Intertek ETL SEMKO

STATEMENT OF TEST RESULTS

Ref.No. SE-713508

Product:	Serie-resistive heating cable
Tested by request of:	Tyco Thermal Controls Nordic AB Flöjelbergsgatan 20B, SE-43137 Mölndal, Sweden
Manufactured at:	Tyco Thermal Controls Shuanglin Industry Zone, Nanxun District, Huzhou 313012 Huzhou, China
Rating and principal characteristics:	2x0,065 – 26,5 ohm/m, 300/500V
Trade mark (if any):	Tyco thermal controls
Model/Type Ref:	T2 Blue
Additional information (if any):	-
A sample of the product has been tested and found to be in conformity with:	SS 4241411:1992
As shown in the Test Report (ref.no):	713508

Stockholm

Date: 11 December 2007

Internal ref: Niklas Larsson

Intertek Semko AB

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30, www.sweden.intertek-etlsemko.com
Registered in Sweden: No SE556024059901, Registered office: As address

TEST REPORT

SS 424 24 11

Heating cables with rated voltages up to and including 300/500 V

Report reference No ..... :	713508
Tested by (printed name and signature) ..... :	Bo Erlandsson
Approved by (printed name and signature) ..... :	Leif Edström
Date of issue ..... :	10 December 2007

This report is based on a blank test report that was prepared by SEMKO.

Testing Laboratory Name ..... :	Intertek SEMKO AB
Address ..... :	Torshamnsgatan 43, Box 1103
Testing location ..... :	SE-164 22 Kista, Sweden
Applicant's Name ..... :	Tyco Thermal Controls Nordic AB
Address ..... :	Flöjelbergsgatan 20B, SE-43137 Mölndal, Sweden
..... :	
Manufacture's Name..... :	Tyco Thermal Controls
Address ..... :	Shuanglin Industry Zone, Nanxun District, Huzhou
..... :	313012 Huzhou, China
Test specification	
Standard ..... :	SS 424 14 11:1992
Test procedure ..... :	Intertek SEMKO certificate
Procedure deviation ..... :	N/A
Non-standard test method ..... :	N/A
Test Report Form	
Test Report Form No. ..... :	SS 424 14 11A
TRF originator ..... :	Intertek SEMKO
Master TRF ..... :	dated 03-11
Test item	Heating cable
Description ..... :	Serie-resistive
Trademark ..... :	Tyco thermal controls
Model and/or type reference ..... :	T2 blue
Rating(s) ..... :	2x0,065 – 26,5 ohm/m

Test case verdicts	
Test case does not apply to the test object .. :	N/A
Test item does meet the requirement ..... :	P(ass)
Test item does not meet the requirement ..... :	F(ail)
Testing	
Date of receipt of test item ..... :	June/October 2007
Date(s) of performance of test ..... :	August/October 2007

General remarks

This report shall not be reproduced except in full without the written approval of the testing laboratory.
The test results presented in this report relate only to the item(s) tested.
"(see remark #)" refers to a remark appended to the report.
"(see Annex #)" refers to an annex appended to the report.
Throughout this report a comma is used as the decimal separator.

Copy of marking plate and summary of test results:

Marking printed on cables: Tyco Thermal Controls T2Blue2X0.100 Ω/m
Tested cables: 2x0,10 Ω/m, 2x2,9 Ω/m + joint and ending

The cable passed all tests.

The test results have been taken from tests made in August and October (noted by *).

SS 424 14 11		
Cl.	Prescribed	Observed

6 Type reference		
1. Rated temperature in °C		90
2. Presence of conductive sheath and armouring.	A = Without conductive sheath	N/A
	B = With conductive sheath, without armouring	N/A
	C = With conductive sheath, with armouring	P
3. Presence of outer sheath of insulation material.	U = Without sheath:	N/A
	M = With sheath:	P
4. Special type of heating cable.	S = for mounting in rainwater pipe	N/A
	V = for mounting in drinking water pipe	N/A
	X = for mounting in drinking water pipe, not self extinguishing	N/A
	T = for mounting in other type of pipes	N/A

7 RATED VOLTAGE		
Rated voltage	Max 300/500 V	P

8 MARKING		
1. Indication of origin	Indelible, clearly discernible, name continuous and easily legible	P
Distance between the markings	max. 0,5 m	0,44 m
2. Type reference		-
Manufacturers reference		Tyco Thermal Controls *
3. Additional marking required on each length or unit of heating cable.		
3.1 On each length of cable	Rated voltage and max. wattage	-
	Lowest temperature for installation	-
	Resistance at 20°C in ohm/m	0.100 Ω/m *
	Power in W/m at maximum voltage	-
	Start up current at -10°C in A/m	-
3.2 On a pre-fabricated unit of heating cable	Length of the heating cable in m	N/A
	Maximum voltage in V	N/A

SS 424 14 11		
Cl.	Prescribed	Observed
	Start up current at -10°C in A/m	-
3.2 On a pre-fabricated unit of heating cable	Length of the heating cable in m	N/A
	Maximum voltage in V	N/A
	Power in W at max rated voltage	N/A
	Lowest temperature for installation	N/A
	Start up current at -10°C in A	N/A

9 CONSTRUCTION		
1. Conductor and heating conductor	must be of material that is suitable for the temperature obtained at the rated temperature of the cable	P
2. Wall thickness of the insulation	Insulation material	Teflon Polymer[1]
Specified value mm	min. 0,18	0,29
Minimum value mm	min. 0,14	0,26
Diameter of wires mm	max.	-
3. Metallic screen	Material in the screen	Tinned copper
	Construction of the screen	Served 28x0,26 mm
	Filling factor of the screen, min 0,5	0,70
	Resistance of drain wire, Min 1 mm^2 ≤18,1 ohm/km	12,65 ohm/km *
4.Uninsulated drain wire	Can the metallic screen be connected to protective earth	P
	Is the heating cable provided with a drain wire	N/A
5. Bedding	Armouring that is not a screen must be applied on a bedding of sufficient insulation material	N/A
6. Armouring	The armouring consists of	Tinned copper, 28x0,26 mm *
	Filling factor of the armouring Min 0,4	0,70 *
Construction of the armouring	The armouring must meet the requirements in clause 9.3	P
	The armouring must withstand the deformation test according to clause 11.16.10	P
7. Non metallic outer sheath	Material in the sheath	LSOH

[1] Correction of misprinting; 30 January 2008.

SS 424 14 11		
Cl.	Prescribed	Observed
10 JOINTS AND ENDINGS		
Joints and endings	must be adjusted for the heating cable they are going to be used with	P
Joints and endings	for mounting at the installation must be accompanied by a mounting instruction	N/A

11.5 Testing of joints and endings		
The testing is carried out on 6 samples out of which 3 is subject-ed to ageing according to clause 6.14	Voltage test in water according to 11.6.5	P
	Voltage test in heating according to 11.6.6	P
	Insulation resistance in heat according to 11.6.7	P

11.6 Special testmethods			
1. Cable resistance at 20°C	Conductor resistance	0,11-0,115 ohm/m	*
2. Cable resistance at increased temperature	Conductor resistance	0,12 ohm/m	*
	Positive temperature coefficient	No	
3. Resistance of the screen	Resistance of the screen	12,65 ohm/km	*
	Resistance of the drain wire	N/A	
	Separate armouring is not measured together with the screen or the drain wire	N/A	
5. Voltage test in water at room temperature	Voltage test on at least 10m heat-ing cable with 2kV ~ 15 minutes	P	
	Heating cables for installation inside a pipe are tested at the maximum pressure declared by the manufacturer	N/A	
6.Voltage test at rated temperature	2 kV ~15 minutes on at least 5m heating cable after more than 2h at 90 °C	P	
7. Insulation resistance at high temperature (500V=)	Insulation resistance between conductor/heating conductor and screen/ steel balls measured after 2 h at rated temperature +20°C	110°C	
	heating cable mini 0,03 Mohmkm	632-1688 MΩkm	

SS 424 14 11		
Cl.	Prescribed	Observed
	joint/ending min 5 Mohm	Before ageing: 6800-14000 MΩ / 339-420 MΩ After ageing: 421-2910 MΩ / 800-968 MΩ
8. Start up current at -10°C	under consideration	N/A
9. Thermal ageing test	In a heating cabinet with a fan for 336h at rated temperature +25°C= 115°C followed by a bending test on a mandrel 6 x other diameter =-30 mm and a voltage test in salt water 2 kV ~ 15 minutes	115°C Ø32 mm 2 kV OK P
10. Deformation test	Armoured heating cables are subjected to 1500N for 30 s followed by a voltage test with 1,5 kV ~ 1 minute, still under pressure, between conductor/heating conductor and screen /armouring	1500N 1,5 kV OK * 2000N 1,5 kV OK *
	Inspection after deformation test, no broken wires in conductor or armouring/screen may occur	1500N: 0 threads broken * 2000N: 1 thread broken on 1 of 3 samples *
11. Pressure test at high temperature	according to IEC 60811-3-1 clause 8.1 and 8.2 respectively is carried out at rated temperature 90°C	P
Force N	insulation, indentation max. 50 %	-
Force 0,99 N	bedding, indentation max. 50 %	<5%
Force 1,63 N	sheath, indentation max. 50 %	11% *
12. Impact test at low temperature	on complete cable acc. to IEC 60811-1-4 cl. 9.5 at -15 °C	P
Hammer 200 g, fall height 100mm	Result to be obtained, no cracks in 5 out of 6 samples	P
13.Bending test at low temperature	on complete cable after 4 h at -15 °C between steel rods with diameter 6 x other diameter. Three bending cycles and thereafter a voltage test with 2 kV ~ 15 minutes in salt water is carried out_	Ø32 mm P
14. Ageing of joints and endings	336h in a heating cabinet at rated temperature for joints and at rated temperature +25°C for endings, and thereafter testing according to clause 5 is carried out	P

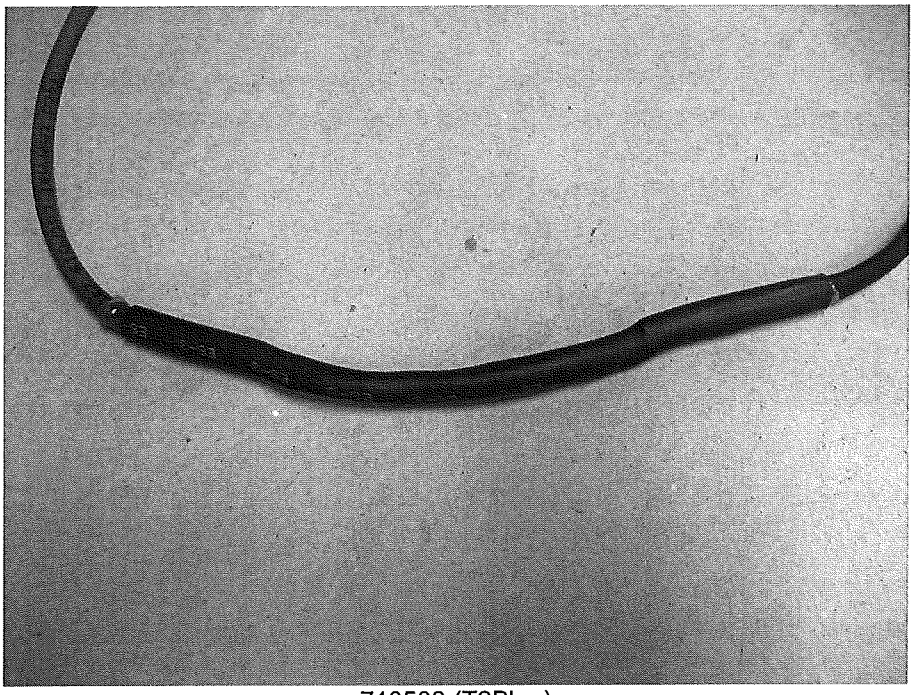
SS 424 14 11				
Cl.	Prescribed	Observed		
MECHANICAL PROPERTIES				
Before ageing		Red	Transp	Sheath
TS N/mm^2	9,0 min.	41,9	20,4	16,8
EB %	125 min.	259,6	706,2	219,6
After 168 h 115 °C:				
TS N/mm^2	9,0 min.	43,8	22,8	16,9
EB %	100 min.	280,6	813,6	220,3
Difference				
TS %	± 40 max.	4,5	11,8	0,6
EB %	± 40 max.	8,1	15,2	0,3
After 168 h 80 °C (comb.):				
TS N/mm^2	10,0 min.	N/A		
EB %	150 min.	N/A		
Difference				
TS %	±20 max.	N/A		
EB %	±20 max.	N/A		

LOSS OF MASS TEST		
Ageing 168 h 80 °C		N/A
Loss of weight mg/cm^2	2,0 max.	N/A

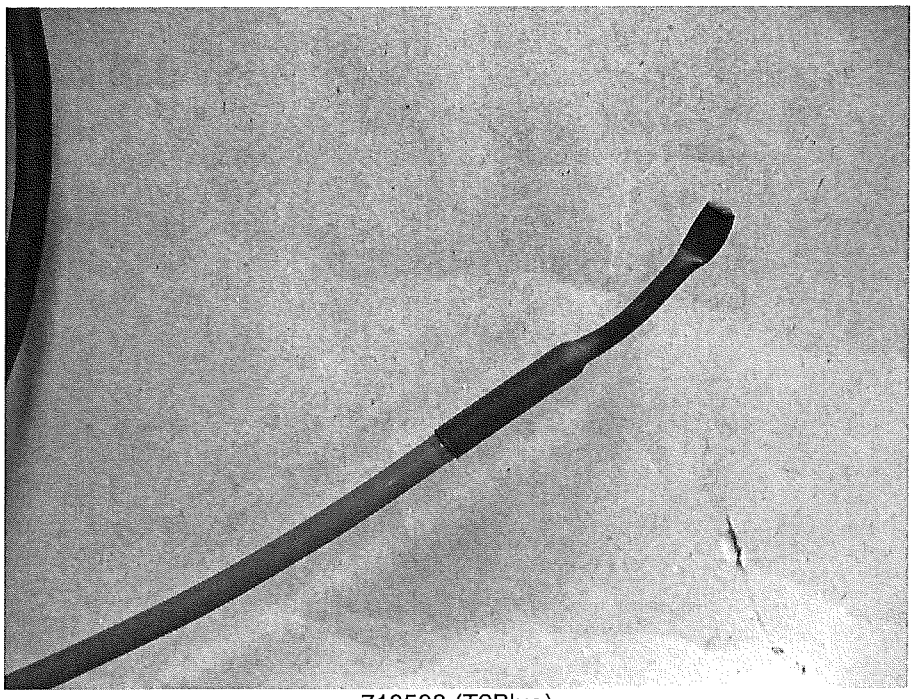
PRESSURE TEST AT HIGH TEMPERATURE		
Force N		N/A
4 h 70 °C		N/A
Impression %	50 max.	See item 11
HEAT SHOCK TEST		
Number of turns		N/A
Diameter of mandrel mm		N/A
1 h 150 °C	No cracks	N/A

TESTS AT LOW TEMPERATURE		
Cold bending test		N/A
Number of turns		N/A
Diameter of mandrel mm		N/A
After 16 h – 15 °C	No cracks	N/A
Cold elongation test		N/A
Temperature - 15 °C		N/A

SS 424 14 11		
Cl.	Prescribed	Observed
Cooling time 16 h		N/A
Elongation at break %	20 min.	N/A
Impact test		N/A
Mass of hammer g		N/A
Samples 16 h – 15 °C	No cracks	See item 12



713508 (T2Blue)

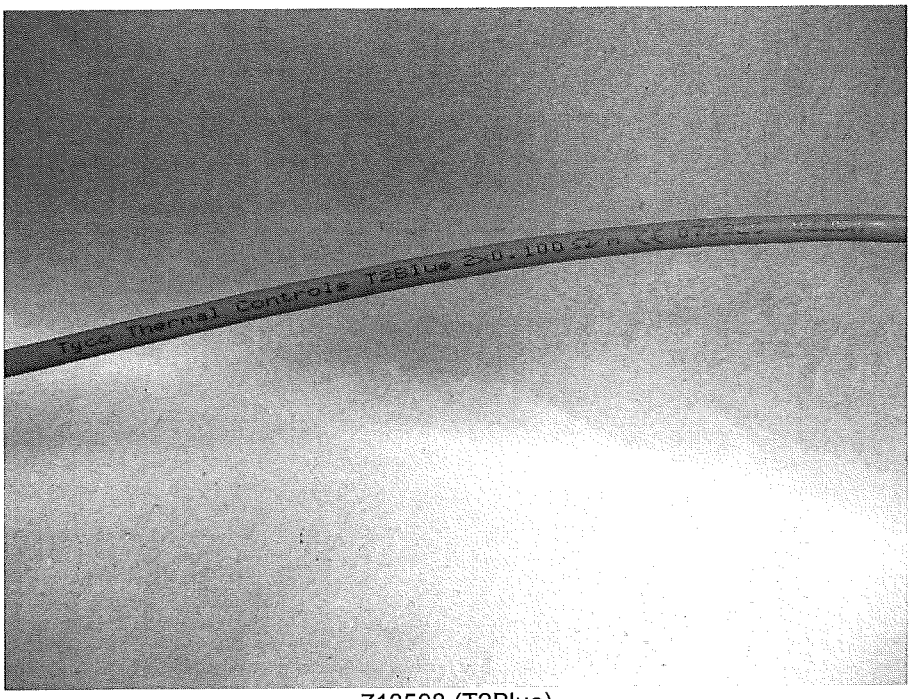


713508 (T2Blue)

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30, www.sweden.intertek-etlsemko.com
Registered in Sweden: No SE556024059901, Registered office: As address

S 113 07-03 Nockeby Tr. 372011/Mc

Intertek ETL SEMKO



713508 (T2Blue)

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30, www.sweden.intertek-etlsemko.com
Registered in Sweden: No SE556024059901, Registered office: As address

S 113 07-03 Nockeby Tr. 372011/Mc