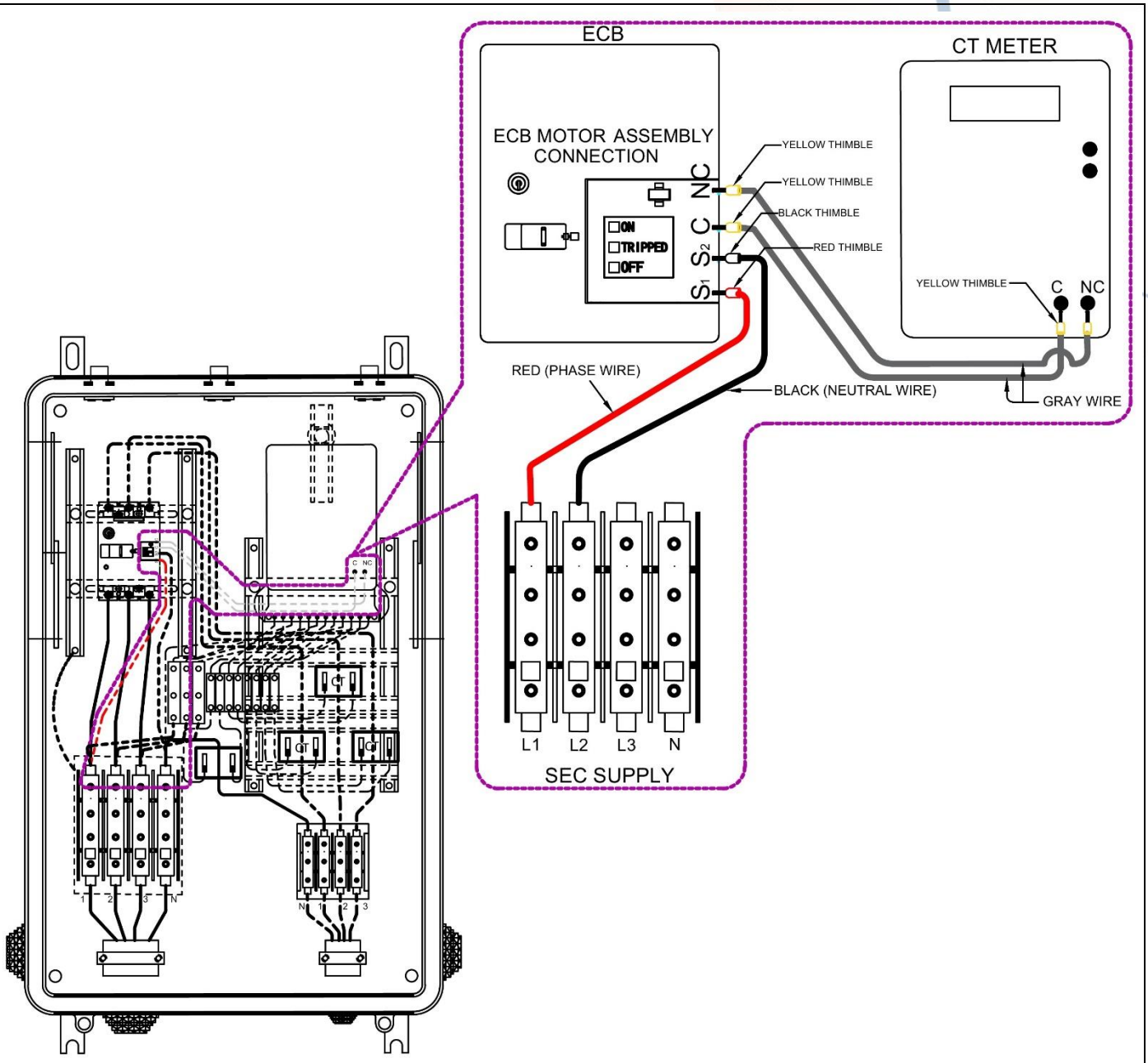
DRAWING No. SEC/ECBCONTROLCABLE-S-05





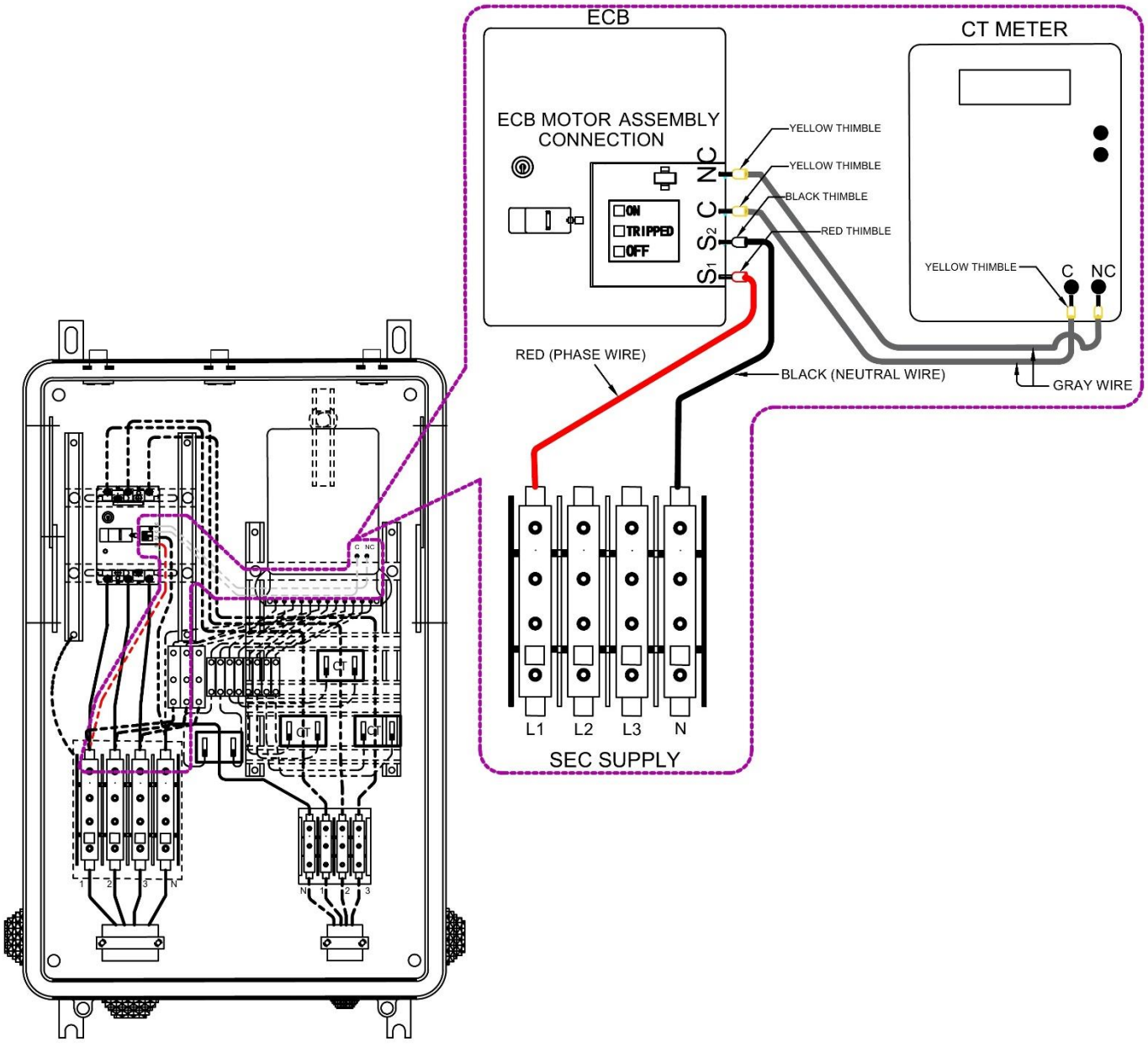
3 PHASE 4 WIRE WC METER AND ECB CONNECTION "B" TYPE ARRANGEMENT FOR 230/400V NETWORK

DRAWING No. SEC/ECBCONTROLCABLE-S-06



3 PHASE 4 WIRE CT OPERATED METER AND ECB CONNECTION "B" TYPE ARRANGEMENT FOR 133/230V NETWORK

DRAWING No. SEC/ECBCONTROLCABLE-S-07



3 PHASE 4 WIRE CT OPERATED METER AND ECB CONNECTION "B" TYPE ARRANGEMENT FOR 230/400V NETWORK

DRAWING No. SEC/ECBCONTROLCABLE-S-08