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PURCHASE SPECIFICATION FOR
1085 μ F RESONANT CAPACITOR
GROUP: TRACTION ENGINEERING

P.S NO. : PS4452714

REV. NO: 00

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REVISION HISTORY SHEET

REV. NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	03.02.2021	FIRST ISSUE	--	Jamuna Rani S	Agosh Chandran

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REVISIONS 00 DT: 03.02.2021

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DATE

03.02.2021



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SPECIFICATION FOR 1085 μ F RESONANT CAPACITOR

Brief description

A 100Hz ripple voltage arise because of the single –phase powered and DC loaded system. To reduce the 100Hz DC-link ripple voltage a series resonant filter is used. This filter comprises an inductor and a capacitor bank. The series resonant circuit serves to filter out the current at double the line frequency, and is tuned to this frequency.

This document specifies a 100Hz series resonant capacitor, used in IGBT propulsion systems. A simplified schematic of the main power scheme can be found in **Figure 1: Simplified main power scheme.**

Figure 1:

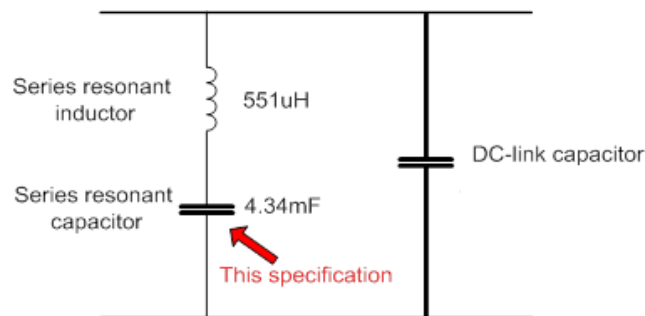


Figure 1: Simplified main power scheme

The capacitor will be fitted in the traction converter cubicle. It will be natural cooled, no forced ventilation. **The capacitor must be dry, oil filled is not allowed.**

1. Detailed Specification

1. Electrical Parameters	
Capacitance per Capacitor	1085 μ F +/-5% (4 capacitors in parallel)
Rated DC Voltage	2800 VDC
Maximum Voltage	3640 V
Rated Current	300 Arms 1200A for 4 capacitors in parallel
Test Voltage b/w terminals	DC 5265V/10sec
Test Voltage b/w terminals	AC 6900V/60sec
Series resistance	<0.28m Ω
Tangent of Loss Angle	2*10 ⁻⁴
Self-Inductance	approx. 100nH
Maximum Peak Current	25 kA
Maximum Surge Current	75 kA
Cooling	Natural Convection



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2. Technology

Dielectric	Polypropylene film metallized, self-healing
Filling material	N ₂ ; resin, dry

3. Bushing

Internal thread	M12
Max. torque	20 Nm
Height	73 mm
Creepage distance	128 mm

4. Mechanical Parameters

Dimensions	450 x 120 x 560 mm
Weight	40 kg
Casing material	Stainless steel
Mounting position	every position
Clearance distance b/w terminals	≥ 60 mm
Clearance distance b/w terminals and case	≥ 40 mm
Colour	RAL 7033
Shock Resistance	As per IEC 61373
Vibration	As per IEC 61373

2. Standards

Standard	Description
IEC61881-1	Rolling stock equipment – capacitors for power electronics
IEC61373	Shock and vibration test
EN50125-1	Environmental conditions
IEC61376	Creepage and clearance

3. Functional requirements

Description	Value	Unit
Operating hours	8640	hours/year
Typical load	continuous operation	
Surge current	1	times/year



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4. Ambient conditions / operating conditions

Description	Value	Unit	Notes
Operating Temperature	-25..+85	°C	
Temperature distribution over the year	+75	°C	10 days/year
	+65	°C	20 days/year
	+55	°C	90 days/year
	+40	°C	100 days/year
	< +40	°C	130 days/year
Storage	-25..+70	°C	
Average year temperature	+ 40	°C	
Relative humidity	< 95	%	During app 3 - 4 months (rainy season) per year frequent condensation can occur
Altitude	<1200	m	
Pollution levels			
Operation in coastal areas			
Maximum PH	8.5		of water damp
Max. concentration of sulphate	7	mg/liter	of water damp
Max. concentration of chlorine	6	mg/liter	of water damp
Maximum conductivity	130	μ S/cm	of water damp
Operation in desert terrain			
Dust content in air	1.6	mg/m3	

5. Reliability, availability, maintainability and safety

Description	Value	Unit	Notes
Design life	30	years	Expected lifetime: 30 x 8640 = 260000 hours
Failure rate	50	FIT	
Maintenance			To be defined by supplier
Safety			The risk of explosion due to over voltage, ageing, loss or other reasons should be minimized



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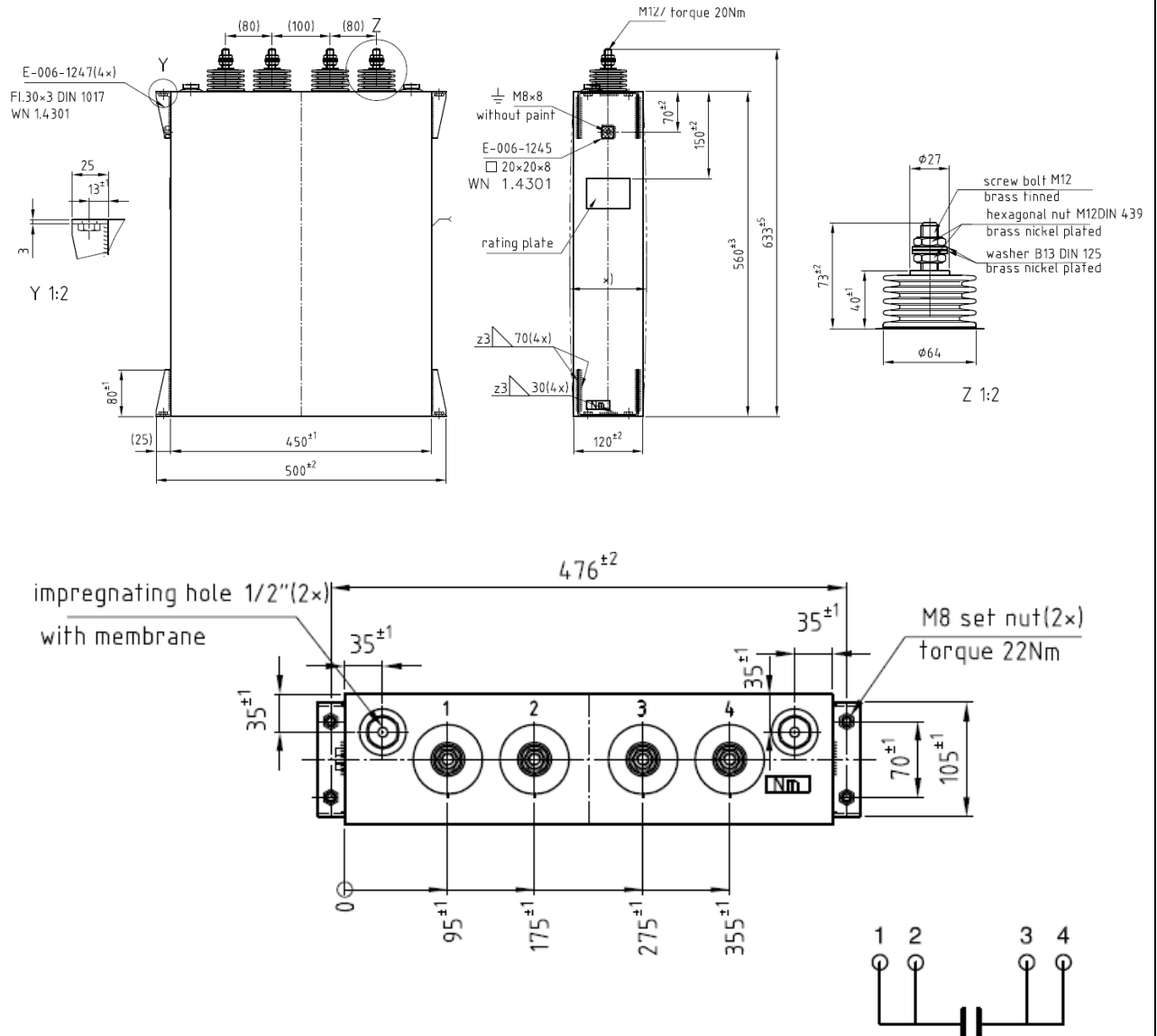
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6. Dimensional details





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7. Testing

List of tests to be performed on prototype as per IEC 61881 are as follows

Sl No	Test	Acceptance criteria	Type/Routine Test
1	Capacitance and Tan δ measurement	Measurements should be within the tolerances specified by the manufacturer	Type/Routine
2	Dimensional check	Dimensions to comply with the Approved drawing	Type/Routine
3	Voltage test between terminals and case	During the test neither flashover nor puncture should occur.	Type/Routine
4	Voltage test between terminals	During the test neither flashover nor puncture should occur. Capacitance measured after the test should be within the range specified	Type/Routine
5	Surge discharge test	After conducting the test capacitance to be measured and the change should be < +/-1%	Type
6	Thermal stability test and loss angle tangent measurement test	No breakdown of the capacitor should occur during the test. The capacitor losses should be measured after the test and should be within the tolerances specified by the manufacturer	Type
7	Self-healing test	Change of capacitance after the test should be < +/- 0.5%	Type
8	Resonance frequency measurement	The self-inductance measured should be within the tolerances specified by the manufacturer	Type
9	Environmental Test 1. Damp heat test 2. Change of temperature	Change of capacitance after the test should be < +/-2%	Type
10	Mechanical tests Mechanical tests of terminals 1. External inspection 2. Vibration and shocks	No mechanical damage should occur after the test.	Type
11	Endurance test	Change of capacitance after the test should be < +/-3%	Type



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8. Rating plate

The following information shall be given on the rating plate of each capacitor unit:

1. Manufacturer
2. Identification number and manufacturing date
3. $C = \mu F$
4. Tol = %
5. UNDC or UN = V
6. $\theta \text{ min} = ^\circ C$
7. $\theta \text{ max} = ^\circ C$
8. Maximum tightening torque = Nm

9. Documentation

1. Datasheet
2. Dimensional Drawing
3. Type test Procedure, Type test Report
4. Routine test Procedure, Routine test Report

10. Acceptance

1. Routine test report to be submitted along with each delivery
2. Equipment shall be packed in a manner suitable for delivery and storage at the appointed delivery address. Transport packaging will provide adequate protection against accidental damage during normal handling. Terminals, leads, mounting brackets will be protected from mechanical damage

Notes:

1. Mounting dimensions needs to be strictly adhered as per the approved drawing submitted by the vendor
2. Supplier should try to minimize the self-inductance and series resistance to a lower value as much as possible