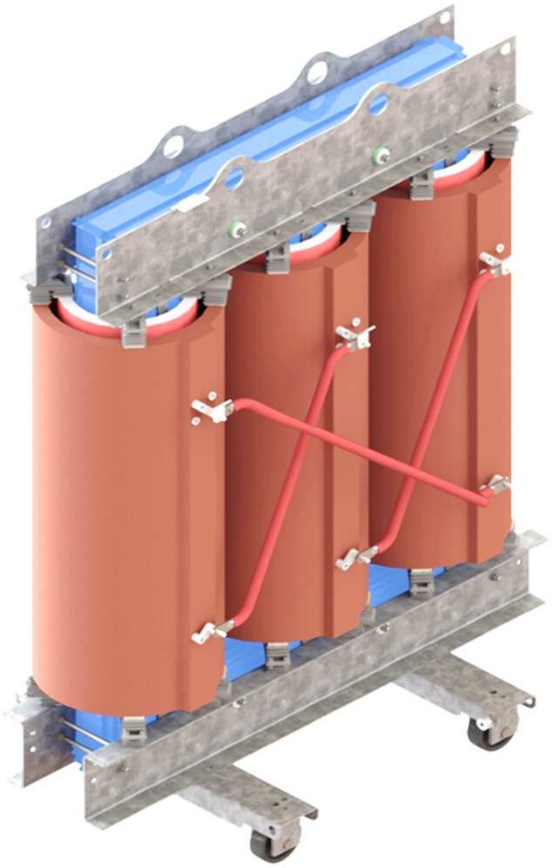
Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

Test certificate for: 3 Phase cast resin transformer



page:

Remarks:

Technical data

SGB Your dedicated partner of the SGB-SMIT Group

Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

3 Phase cast resin transformer according to Standard IEC

Eco Design regulation 548/2014 // 2009/125/EG & Customer specification: V-3.1-EL.TR.01-A-B

Protection cast resin transformer:	IP00	Protection housing:	IP44
Installation site at IP00 / IP44:	Indoor / Indoor	Mass at IP00 / IP44 [kg]:	8600 / 10000
Maximum altitude [m]:	1000	delivery tapping [kV]:	33,000
Max. temp. of cooling medium [°C]:	40	Max. dur. of short circuit [sec.]:	2,0
Environment class:	E2	manufacturing year :	9.2016
Climate class:	C2	K-factor:	
Fire class:	F1	$\hat{I}_E / \hat{I}_N$:	
Service:	Continue	$T_{0,5}$ [sec.]:	
Kind:	PT		

Coremateriał: Grain-oriented electrical steel | Mass [kg]: 6151,5

	HV	MV	LV
Rated power [kVA]:	3800	3300	750
Rated voltage [V]:	+2x 825V (2,5 %) 33000 -2x 825V (2,5 %)	942	665
Rated current [A]:	66,48	2022,6	651,1
Um [kV]:	36,0	1,1	1,1
LI [kV]:	170,0	0,0	0,0
Insulation class:	F	F	F
Max. temperature rise [K]:	100	100	100
Conductor material / Mass [kg]:	Al / 552	Al / 411	Al / 84
Continuous short circuit current [kA]:	0,88	30,67	32,77

Frequency [cps]:	50,00
Vector group:	Dyn5yn5
Cooling:	AF

At 0,9 Un service with Sn allowed

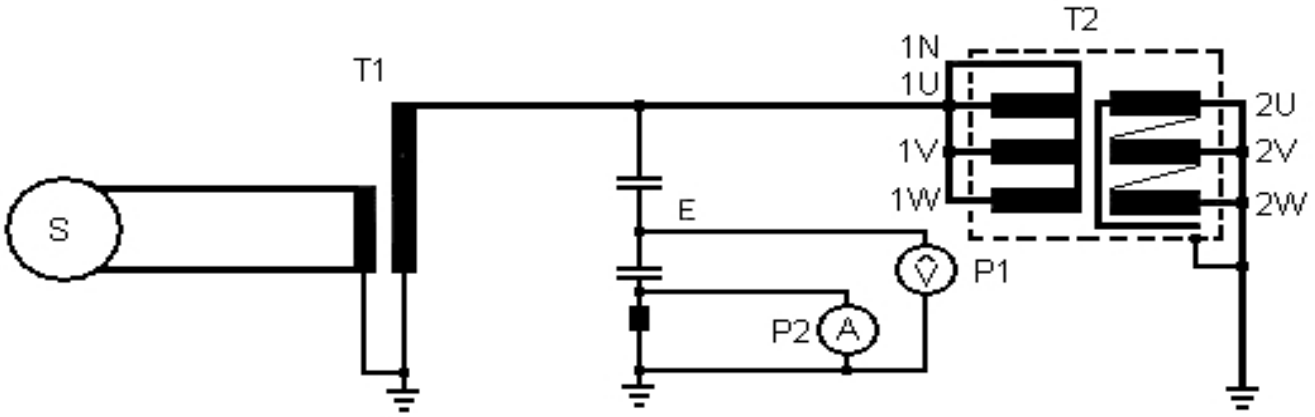
SGB Starkstrom - Gerätebau GmbH
Ohmstraße 10, DE-93055 Regensburg
Test Lab Cast Resin Transformers

Routine testing
(according to Standard IEC)

Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

Dielectric tests

	[kV]	[cps]	[sec.]
Separate-source AC withstand voltage test HV:	70,0	50	60
Separate-source AC withstand voltage test MV:	5,0	50	60
Separate-source AC withstand voltage test LV:	5,0	50	60
Separate-source AC withstand voltage test of auxiliary wiring:	2,0	50	60
Induced AC withstand voltage test LV:	1,330	200	30

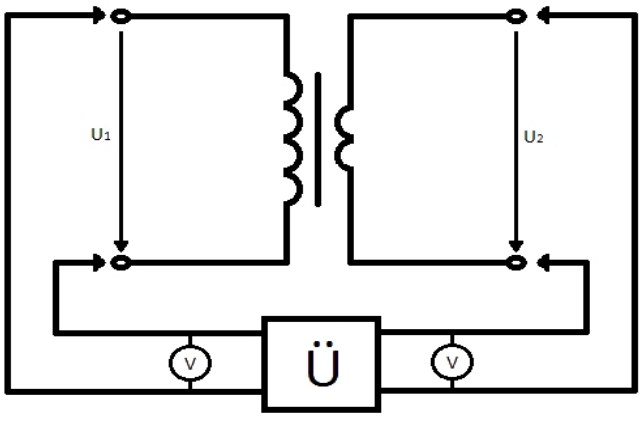


example scheme

Measurement of voltage ratio and check of phase displacement

connection HV / MV:		34650/942	33825/942	33000/942	32175/942	31350/942
deviation in [%]:	Phase U	0,04	0,03	0,01	-0,01	-0,04
	Phase V	0,06	0,05	0,03	0,01	-0,02
	Phase W	0,05	0,04	0,02	0,00	-0,02
Phase displacement:		✓	✓	✓	✓	✓

connection HV / LV:		34650/665	33825/665	33000/665	32175/665	31350/665
deviation in [%]:	Phase U	0,03	-0,02	0,00	-0,06	-0,06
	Phase V	0,06	0,02	0,02	-0,02	-0,03
	Phase W	0,04	0,01	0,00	-0,03	-0,04
Phase displacement:		✓	✓	✓	✓	✓



example scheme

Routine testing
(according to Standard IEC)

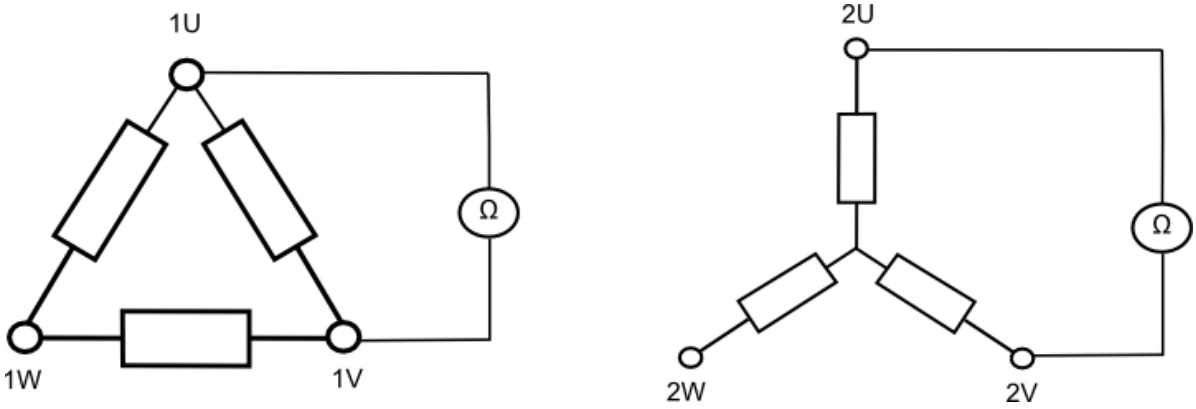
SGB Your dedicated partner of the SGB-SMIT Group

Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

Measurement of winding resistance

HV	33,000 kV	MV	0,942 kV	LV	0,665 kV
1U - 1V	1,71328	2U - 2V	0,0008313	3U - 3V	0,0015913
1U - 1W	1,71404	2U - 2W	0,0008395	3U - 3W	0,0016649
1V - 1W	1,71826	2V - 2W	0,0008319	3V - 3W	0,0015925

Measured values in Ω // at Temperature 22,74°C



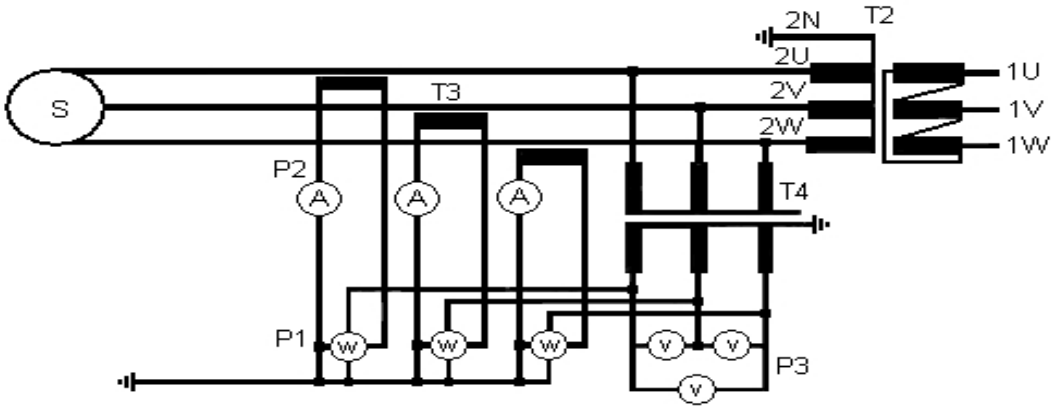
example scheme

Measurement of no-load loss and current

Voltage [V]:	Currents [A]:	Losses [W]:
U_{12} 664,5	I_1 5,865	P_1 1727
U_{23} 666,3	I_2 4,078	P_2 1330
U_{31} 664,6	I_3 5,804	P_3 2098
Ū 665,1	Ī 5,249	∑ 5155

connection LV 665 V & Frequency 50 cps

Io [%]: 0,159 Po [W]: 5155



example scheme

Routine testing
(according to Standard IEC)

SGB Your dedicated partner of the SGB-SMIT Group

Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

Measurement of short-circuit impedance and load loss

connection HV 33 kV & Frequency 50 cps; MV 942 V short-circuit at 3300 kVA

Voltage [V]:	Currents [A]:	Losses [W]:
U_{12} 1327,6	I_1 35,241	P_1 4406,2
U_{23} 1329,6	I_2 35,418	P_2 1933,1
U_{31} 1325,0	I_3 35,200	$-P_3$ 453,3
Ū 1327,4	Ī 35,286	∑ 5886,0

Pl at Ir & 22,74 °C [W]: 15757

Losses & ez at 120 °C

Pz [W]:	1481	ex [%]:	6,56
I²R [W]:	19071	er [%]:	0,62
Pl [W]:	**20552**	**ez [%]:**	**6,59**

connection HV 33 kV & Frequency 50 cps; LV 665 V short-circuit at 750 kVA

Voltage [V]:	Currents [A]:	Losses [W]:
U_{12} 415,37	I_1 8,354	P_1 214,9
U_{23} 416,47	I_2 8,389	P_2 230,7
U_{31} 415,85	I_3 8,340	P_3 216,1
Ū 415,90	Ī 8,361	∑ 661,7

Pl at Ir & 22,74 °C [W]: 1630

Losses & ez at 120 °C

Pz [W]:	114	ex [%]:	1,97
I²R [W]:	2048	er [%]:	0,29
Pl [W]:	**2162**	**ez [%]:**	**1,99**

connection MV 0,942 kV & Frequency 50 cps; LV 665 V short-circuit at 750 kVA

Voltage [V]:	Currents [A]:	Losses [W]:
U_{12} 2,6458	I_1 283,66	P_1 144,7
U_{23} 2,7001	I_2 290,66	P_2 269,7
U_{31} 2,7704	I_3 287,73	P_3 123,2
Ū 2,7054	Ī 287,35	∑ 537,6

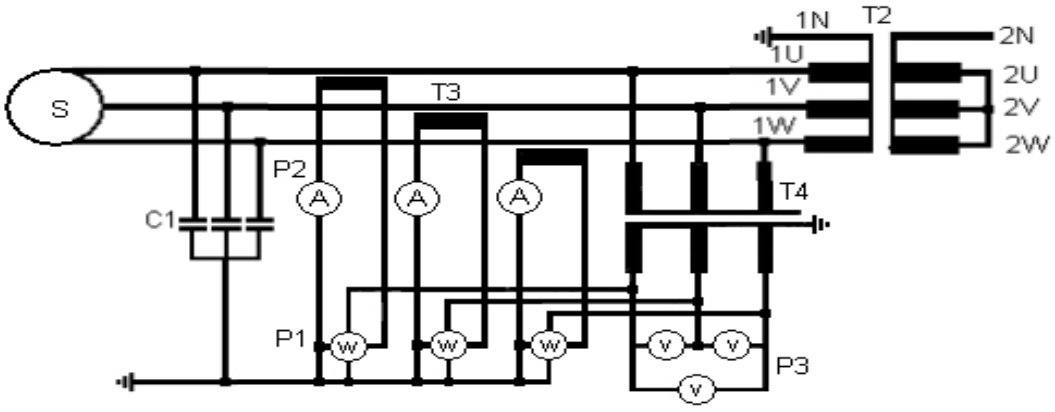
Pl at Ir & 22,74 °C [W]: 1376

Losses & ez at 120 °C

Pz [W]:	60	ex [%]:	0,42
I²R [W]:	1800	er [%]:	0,25
Pl [W]:	**1860**	**ez [%]:**	**0,49**

Losses & ez at 3800 kVA & 120 °C

Pl [W]:	**25282**	**ez [%]:**	**7,92**



example scheme

Routine testing
(according to Standard IEC)

SGB Your dedicated partner of the SGB-SMIT Group

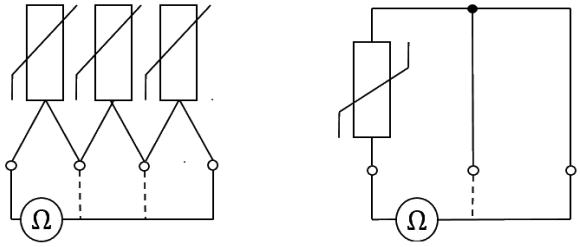
Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

Temperature sensor resistance measurement at 22,74°C:

1-2-3 PT 100/3 Core Phase V 4*111 Ω
4-5-6 PT 100/3 LV Phase U 4*111 Ω
7-8-9 PT 100/3 LV Phase V 4*111 Ω
10-11-12 PT 100/3 LV Phase W 4*111 Ω
13-14-15 PT 100/3 MV Phase U 4*111 Ω
16-17-18 PT 100/3 MV Phase V 4*111 Ω
19-20-21 PT 100/3 MV Phase W 4*111 Ω

22-23 Trip LV Phase U PTC 150°C black - black 71/68 Ω
24-25 Trip LV Phase V PTC 150°C black - black 69/60 Ω
26-27 Trip LV Phase W PTC 150°C black - black 66/61 Ω
28-29 Trip MV Phase U PTC 150°C black - black 75/70 Ω
30-31 Trip MV Phase V PTC 150°C black - black 72/62 Ω
32-33 Trip MV Phase W PTC 150°C black - black 79/77 Ω
34-35 Trip Core Phase V PTC 150°C black - black 70/66 Ω

example scheme



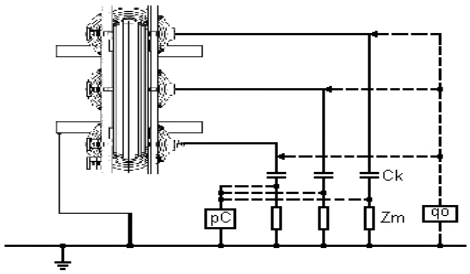
Remarks:

Routine testing
(according to Standard IEC)

Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

Measurement of partial discharge

Measuring circuit

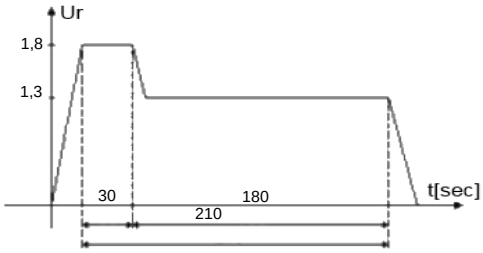


example scheme

Measurement in tap: 3 33 kV

Calibration of measuring circuit with the complete test circuit:
Calibration factor Kü = 1,97

Testing voltage



30 sec.	[kV]	180 sec.	[kV]
1,8 * UrHV	59,40	1,3 * UrHV	42,90
1,8 * UrMV	1,696	1,3 * UrMV	1,225
1,8 * UrLV	1,197	1,3 * UrLV	0,865

Test results in pC:

Testing voltage	after Time [sec.]	1U	1V	1W
1,3 * Ur				
	90	1	1	1
	180	1	1	1
	210	1	1	1
Background level		1	1	1

Appendix

Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

Test results / 3.1 Acceptance test certificate according to DIN EN 10204:2004

Routine testing — Test passed

Dielectric tests

Separate-source AC withstand voltage test HV:	70 [kV]; 50 [cps]; 60 [sec.]	✓
Separate-source AC withstand voltage test MV:	5 [kV]; 50 [cps]; 60 [sec.]	✓
Separate-source AC withstand voltage test LV:	5 [kV]; 50 [cps]; 60 [sec.]	✓
Separate-source AC withstand voltage test of auxiliary wiring:	2 [kV]; 50 [cps]; 60 [sec.]	✓
Induced AC withstand voltage test LV:	1,33 [kV]; 200 [cps]; 30 [sec.]	✓

		Guarantee values:	tolerance:	Measured values:	deviation:	
Measurement of voltage ratio and check of phase displacement						
Ratio at connection HV / MV [%]:		33000/942	± 0,50	0,03		✓
Ratio at connection HV / LV [%]:		33000/665	± 0,50	0,02		✓
Measurement of winding resistance at 22,74 °C						
Measurement of winding resistance HV MV LV		--	--	--	--	✓
Measurement of no-load loss and current at connection LV 665 V & 50 cps						
Po [W]:		5700	+0,0%	5155	-9,56%	✓
Io [%]:				0,159		✓
Measurement of short-circuit impedance and load loss at 120 °C						
Pl at 3800 kVA; HV/MV+LV [W]:		26923	+0,0%	25282	-6,09%	✓
ez at 3300 kVA; HV/MV [%]:		6,51	±10,0%	6,59	1,28%	✓
ez at 750 kVA; HV/LV [%]:		2,00	±10,0%	1,99	-0,65%	✓
Po + Pl [W]:		32623	+0,0%	30438	-6,70%	✓
PEI (at k[PEI] 0,45 = 1716 kVA) (A) [%]:		99,348	--	99,399	0,05%	✓
Measurement of partial discharge						
PD max. HV at 1,3 x Rated voltage [pC]:	(Background level 1 [pC])	≤10	--	1		✓

Customer:	Senvion GmbH	Order-number:	142017672/10
		Serial-number:	286099
Order number:	200/4500338765	Type:	DTTHK1NG 3150/30
Date of order:	17.06.2016	Wd. number:	728069
Customer item no.: 60920		Units:	8

Gemäß der EG - Richtlinie 2009/125/EG zur umweltgerechten Gestaltung energieverbrauchsrelevanter Produkte gemäß Anhang VI;

(in accordance with the EG - Directive 2009/125/EC
Ecodesign of energy related products in accordance with Annex VI)

Hiermit erklären wir, dass das nachstehend bezeichnete Produkt in seiner Konzeption und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den Anforderungen der EG-Richtlinie 548/2014 zur umwelgerechten Gestaltung energieverbrauchsrelevanter Produkte entspricht. Bei einer mit uns nicht abgestimmten Änderung des Produktes verliert diese Erklärung ihre Gültigkeit.

(Hereby we declare that the product designated below, regarding its design and build and the model placed into circulation by us, corresponds to the EC Eco- Regulation No 548/2014 of energy related products Directive. In case of a modification to the product not coordinated with us, this Declaration shall become invalid.)

Hersteller:
(Manufacturer)

Starkstrom-Gerätebau GmbH
Ohmstraße 10
D-93055 Regensburg, Germany

Es wird die Übereinstimmung mit folgenden für das Produkt geltenden Richtlinien/Bestimmungen erklärt:
(The conformity with the following directives/regulations will declared)

- **EG Richtlinie 2009/125/EG vom 21. Oktober 2009 über umweltgerechte Gestaltung energieverbrauchsrelevanter Produkte**
  (EC Directive 2009/125/EC of 21 October 2009 on the Ecodesign of energy related products)
- **EG Verordnung Nr. 548/2014 vom 21. Mai 2014 zur Umsetzung der EG - Richtlinie 2009/125/EG**
  (Regulation EC No. 548/2014 of 21 May 2014 to implement the EC Directive 2009/125/EC)

Angewandte Normen sind insbesondere:
(Applied standards are especially)

EN 60076-11:2004
EN 50588-01:2015
EN 50629-01:2015

Regensburg,

Stefan Hausberger
Managing Director

EG-Konformitätserklärung – EC-Declaration of Conformity