Project: MDL3 PCS

ADDITIONAL NOTES:

N1. AS PART OF THE TRACEABILITY REQUIREMENT (G4), VENDOR MUST MEASURE AND RECORD BY SERIAL NUMBER THE FOLLOWING ELECTRICAL SPECIFICATIONS FOR 100% OF ASSEMBLIES (TOTAL 5 DATA POINTS PER ASSEMBLY):
- PRIMARY MAGNETIZING INDUCTANCE
- PRIMARY LEAKAGE INDUCTANCE
- PRIMARY DCR
- IMPULSE LAPLACIAN VALUE X2

ELECTRICAL SPECIFICATIONS

100% OF ASSEMBLIES MUST BE TESTED FOR THE FOLLOWING SPECIFICATIONS. ASSEMBLY MUST BE ALLOWED TO COOL TO ROOM TEMPERATURE (AFTER SOLDERING, FOR EXAMPLE) BEFORE MEASUREMENT.

E1. HV WINDING HIPOT:
- TEST BETWEEN (HV WINDING) AND (POTTING CUP, LV BUS BARS, AND ALL CORES)
- VOLTAGE = 4.3 kV DC
- MEASUREMENT DURING RAMP = OFF
- LEAKAGE CURRENT MAX = 6.0 μA
- RAMP = 5 SEC
- DWELL = 1 SEC
- TEST = 1 SEC
- ARC SENSE = OFF

E2. LV BUS BAR HIPOT:
- TEST BETWEEN (LV BUS BARS) AND (POTTING CUP AND ALL CORES)
- VOLTAGE = 100 V DC
- MEASUREMENT DURING RAMP = OFF
- LEAKAGE CURRENT MAX = 6.0 μA
- RAMP = 5 SEC
- DWELL = 1 SEC
- TEST = 1 SEC
- ARC SENSE = OFF

E3. INDUCTANCES @ 100 kHz, 0.1 V:
- MEASURE BETWEEN TERMINALS P11 AND P12
- PRIMARY MAGNETIZING = 3.0 to 6.9 mH
- PRIMARY LEAKAGE (TERMINALS A, B, C SHORTED) = 120 ± 5 μH ← SC-01

E4. HOT INDUCTANCE @ 100 kHz, 0.1 V:
- DETAILS ON SHEET 5
- 100% TEST IN PROTOTYPE BUILDS
- TEST 10 PER BATCH IN MASS PRODUCTION

E5. PRIMARY DCR:
- DETAILS ON SHEET 5

E6. IMPULSE:
- TRANSFORMER TEST: PRIMARY WINDING AT 4 kV
- INDUCTOR TEST: PRIMARY WINDING AT 3 kV WITH THREE SECONDARY TERMINALS SHORTED
- < 10% AREA SIZE DIFFERENCE PERMITTED BETWEEN TEST WAVEFORMS AND GOLDEN WAVEFORMS
- MEASURE AND RECORD LAPLACIAN VALUES (FOR DETECTION OF CORONA DISCHARGE)

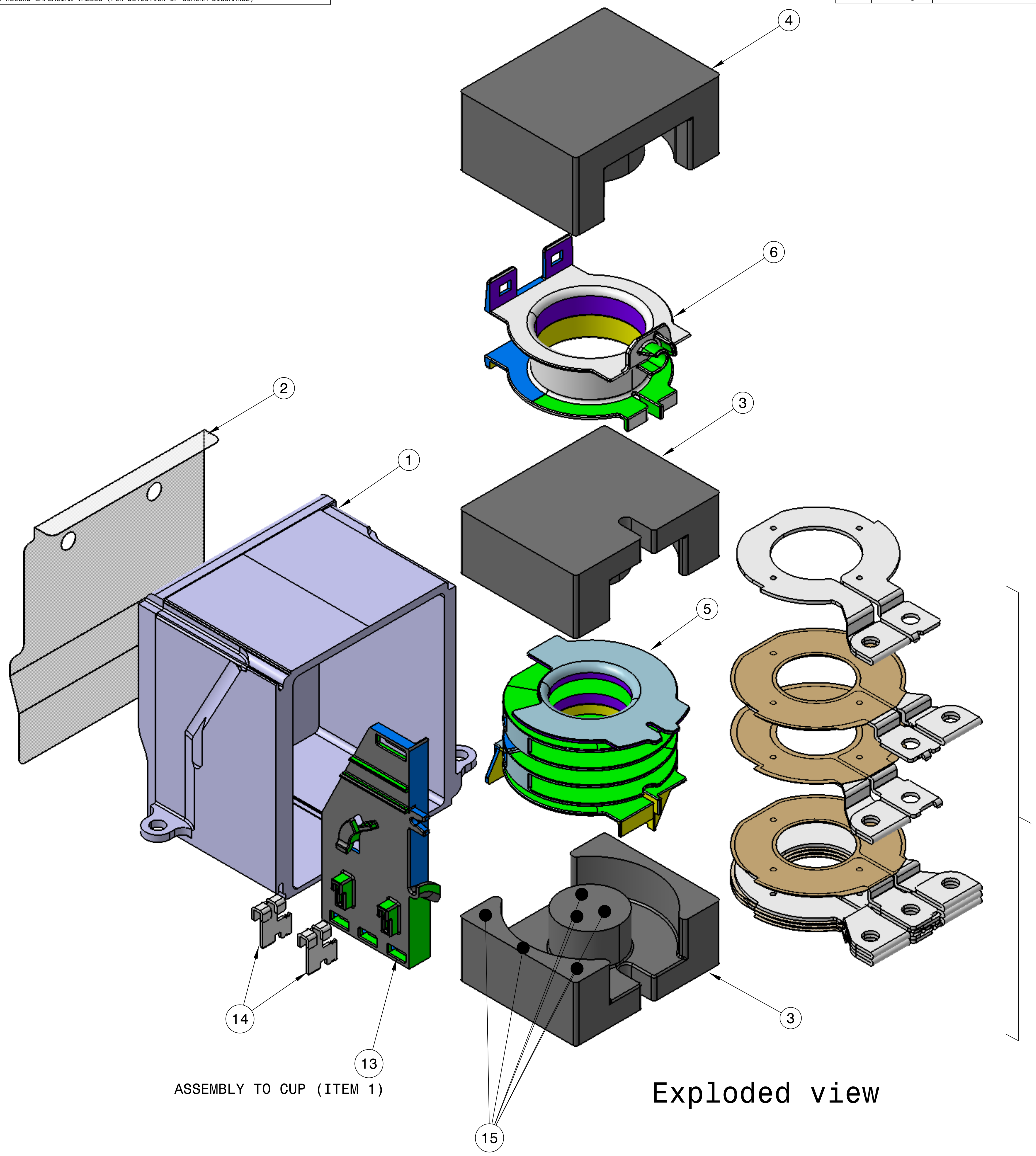
ITEM 7: NOT DEPICTED

BILL OF MATERIALS

NOTE: NON-EACH QUANTITIES ARE FOR REFERENCE ONLY.

ITEM	QTY.	TESLA P/N	TESLA PART TITLE	MANUFACTURER PART NAME	MATERIAL NUMBER
1	1	1137873-00-B	ASY,POTTING CUP,XFMR,DCDC,PCS,MDL3		
2	1	1138257-00-A	INSULATOR,CUP,XFMR,DCDC,PCS,MDL3		
3	2	1102870-00-C	CORE,EQ,50,19,20CNTR,PWR FER	DMEGC ECW50F DMR95E	
4	1	1102868-00-D	CORE,EQ,50,24,26CNTR,PWR FER,3 GAP	DMEGC ECW50G GAP DMR95E	
5	1	1099977-00-D	BOBBIN,XFMR,DCDC,PCS,MDL3		
6	1	1100035-00-E	BOBBIN,INDCTR,XFMR,DCDC,PCS,MDL3		
7	4200 mm	1107689-00-A	WIRE,LITZ,550/44AWG,MW79,ETFE,3L	NEW ENGLAND WIRE TECH. W17T2.0E010MW9S550A	
				RUBADUE TxxL550/44Txxx-2(MW79)	
8	2	1097290-00-F	BUS BAR1,LV,XFMR,DCDC,PCS,MDL3		
9	2	1103874-00-D	BUS BAR2,LV,XFMR,DCDC,PCS,MDL3		
10	2	1103875-00-D	BUS BAR3,LV,XFMR,DCDC,PCS,MDL3		
11	2	1103876-00-D	BUS BAR4,LV,XFMR,DCDC,PCS,MDL3		
12	6	1108354-00-B	INSUL,BUS BARS,XFMR,DCDC,PCS,MDL3		
13	1	1137880-00-B	HV GUIDE,XFMR,DCDC,PCS,MDL3		
14	2	1106979-00-E	TERM,0.8,BLADE,HV,DCDC,PCS,MDL3		
15	0.3 mL	1012263-00-A	ADH,EPOXY,DLCTRC,1-PART,120C CURE	HENKEL HYSOL E-214HP	
16	50 g	1097734-00-A	ENCPSLNT,DLCTRC,SI,4W/mK,50A,ASIA,A	LORD THERMOSET SC-324 A/B XLW (CHINA)	3025583
17	50 g	1097736-00-A	ENCPSLNT,DLCTRC,SI,4W/mK,50A,ASIA,2B		3025585

DATE	REV	DESCRIPTION	DRN	APPD
2018-01-05	01	PRECEDED BY 1138081-00-B; POTTING CHANGED TO CHINA-SOURCED MATERIAL; ADDED DIMENSION SHEET 4 GRID G5	BC	

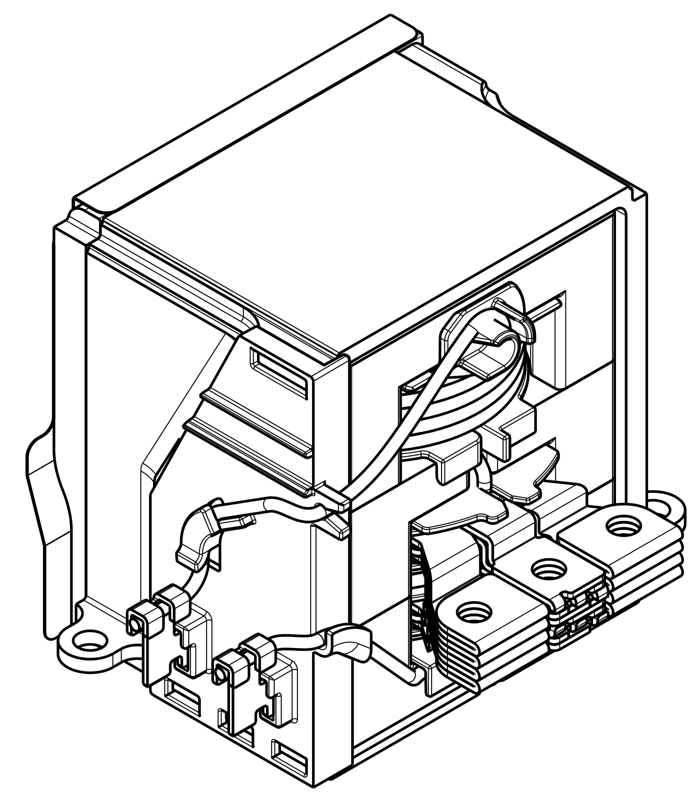


2X (8), (9), (10), AND (11)
6X (12)
VACUUM VARNISH AND INSERT INTO TRANSFORMER BOBBIN (ITEM 6)

ASSEMBLY TO CUP (ITEM 1)

ON SIX CORE LEGS AND TWO UNGAPPED CENTERPOSTS

Exploded view



Isometric view
Scale: 1:1

REGULATORY COMPLIANCES

R1. ALL MATERIALS AND COATINGS MUST COMPLY WITH ALL APPLICABLE INTERNATIONAL ENVIRONMENTAL RELATED REGULATIONS, INCLUDING BUT NOT LIMITED TO EU DIRECTIVES WVTA, ELV, RRR, RoHS, WEEE, REACH AND BATTERY DIRECTIVE 2006/66/EC, WHICH ARE DESCRIBED IN DETAIL AT THE GADSL LIST IN ITS LATEST VERSION AT THE TIME OF USE (http://www.gadsl.org). REFER TO TESLA SPEC DOC# BMS-0000147 FOR DETAIL.

R2. THIS COMPONENT HAS BEEN DESIGNED TO COMPLY WITH A REGULATORY REQUIREMENT. CONTACT TESLA TYPE APPROVAL BEFORE UNDERTAKING DESIGN MODIFICATIONS. A COMPONENT WHICH EMBODIES ALL REQUIREMENTS STATED ON THIS DRAWING WILL COMPLY WITH REGULATORY REQUIREMENTS.

R3. FOR A COMPREHENSIVE LIST OF ALL SUPPLIER QUALITY ASSURANCE REQUIREMENTS, REFERENCE THE SUPPLIER HANDBOOK BMS-0000051.

GENERAL NOTES

G1. THE MASTER SOURCE OF INFORMATION FOR THIS DOCUMENT IS A COMPUTER DATABASE. FOR BILL OF MATERIALS, REFER TO ITEM IN TESLA MOTORS PLM TOOL. THE ITEM LIST PROVIDED ON THIS DRAWING IS FOR REFERENCE ONLY.

G2. 3D CAD DATA SUPPLIED IS TO BE USED TO PRODUCE PRODUCTION TOOLING AND FOR INSPECTION.

G3. PRINTED DOCUMENT IS UNCONTROLLED - DOCUMENT OBSOLETE WHEN PRINTED.

(G4) THIS ASSEMBLY SHALL COMPLY WITH GRADE "A" BATCH TRACEABILITY REQUIREMENTS PER TESLA MOTORS SPECIFICATION BMS-0000151.

(G5) ASSEMBLY TO BE LABELED IN THE LOCATION SPECIFIED PER TESLA PART LABELING SPECIFICATION BMS-0000007.

G6. (BLANK)

G7. TOOLING CONSTRUCTED TO FABRICATE THIS COMPONENT SHALL BE PROPERTY OF TESLA MOTORS INC. AND SHALL BE PERMANENTLY MARKED WITH "TESLA INC.", TOOLING PART NUMBER AND DATE.

DIMENSIONAL NOTES

D1. INTERPRET SPECIFICATIONS PER GEOMETRIC DIMENSIONING & TOLERANCING ASME Y14.5-2009

D2. CAD UNITS ARE MILLIMETERS AT 1:1.

D3. DIMENSIONS APPLY AFTER FINISHING OPERATIONS, UNLESS OTHERWISE SPECIFIED.

D4. HARDCOPY IS NOT TO SCALE. DO NOT SCALE IMAGES.

D5. DEBURR AND BREAK ALL SHARP EDGES 0.4 mm UNLESS OTHERWISE SPECIFIED.

D6. UNSUPPLIED BASIC DIMENSIONS MAY BE EXTRACTED FROM 3D CAD.

D7. TOLERANCES UNLESS OTHERWISE NOTED:

⌓ 2 A B C	⌒ 2 A B C	⌀SIZE ±0.25 ⌖ ⌀2 A B C	SIZE ±0.25 ⌖ 2 A B C
SURFACES WITH BLENDED UNIFORMITY	ALL TRIM EDGES	CIRCULAR FEATURES	NON-CIRCULAR FEATURES

MATERIAL SPECIFICATIONS

M1. MATERIAL: SEE BOM

M2. FINISH: NONE

M3. MANUFACTURING PROCESS: VARIOUS

M4. WORKMANSHIP STANDARD DOCUMENT BMS-0000026 APPLIES.

M5. NO CHANGES SHALL BE MADE TO RAW MATERIALS OR ASSOCIATED PACKAGING AND PROCESSING MATERIALS AND CHEMICALS WITHOUT THE PRIOR WRITTEN CONSENT OF TESLA MOTORS.

M6. CLEANLINESS: ALL SURFACES TO BE FREE OF ANY OILS, FLUIDS, OR OTHER CONTAMINANTS.

CAD FILE NAME	CAD FILE VERSION
--	--

DRAWN BY	BENJAMIN CHEN	DATE	2018-01-05

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MATERIAL: SEE BOM

FINISH: NONE

EST. MASS (g): 797

THIRD ANGLE PROJECTION

DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.

SCALE: 1:1

SHEET SIZE: C

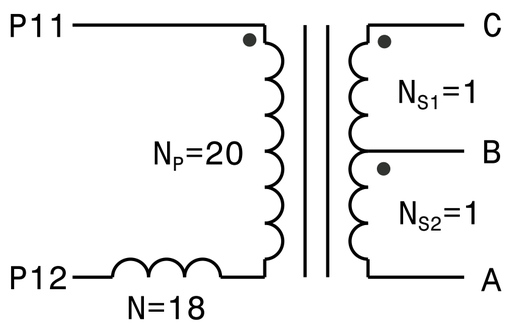
ITEM NAME: ASY,XFMR,DCDC,PCS,MDL3

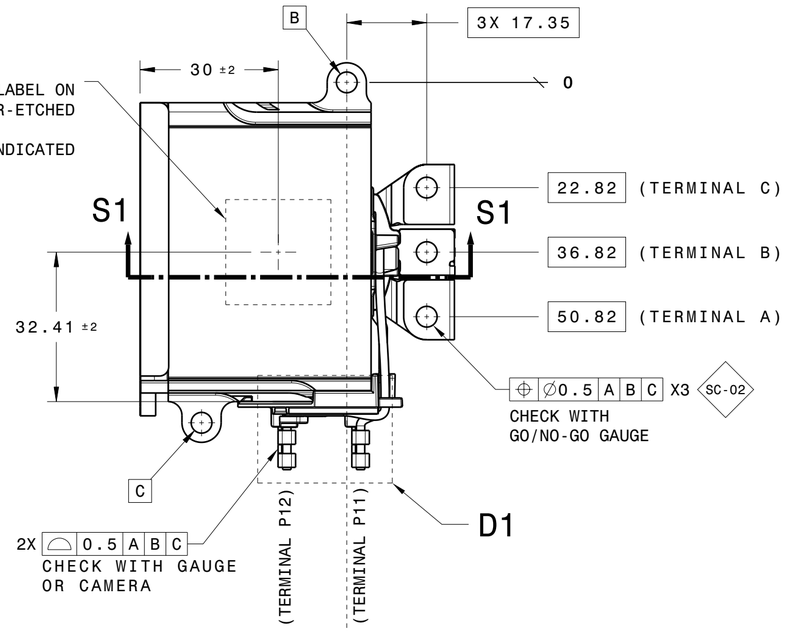
ITEM NUMBER: 1138081-00-C

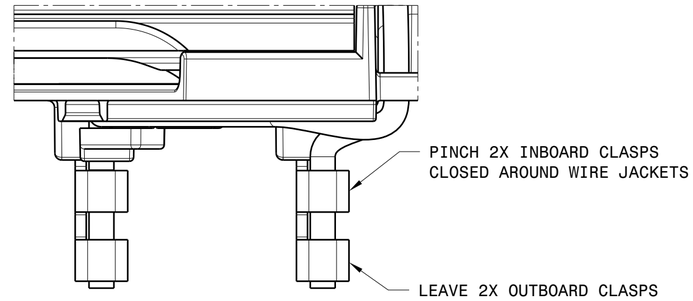
REVISION: 01

C ASY,XFMR,DCDC,PCS,MDL3 REV 01 PDM VERSION 01.0

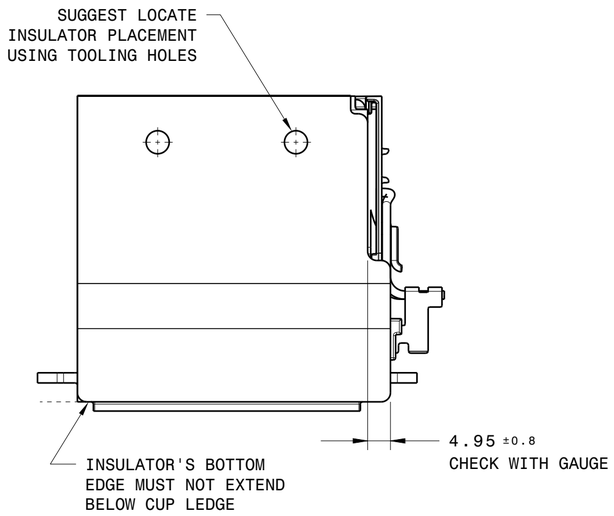
ASSEMBLY SPECIFICATIONS



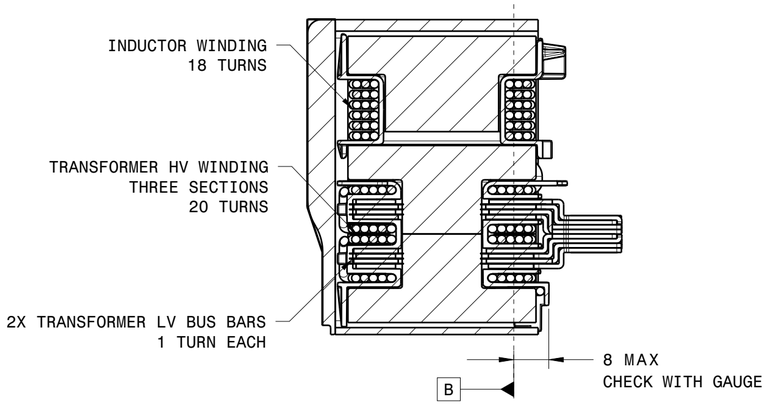




Detail D1
Scale: 3:1



CHECK FOR INSULATOR PRESENCE AT END-OF-LINE VIA RESISTANCE MEASUREMENT TO CUP



Section view S1-S1

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ITEM NAME: ASY,XFMR,DCDC,PCS,MDL3

ITEM NUMBER	REVISION	SHEET
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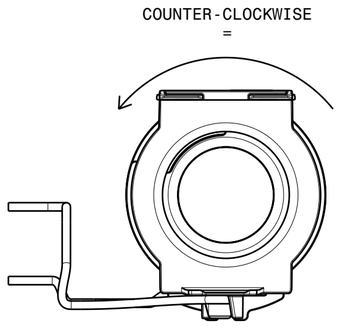
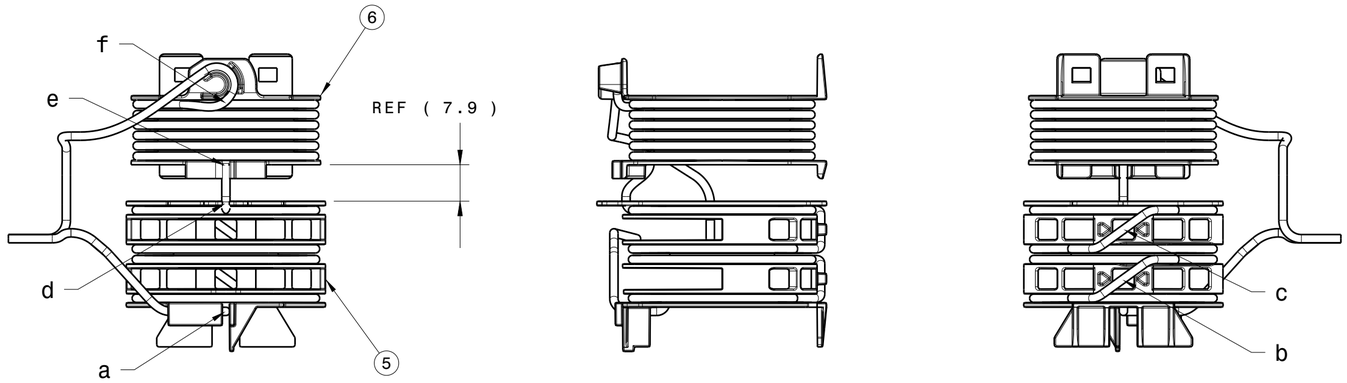
C | ASY,XFMR,DCDC,PCS,MDL3 | REV 01 | PDM VERSION 01.0

WINDINGS



SECTION	START-END	TURNS	DIRECTION	NOTES
PRIMARY BOTTOM	a-b	5.5	COUNTER-CLOCKWISE	
PRIMARY MIDDLE	b-c	10		
PRIMARY TOP	c-d	4.5		
TRANSITION	d-e	N/A	N/A	
INDUCTOR	e-f	18	COUNTER-CLOCKWISE	3 LAYERS, EACH 6 TURNS

NOTE:
-ENFORCE 7.9 mm SPACING BETWEEN BOBBINS ON WINDING MANDREL
-LEAVE SUFFICIENT WIRE LENGTH AT BEGINNING AND END FOR TERMINATIONS



C | ASY,XFMR,DCDC,PCS,MDL3 | REV 01 | PDM VERSION 01.0

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ITEM NAME
ASY,XFMR,DCDC,PCS,MDL3

ITEM NUMBER	REVISION	SHEET
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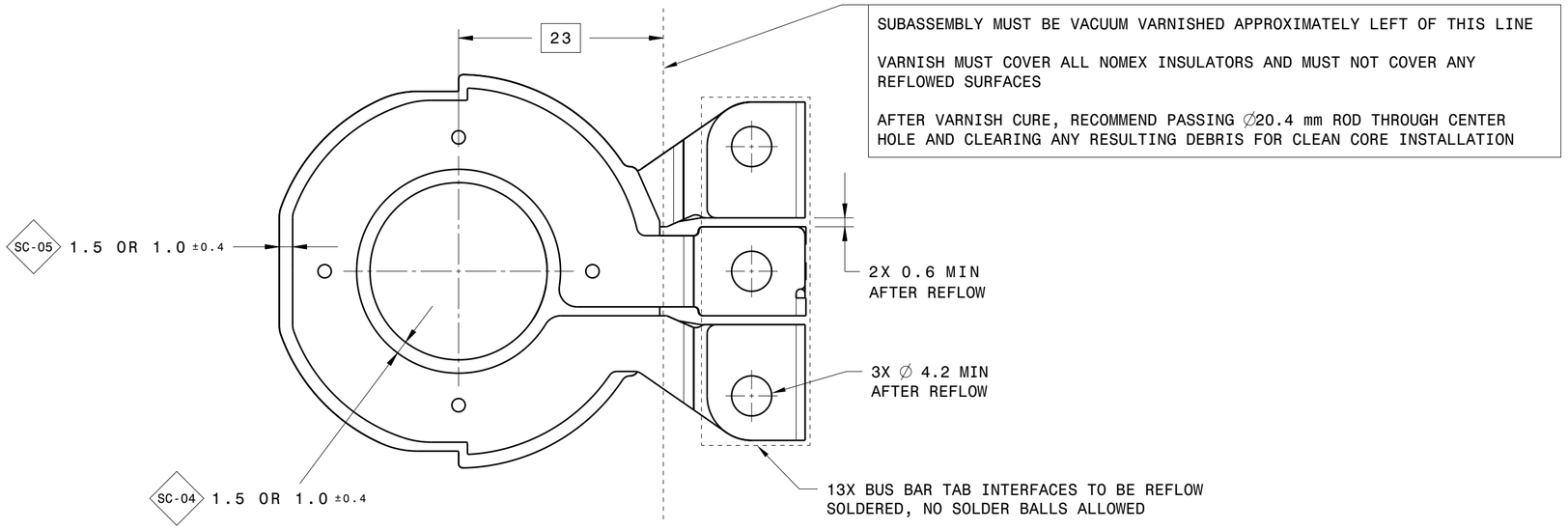
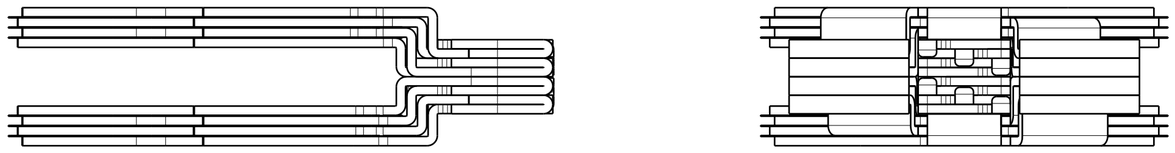
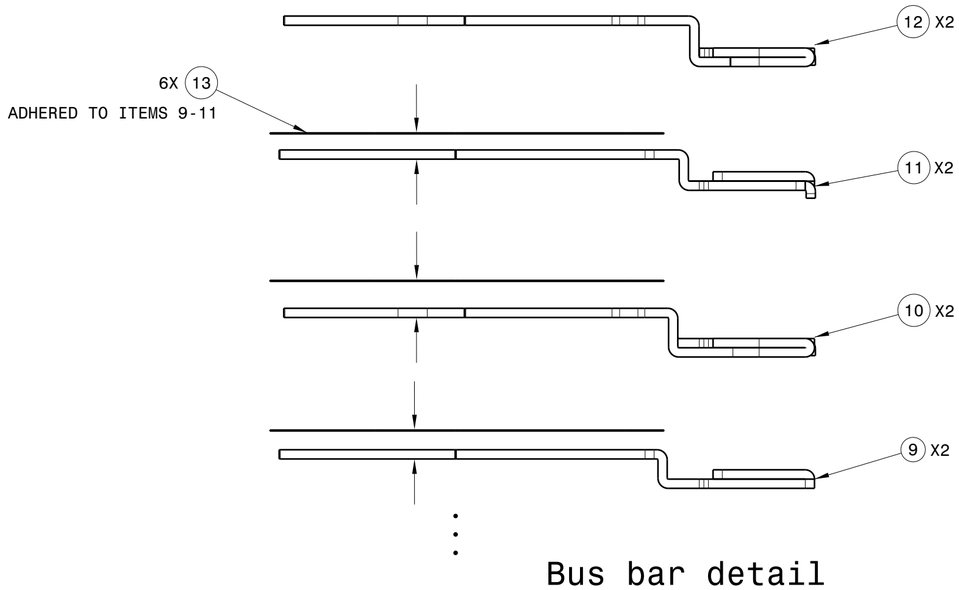
BUS BAR SUBASSEMBLY







Bus bar detail
Half-subassembly
Scale: 2:1

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ITEM NAME		
ASY,XFMR,DCDC,PCS,MDL3		
ITEM NUMBER	REVISION	SHEET
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C | ASY,XFMR,DCDC,PCS,MDL3 | REV 01 | PDM VERSION 01.0

PROCESS INSTRUCTIONS

ASSEMBLY STEPS:
-WIND TRANSFORMER BOBBIN AND INDUCTOR BOBBIN (DETAILS ON SHEET 3)
-BUILD SECONDARY BUS BAR SUBASSEMBLY (DETAILS ON SHEET 4)
-INSERT BUS BAR SUBASSEMBLY INTO TRANSFORMER BOBBIN; ENSURE FULL INSERTION
-EPOXY AND CLAMP CORES TOGETHER AROUND BOBBINS
-CURE EPOXY AT HIGH TEMPEARTURE (RECOMMEND 2 HOUR BAKE IN OVEN PRE-HEATED TO 125°C)
  -OVEN MUST GUARANTEE FERRITE TEMPERATURE OF ≥ 120°C FOR ≥ 40 MINUTES REGARDLESS OF OVEN CONTENTS OR LOCATION IN OVEN
  -ALLOW ASSEMBLY TO COOL NATURALLY (NO FORCED CONVECTION) TO PREVENT CORE CRACKING
-ALLOW ASSEMBLY TO COME TO ROOM TEMPERATURE
-SEAL CUP WITH RTV (DETAILS ON SHEET 5)
-INJECT POTTING INTO CUP; WET INSIDE TOP AND BOTTOM WALLS BY TILTING CUP
-PLACE TRANSFORMER ASSEMBLY INTO CUP
-FIXTURE WET ASSEMBLY TO ENSURE CORRECT POSITIONING
-CURE POTTING AT HIGH TEMPERATURE (RECOMMEND 100 MINUTES BAKE IN OVEN PRE-HEATED TO 135°C)
  -OVEN MUST GUARANTEE 1) FERRITE CENTERPOST REACHES 125°C WITHIN 40 MINUTES AND 2) FERRITE CENTERPOST TEMPERATURE OF ≥ 125°C FOR ≥ 60 MINUTES REGARDLESS OF OVEN CONTENTS OR LOCATION IN OVEN
-ADHERE HV GUIDE WITH TERMINALS ONTO CUP USING EPOXY (ITEM 15)
  -BAKE TO CURE FOR 60 MINUTES AT 135°C
-INSTALL HV WIRES INTO HV GUIDE
-STRIP WIRES AND INSTALL INTO TERMINALS, PINCHING WIRE CLASPS CLOSED
-SOLDER DIP WIRE ENDS
-ALLOW ASSEMBLY TO COME TO ROOM TEMPERATURE
-CHECK FOR CUP INSULATOR PRESENCE BY RESISTANCE MEASUREMENT TO POTTING CUP
-TEST HIPOT E1 (DETAILS BELOW) AND E2, INDUCTANCE E3, AND PRIMARY DCR E5 (DETAILS BELOW), AND IMPULSE E6, AND RECORD BY SERIAL NUMBER
-TEST HOT INDUCTANCE E4 IF APPLICABLE (DETAILS BELOW)

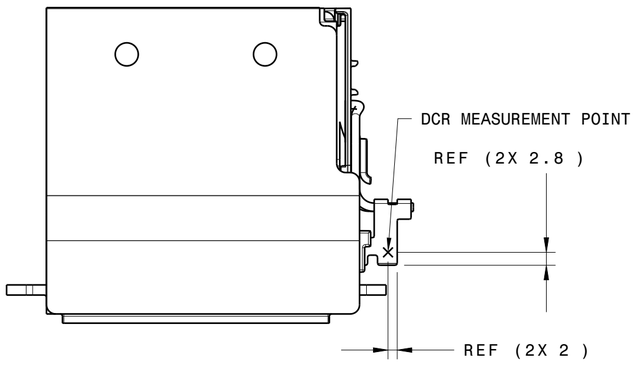
HIPOT TEST (E1):
-FOR PRIMARY-TO-CORES TEST, ACCESS CORES BY PIERCING THROUGH POTTING WITH SHARP PROBE TIP IF NECESSARY

HOT INDUCTANCE (E4):
-PRE-HEAT OVEN TO 135°C
-BAKE FINISHED ASSEMBLY FOR 40 MINUTES
-REMOVE ASSEMBLY FROM OVEN
-IMMEDIATELY MEASURE PRIMARY MAGNETIZING INDUCTANCE WHILE ASSEMBLY IS HOT
-HOT INDUCTANCE VALUE MUST BE ≥ ROOM TEMPERATURE PRIMARY MAGNETIZING INDUCTANCE
  -IF < ROOM TEMPERATURE VALUE, BATCH IS SUSPECT AND TEARDOWN IS REQUIRED TO INSPECT FOR CORE CRACKING

DCR MEASUREMENT (E5):
-PRIMARY DCR IS MEASURED FROM TERMINAL TO TERMINAL AT THE LOCATION SPECIFIED BELOW
-DCR MUST BE ≤ R_{MAX}, CALCULATED AS FOLLOWS:

$$R_{MAX} = (0.011\ \text{mOhms} \times 2) + (4200\ \text{mm} \times 1.02) \times (Z\ \text{mOhms/mm} \times 1.02),$$

WHERE Z IS THE RESISTANCE-PER-LENGTH VALUE OF THE WIRE BATCH USED TO BUILD THAT ASSEMBLY. Z MUST BE CALCULATED FOR EVERY LITZ WIRE BATCH AS FOLLOWS:
  -CUT TEST WIRE 1020 mm LENGTH FROM WIRE BATCH
  -RECORD WIRE BATCH CODE TO ASSEMBLY SERIAL NUMBER
  -SOLDER DIP 10 mm OF EACH END IN 420°C SOLDER FOR 5 SECONDS
  -MEASURE TEST WIRE DCR AT ROOM TEMPERATURE WITH MICROHMMETER SET AT 1 A
  -LET Z = BATCH TEST WIRE DCR / 1000 mm
  -IF DCR > R_{MAX}, SOLDER JOINTS MUST BE INSPECTED FOR QUALITY AND MAY BE REWORKED
-DCR MUST BE ≤ ABSOLUTE MAXIMUM OF 81.1 mOhm



C | ASY,XFMR,DCDC,PCS,MDL3 | REV 01 | PDM VERSION 01.0

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ITEM NAME		
ASY,XFMR,DCDC,PCS,MDL3		
ITEM NUMBER	REVISION	SHEET
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