CERTIFICATE

Certificate number	16355 Rev.0	Replaces	-
Issued	19/07/2019	First edition	19/07/2019
Report number	PKC0003835	Expiry date	18/07/2024
Page	1 of 1	Contract number	PKC0003872

Product Certificate Solar Thermal Products

License holder: **Immergas S.p.A.**
Via Cisa Ligure 95 – 42041 Brescello (RE), Italy

Production site(s): Via Venezia 11 – 37053 Cerea (VR), Italy

Product Solar thermal system

Model(s):
SOLARSMART 110; SOLARSMART 110 – R
SOLARSMART 150; SOLARSMART 150 – R
SOLARSMART 220; SOLARSMART 220 – R
SOLARSMART 260; SOLARSMART 260 – R
(**Remarks:** R = red frame)

Kiwa Cermet Italia hereby declares that the product can be considered complying to the testing requirements and is entitled to use the Solar Keymark Label, based upon the following aspects:

Laboratory testing of the solar thermal products, which are performed by an accredited laboratory in accordance to ISO/IEC 17025 -see annex-, using the following standards:

- EN 12976-2:2006
  Thermal solar systems and components - Factory made systems - Part 2: Test methods

Specific CEN Keymark Scheme Rules for Solar Thermal Products SKN_N0444R1.

Periodic Inspection of the Factory site(s) performed by Kiwa Cermet Italia.

A description of the test results is given in the annex to this certificate.

This certificate is issued in accordance with the Kiwa Cermet Italia regulations.
Publication of the certificate is allowed.
The validity of this certificate is subject to the positive result of periodic surveillance visits.
The validity of this certificate can be verified on request at the following e-mail address: energy@kiwacermet.it.
Any total or partial reproduction of this document in any form, without Kiwa Cermet Italia express authorization, is prohibited.

Kiwa Cermet Italia S.p.A.
Società con socio unico, soggetta all'attività di direzione e coordinamento di Kiwa Italia Holding Srl
Via Cadriano, 23
40057 Granarolo dell'Emilia (BO)
Tel +39.051.459.3.111
Fax +39.051.763.382
E-mail: info@kiwacermet.it
www.kiwa.it

Chief Operating Officer
Giampiero Belcredi

034

PRD N° 069B

Summary of	EN12976-2	SOLAR SYSTEM test results	Licence Number	16355 Rev.0
Annex to Solar KEYMARK Certificate			Issued	2019-07-19

Company	Immergas S.p.A.		Country	Italy	
Brand (optional)			Website	www.immergas.com	
Street	Via Cisa Ligure, 95		E-mail	consulenza@immergas.com	
Postal Code	42041	Brescello (RE)	Tel. / Fax	+39	522.689.011

System classification

Application(s)	Hot water
Solar loop, circulation principle	Thermosyphon
Direct solar loop / heat exchanger	Direct
Open, vented or closed solar loop	Closed
Drain back/down	Always filled (no drain)
Store location	Int. collector-store
Store orientation (of main axis)	Horizontal
Type of auxiliary heating (internal back-up heat)	None
If other auxiliary/internal back-up heating, please specifiy:	
Solar+supplementary OR Solar-only / Solar pre-heat	Solar only / Solar preheat

Collector(s)

Company	Immergas S.p.A.		
Keymark lic.no. if available			
	Per module		
Collector name	Gross Area (Ag)	Gross length	Gross width
	m²	mm	mm
SOLARSMART 110	1,52	2136	711
SOLARSMART 150	1,93	2136	906
SOLARSMART 220	2,77	2136	1296
SOLARSMART 260	3,18	2136	1491

Heat store(s)

Company	Immergas S.p.A.					
Keymark lic.no. if available						
Store name	Total nominal volume	Gross height	Gross width	Gross depth	Auxiliary heated volume	Electrical aux. heating power
	litres	mm	mm	mm	litres	kW
SOLARSMART 110	105	1870				
SOLARSMART 150	140	1870				
SOLARSMART 220	210	1870				
SOLARSMART 260	245	1870				

Solar loop controller

Keymark lic.no. if available	
Company	
Name	
Solar loop pump - power range	W to W

Solar loop fluid

Recommended/required	No recommend./requirements
Company	
Name	
Freezing point	°C

System family overview

Collector name	Number of collectors in each configuration for each store			
	Store name			
	SOLARSMART 110	SOLARSMART 150	SOLARSMART 220	SOLARSMART 260
SOLARSMART 110	1			
SOLARSMART 150		1		
SOLARSMART 220			1	
SOLARSMART 260				1

Testing Laboratory	ENEA - Centro Ricerche Trisaia
Website	http://www.trisaia.enea.it
Test report id. number	RP.2016.SYS.191.1
Date of test report	2016-12-15

Comments of test lab

Additional test report: RP.2016.SYS.191a.1 issued by ENEA - Centro Ricerche Trisaia on 21/12/2016.
Aperture area of collectors: SOLARSMART 110: 1,09 m2; SOLARSMART 150: 1,48 m2; SOLARSMART 220: 2,25 m2; SOLARSMART 260: 2,64 m2.

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	16355 Rev.0
Annex to Solar KEYMARK Certificate			Issued	2019-07-19

Company	Immergas S.p.A.		Country	Italy	
Brand (optional)			Website	www.immergas.com	
Street	Via Cisa Ligure, 95		E-mail	consulenza@immergas.com	
Postal Code	42041	Brescello (RE)	Tel. / Fax	+39	522689011

Parameters for systems extrapolation (Annex D)

Collector of measured system		Storage tank of measured system	
A_{ref} [m²]		Volume [l]	
η_0		A_{hx} [m²]	
a_1 [W/Km²]		Piping	
a_2 [W/Km²]		$U_{loop,p}$	
IAM (50º)			

Parameters of system tested (ISO 9459-2)

Name of System Configuration Tested	I-O Diagram Parameters and Tank heat loss coeficient			
	a_1 [1/m²]	a_2 [MJ/K]	a_3 [MJ]	U_s [W/K]
SOLARSMART 220	1,05	0,47	1,20	6,03

Draw-off profiles

	H<16 MJ/m²	H≥16 MJ/m²	Mixing Draw-off		H<16 MJ/m²	H≥16 MJ/m²	Mixing Draw-off
V/V_{dep}	$f(V/V_{dep})$	$f(V/V_{dep})$	$g(V/V_{dep})$	V/V_{dep}	$f(V/V_{dep})$	$f(V/V_{dep})$	$g(V/V_{dep})$
0.1	0,62	1,09	1,40	1.6	0,01	0,03	0,07
0.2	0,49	0,86	1,12	1.7	0,01	0,02	0,05
0.3	0,48	0,84	1,13	1.8	0,01	0,03	0,04
0.4	0,47	0,82	1,12	1.9	0,00	0,02	0,03
0.5	0,58	0,95	1,33	2.0	0,00	0,02	0,02
0.6	0,43	0,67	0,96	2.1	0,01	0,02	0,01
0.7	0,37	0,58	0,84	2.2	0,01	0,01	0,01
0.8	0,38	0,59	0,72	2.3	0,01	0,01	0,01
0.9	0,25	0,37	0,73	2.4	0,01	0,01	0,01
1.0	0,19	0,30	0,46	2.5	0,01	0,01	0,01
1.1	0,14	0,23	0,36	2.6	0,00	0,01	0,01
1.2	0,12	0,19	0,27	2.7	0,00	0,01	0,01
1.3	0,06	0,12	0,21	2.8	0,00	0,01	0,01
1.4	0,04	0,07	0,18	2.9	0,00	0,01	0,01
1.5	0,03	0,06	0,10	3.0	0,00	0,00	0,00

Testing Laboratory	ENEA - Centro Ricerche Trisaia
Website	http://www.trisaia.enea.it
Test report id. number	RP.2016.SYS.191.1
Date of test report	2016-12-15
Test method	ISO 9459-2 (CSTG)

Comments of test lab

Data regarding draw-off profiles refer to gross area (A_G= 2.77 m²) of the system configuration tested.

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All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	16355 Rev.0
Annex to Solar KEYMARK Certificate			Issued	2019-07-19

Company	Immergas S.p.A.		Country	Italy	
Brand (optional)			Website	www.immergas.com	
Street	Via Cisa Ligure, 95		E-mail	consulenza@immergas.com	
Postal Code	42041	Brescello (RE)	Tel. / Fax	+39	522689011

System family overview

Collector name	For each storage and collector size, give number of collectors			
	SOLARSMART 110	SOLARSMART 150	SOLARSMART 220	SOLARSMART 260
SOLARSMART 110	1			
SOLARSMART 150		1		
SOLARSMART 220			1	
SOLARSMART 260				1

Name of system configuration				Storage name	
				SOLARSMART 110	
Collector name	SOLARSMART 110	No. Collectors	1	Storage name	SOLARSMART 110

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 80 l				Daily drawoff 110 l				Daily drawoff 140 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE		4461	1829		0,41	6134	2104		0,34	7808	2186		0,28
WürzburgDE		4278	2013		0,47	5882	2365		0,40	7487	2459		0,33
Davos CH		4840	2663		0,55	6655	3011		0,45	8471	3121		0,37
Athens GR		3325	2466		0,74	4571	3043		0,67	5818	3362		0,58
Optional OP													

Perf. indicators for the table above

Qd,sh	MJ/y	Not relevant for solar domestic hot water system
Qd	MJ/y	Annual heat demand for domestic hot water
QL	MJ/y	Annual heat energy delivered by the solar system
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
$f_{sol}=Q_L/Q_d$	-	Solar fraction

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Optional OP		
	G	1.157	1.230	1.684	1.736			
	Ta,ave	7,5	9,0	3,2	18,5			
	Tc,ave	8,5	10,0	5,4	17,8			
	± ΔTc	6,4	3,0	0,8	7,4			

G	kWh/m²	Annual irradiation South, 45°
Ta,ave	°C	Annual average outdoor air temperature
Tc,ave	°C	Annual average mains cold water temp.
ΔTc	K	Seasonal variation of Tc
Th	45 °C	Desired hot water temperature (mixing valve temperature).

Max. operating press. - collector side	400	kPa	Max. operating press. - tank side	400	kPa

Testing Laboratory	ENEA - Centro Ricerche Trisaia
Website	http://www.trisaia.enea.it
Test report id. number	RP.2016.SYS.191.1
Date of test report	2016-12-15
Test method	ISO 9459-2 (CSTG)

Comments of test lab

Additional test report: RP.2016.SYS.191a.1.

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Dr. Vincenzo Sabatelli

All values are subject to some uncertainty, e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	16355 Rev.0
Annex to Solar KEYMARK Certificate			Issued	2019-07-19

Company	Immergas S.p.A.		Country	Italy	
Brand (optional)			Website	www.immergas.com	
Street	Via Cisa Ligure, 95		E-mail	consulenza@immergas.com	
Postal Code	42041	Brescello (RE)	Tel. / Fax	+39	522689011

System family overview

Collector name	For each storage and collector size, give number of collectors			
	SOLARSMART 110	SOLARSMART 150	SOLARSMART 220	SOLARSMART 260
SOLARSMART 110	1			
SOLARSMART 150		1		
SOLARSMART 220			1	
SOLARSMART 260				1

Name of system configuration				Storage name	SOLARSMART 150
Collector name	SOLARSMART 150	No. Collectors	1		

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 110 l				Daily drawoff 140 l				Daily drawoff 170 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE		6134	2529		0,41	7808	2833		0,36	9481	2947		0,31
WürzburgDE		5882	2782		0,47	7487	3168		0,42	9091	3313		0,36
Davos CH		6655	3682		0,55	8471	4064		0,48	10286	4209		0,41
Athens GR		4571	3401		0,74	5818	4007		0,69	7065	4403		0,62
Optional OP													

Perf. indicators for the table above

Qd,sh	MJ/y	Not relevant for solar domestic hot water system
Qd	MJ/y	Annual heat demand for domestic hot water
QL	MJ/y	Annual heat energy delivered by the solar system
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
$f_{sol}=Q_L/Q_d$	-	Solar fraction

Ref. conditions	Stockholm SE	Würzburg DE	Davos CH	Athens GR	Optional OP		
G	1.157	1.230	1.684	1.736			
Ta,ave	7,5	9,0	3,2	18,5			
Tc,ave	8,5	10,0	5,4	17,8			
± ΔTc	6,4	3,0	0,8	7,4			

G	kWh/m²	Annual irradiation South, 45°
Ta,ave	°C	Annual average outdoor air temperature
Tc,ave	°C	Annual average mains cold water temp.
ΔTc	K	Seasonal variation of Tc
Th	45 °C	Desired hot water temperature (mixing valve temperature).

Max. operating press. - collector side	400	kPa	Max. operating press. - tank side	400	kPa

Testing Laboratory	ENEA - Centro Ricerche Trisaia
Website	http://www.trisaia.enea.it
Test report id. number	RP.2016.SYS.191.1
Date of test report	2016-12-15
Test method	ISO 9459-2 (CSTG)

Comments of test lab	
Additional test report: RP.2016.SYS.191a.1.	ENEA DTE-STSN Dr. Vincenzo Sabatelli

All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	16355 Rev.0
Annex to Solar KEYMARK Certificate			Issued	2019-07-19

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Brand (optional)			Website	www.immergas.com	
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Postal Code	42041	Brescello (RE)	Tel. / Fax	+39	522689011

System family overview

Collector name	For each storage and collector size, give number of collectors			
	SOLARSMART 110	SOLARSMART 150	SOLARSMART 220	SOLARSMART 260
SOLARSMART 110	1			
SOLARSMART 150		1		
SOLARSMART 220			1	
SOLARSMART 260				1

Name of system configuration					SOLARSMART 220	
Collector name	SOLARSMART 220	No. Collectors	1	Storage name	SOLARSMART 220	

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 170 l				Daily drawoff 200 l				Daily drawoff 250 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE		9481	3930		0,41	11154	4252		0,38	13942	4484		0,32
WürzburgDE		9091	4321		0,48	10695	4727		0,44	13369	5037		0,38
Davos CH		10286	5734		0,56	12101	6120		0,51	15126	6405		0,42
Athens GR		7065	5268		0,75	8312	5892		0,71	10390	6621		0,64
Optional OP													

Perf. indicators for the table above

Qd,sh	MJ/y	Not relevant for solar domestic hot water system
Qd	MJ/y	Annual heat demand for domestic hot water
QL	MJ/y	Annual heat energy delivered by the solar system
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
$f_{sol}=Q_L/Q_d$	-	Solar fraction

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Optional OP		
	G	1.157	1.230	1.684	1.736			
	Ta,ave	7,5	9,0	3,2	18,5			
	Tc,ave	8,5	10,0	5,4	17,8			
	± ΔTc	6,4	3,0	0,8	7,4			

G	kWh/m²	Annual irradiation South, 45°
Ta,ave	°C	Annual average outdoor air temperature
Tc,ave	°C	Annual average mains cold water temp.
ΔTc	K	Seasonal variation of Tc
Th	45 °C	Desired hot water temperature (mixing valve temperature).

Max. operating press. - collector side	400	kPa	Max. operating press. - tank side	400	kPa

Testing Laboratory	ENEA - Centro Ricerche Trisaia
Website	http://www.trisaia.enea.it
Test report id. number	RP.2016.SYS.191.1
Date of test report	2016-12-15
Test method	ISO 9459-2 (CSTG)

Comments of test lab

Additional test report: RP.2016.SYS.191a.1.

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Dr. Vincenzo Sabatelli

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	16355 Rev.0
Annex to Solar KEYMARK Certificate			Issued	2019-07-19

Company	Immergas S.p.A.		Country	Italy	
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Postal Code	42041	Brescello (RE)	Tel. / Fax	+39	522689011

System family overview

Collector name	For each storage and collector size, give number of collectors			
	SOLARSMART 110	SOLARSMART 150	SOLARSMART 220	SOLARSMART 260
SOLARSMART 110	1			
SOLARSMART 150		1		
SOLARSMART 220			1	
SOLARSMART 260				1

Name of system configuration				Storage name	
Collector name	SOLARSMART 260	No. Collectors	1		SOLARSMART 260

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 200 l				Daily drawoff 250 l				Daily drawoff 300 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE		11154	4642		0,42	13942	5097		0,37	16730	5283		0,32
WürzburgDE		10695	5101		0,48	13369	5693		0,43	16043	5932		0,37
Davos CH		12101	6760		0,56	15126	7318		0,48	18151	7544		0,42
Athens GR		8312	6215		0,75	10390	7178		0,69	12468	7845		0,63
Optional OP													

Perf. indicators for the table above		
Qd,sh	MJ/y	Not relevant for solar domestic hot water system
Qd	MJ/y	Annual heat demand for domestic hot water
QL	MJ/y	Annual heat energy delivered by the solar system
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
$f_{sol}=Q_L/Q_d$	-	Solar fraction

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Optional OP		
	G	1.157	1.230	1.684	1.736			
	Ta,ave	7,5	9,0	3,2	18,5			
	Tc,ave	8,5	10,0	5,4	17,8			
	± ΔTc	6,4	3,0	0,8	7,4			

G	kWh/m²	Annual irradiation South, 45°
Ta,ave	°C	Annual average outdoor air temperature
Tc,ave	°C	Annual average mains cold water temp.
ΔTc	K	Seasonal variation of Tc
Th	45 °C	Desired hot water temperature (mixing valve temperature).

Max. operating press. - collector side	400	kPa	Max. operating press. - tank side	400	kPa

Testing Laboratory	ENEA - Centro Ricerche Trisaia
Website	http://www.trisaia.enea.it
Test report id. number	RP.2016.SYS.191.1
Date of test report	2016-12-15
Test method	ISO 9459-2 (CSTG)

Comments of test lab

Additional test report: RP.2016.SYS.191a.1.

ENEA
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Version 4.5, 2017-10-24