

REGIONAL TEST CENTRE (SOLAR THERMAL)

School of Energy, Environment and Natural Resources
Madurai Kamaraj University
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TEST REPORT


As per IS 12933 (Part 1) : 2003
Together with amendments
No. 1 of June 2005,
No. 2 of August 2007 &
No. 3 of May 2013

BIS CODE NUMBER
Not Applicable

REPORT NUMBER
928

DATE
02.01.2014

Checked by


Research Associate
Dr. Tennyson Daniel



Authorized Signatory
Dr. C. GOPINATHAN
PRINCIPAL INVESTIGATOR
REGIONAL SOLAR ENERGY TESTING CENTRE
Madurai Kamaraj University
MADURAI-625 021



REPORT NUMBER : 928

As per IS 12933 (Part 1) : 2003



1. PARTICULARS OF SAMPLE RECEIVED

- | | | |
|---|---|---|
| a) Nature of sample | : | Solar collector |
| b) Grade / Variety / Type / Glass /etc. | : | Flat plate type |
| c) Declared value, if any | : | Not applicable |
| d) BIS code number | : | Not applicable |
| e) Batch number and date of manufacture | : | Not applicable |
| f) Quality and mode of packing | : | Crate packed with EPS sheet |
| g) Date of receipt of sample | : | 24.06.2013 |
| h) BIS seal | : | Not applicable |
| i) IO's signature | : | Not applicable |
| j) Any other information | : | Nil |
| k) Date of commencement of tests | : | 25.06.2013 |
| l) Date of completion of tests | : | 30.12.2013 |
|
m) Name and address of manufacturer | : | M/s. Focusun Energy Systems
Old No. 27, New No. 30
Jaganathan Nagar
Opp CMC, Avinashi Road
Coimbatore - 641 014 |
|
n) Serial No. | : | 0107 |
| o) Country of manufacture | : | India* |
| p) Maximum working pressure in kPa | : | 245 kPa* |
| q) Standard mark details, if present | : | Nil |

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2. CHARACTERISTICS OF COVER PLATE

(Section 1 of Part 2)

Tests	Specified requirements	Results
Cover plate	Cover plate shall be fixed with the collector box through gasket which could provide an effective sealant against water and dust between the collector box and cover	Cover plate is fixed with the collector box through gasket which could provide an effective sealant against water and dust between the collector box and cover
Material appearance	Single piece glass Tempered / toughened	Toughened*
General appearance of glass	Free from bubbles and rough surface	Free from bubbles and rough surface
Transmittance test	82% (Min)	83%
Environmental condition:	Test carried out on a clear sunny day and near solar noon	
Impact resistance test (5.7 of Part 5)	Glass broken or cracked/ did not break or crack	Did not break or crack

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3. CHARACTERISTICS OF COLLECTOR BOX
(Section 2 of Part 2)

Tests	Specified requirements	Results
Material appearance	Al / fibre glass / CRCA / GS / HRC	Aluminium*
Thickness (in mm)	Al - channel section for sides : 1.4 (Min)	1.4
	Sheet for bottom : 0.45 (Min)	0.47
	Support for glass retaining : 1.2 (Min)	1.3
	Sheet for entire body : 1.0 (Min)	Not applicable
	Fibre glass : 3.0	Not applicable
	GS / SS : 0.80	Not applicable
	CRCA / HRC : 0.91	Not applicable
Size (in mm)	May be 1860 x 1240 x 100 / 2120 x 1040 x 100 / 2050 x 930 x 100 for size a, b, c respectively with a tolerance of ± 10	2029 x 1029 x 97 (Other size)
Workmanship and finish (appearance) (7 of Part 2)	Surface shall be smooth / free from roughness / raised spots / scale / any other defects	Surface is smooth, free from roughness, raised spots, scale and other defects
	Sharp edges / corners shall be rounded off	No sharp Edges
Corrosion resistance coating (appearance) (7.2 of Part 2)	Only for CRCA or HRC boxes both sides	Not applicable
Resistance to abrasion (appearance) (7.3 of Part 2)	Examine for scratch jigged edges and penetration	Not applicable
Fabrication (appearance)	Al : 8.1 of Part 2 Fibre glass : 8.2 of Part 2 CRCA/HRC/GS/ any other : 8.3 of Part 2	Screw joints are leak proof

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4. CHARACTERISTICS OF ABSORBER

(Section 3 of Part 2)

Tests	Specified requirements	Results
Absorber (appearance)	Absorber shall consist of risers, headers and sheet for absorber	Absorber consists of risers, headers and sheet for absorber
Material (appearance)	Cu / Al / SS / MS	Copper*
Coating (appearance)	Selective coating / non selective coating	Selective coating*
Temperature test for coating	No damage to coated / painted surface	No damage
Bonding between riser and sheet (appearance)	Brazing / soldering / TIG welding / Laser	Ultrasonic seam welding*
	Unbrazed / unsoldered portion not exceeding 10% of the length of riser	Not applicable
	Flux (non-greasy) should be removed	Not applicable

5. CHARACTERISTICS OF COLLECTOR BOX INSULATION

(Section 4 of Part 2)

Tests	Specified requirements	Results
R Value at 100°C		Rockwool
Back	0.96 m ² C/W (Min)	R = 0.96 m ² C/W
Side	0.48 m ² C/W (Min)	R = 0.48 m ² C/W
Covering of the back and side insulation (appearance)	Aluminium foil	Aluminium foil*

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6. CHARACTERISTICS OF GASKETS AND GROMMETS

(Section 5 of Part 2)

Tests	Specified requirements	Results
Material for gaskets	Neoprene / silicon / EPDM rubber channel	EPDM*
Grommets	Neoprene / silicon / EPDM	EPDM*
Thermal Shock Test	No crack / brittleness	No crack and brittleness

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7. ASSEMBLY AND WORKMANSHIP (appearance)

Specified requirements	Results
Free from surface defects, sharp edges / corners	Yes
Exposed surface / Corrosion resistant	Yes*
Insulation - No slippage	No slippage
Cover plate fixing - adequate precautions taken to protect it from damage	Yes
Cover plate fixing - provision for expansion of glass	Yes
Replaceable components accessible for repair / replacement at site	Yes

8. ROUTINE TEST - SOLAR COLLECTOR

Tests	Specified requirements	Results
Static pressure leakage test (5.3 of Part 5)	No pressure drop No appearance of swelling distortion or ruptures in the risers and headers	No pressure drop No appearance of swelling distortion or ruptures in the risers and headers

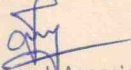
9. TYPE TEST - SOLAR COLLECTOR

Tests	Specified requirements	Results
Outdoor no flow exposure test (5.2 of Part 5)	No degradation of rubber material No out gassing from the insulation material No discolouration or peeling of black paint No deposition of water vapour, dust or any other material inside the cover plate	No degradation of rubber material, no out gassing from the insulation material, no discolouration or peeling of black paint and no deposition of water vapour, dust or any other material inside the cover plate

Environmental condition: 30 days exposure to a minimum irradiation of 4 kWh/m²/day

External thermal shock test (5.2 of Part 5)	No cracking / Distortion No condensation / water penetration	No cracking / Distortion No condensation / water penetration
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Tests	Specified requirements	Results
Internal thermal shock test (5.5 of Part 5)	No cracking / Distortion / Deformation	No cracking, distortion and deformation
Environmental condition: Solar radiation > 700 W/m ² maintained for a period of 1 hour		
Rain penetration test (5.6 of Part 5)	No water penetration	No water penetration
Thermal performance test (6.4 of Part 5)		
$F_R U_L$	Lesser than or equal to 5.5 W /m ² °C	2.88 W /m ² °C
$F_R (\alpha\tau)_0$	Greater than or equal to 0.65	0.70
Environmental conditions: Solar radiation > 700 W/m ² Air speed between 2 to 5 m/s		
Time constant test (6.5 of Part 5)	Report the value of time constant	113 seconds
Incident angle modifier test (6.6 of Part 5)	Report the value of incident angle modifier coefficient ($-b_0$)	0.117

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Remarks :

* As per the claim of the manufacturer

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