BMTRADA

Fire Resistance Testing

Sponsor:

AFP Air Tech Ltd
15 Lime Tree Walk
Sevenoaks
Kent
TN13 1YH

CONFIDENTIAL

Report: BMT/FEI/F15056
A fire resistance test performed on an air transfer grille within a blockwork wall
Test conducted to BS EN 1363-1: 2012 and BS EN 1364-1: 1999

Test date: 2nd June 2015

1762

Contents

1 Introduction

An air transfer grille vent was delivered to BM TRADA on 1st June 2015 for testing to evaluate its resistance to fire within a masonry wall construction. BM TRADA constructed a blockwork supporting construction and fitted the specimen into a prepared aperture in the wall.

2 Specimen verification

The component parts of the vent were identified based on nominal information supplied by the client. The conformity of the specimen has been verified by the laboratory in so far as the structure of the specimen allowed verification to take place.

3 Description of supporting construction

The supporting construction consisted of 140mm thick aerated autoclaved concrete blocks build within a 1.5m x 1.5m refractory lined steel restraint frame built in accordance with BS EN 1363-1: 2012. An aperture of 1050mm wide x 1050mm high x 140mm deep was built into the wall to accept the test specimen.

4 Description of specimen

Drawings of the specimen are shown in Appendix 1. All measurements are in mm and the descriptions are written viewing the specimen from the unexposed face unless stated otherwise.

Air transfer grille (referenced AFP Air Tech Ltd SHX UN 1000 Thermoflow)
(see Appendix, and client drawing SHX UN 1000 Main Ass.)

The air transfer grille vent comprised powder coated 1.5mm thick profiled steel frame and measured 1120mm high x 1120mm wide x 121.2mm deep, with a 60mm wide flange on the vertical edges and a 47mm wide flange on the horizontal edges, fixed to the unexposed face of the wall with 60mm long masonry fixings at each corner and centrally spaced between. The flange was sealed to the wall with Lorient Polyproducts Ltd acrylic intumescent mastic.

On the exposed face, a powder coated 1.2mm thick profiled steel flanged aperture liner was fitted, fixed to the exposed face of the wall with 60mm long masonry fixings at each corner and centrally spaced between. The flange was sealed to the wall with Lorient Polyproducts Ltd acrylic intumescent mastic. The liner measured 1120mm high x 1120mm wide x 121.2mm deep.

The air transfer grille vent comprised 10No. 100mm high x 1000mm wide x 1.0mm thick powder coated profiled steel, pivoting, interlocking blades fitted horizontally across the vent (see photograph). Each blade was constructed from two 1mm thick powder coated profiled steel sections fixed together with 4mmØ stainless steel 'pop' rivets. A powder coated 10mm high x 10mm wide steel bar was riveted along the top of the blade.

On the unexposed face, the air transfer grille vent side framing comprised a powder coated 106.2mm deep x 20mm wide profiled steel box section containing the blade pivots and stops for the ten blades. A 1mm thick powder coated profiled steel 'L' section strip was riveted to the top and bottom framing to provide stops for the top and bottom vent blades.

The vent was installed with the blades opening in towards the furnace.

5 Photographs

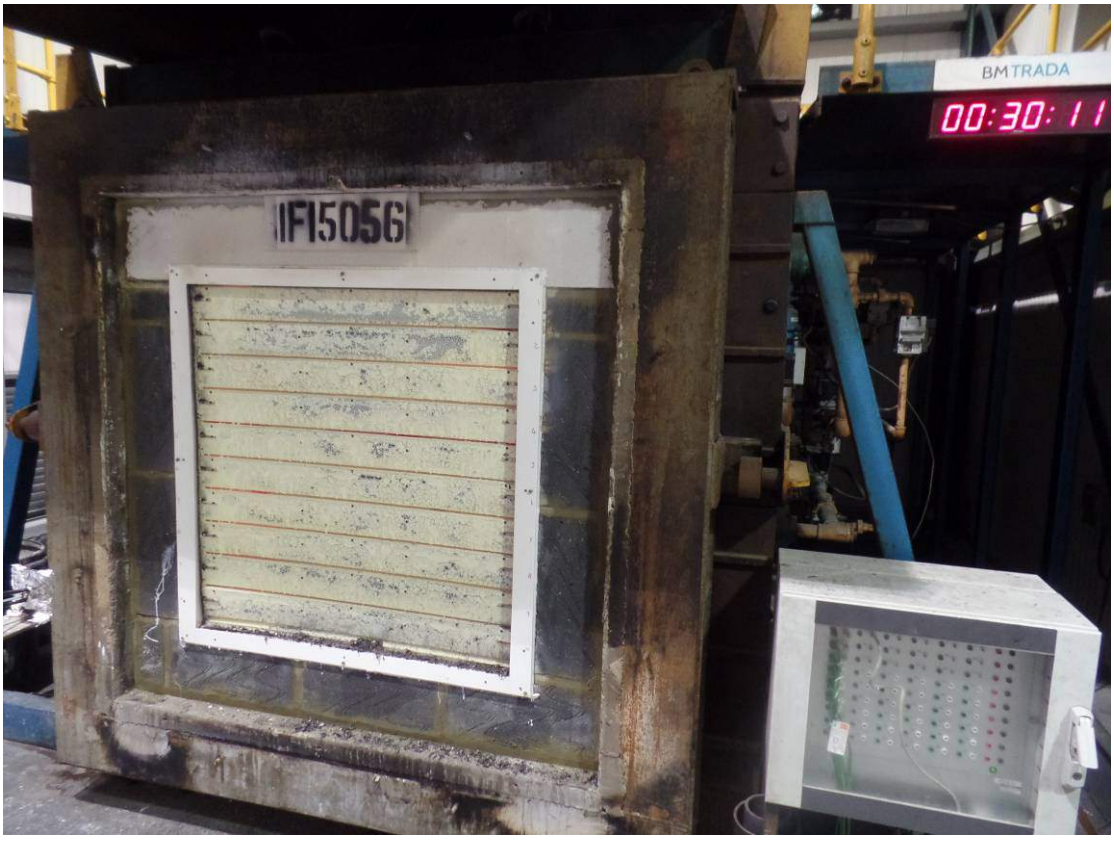
Unexposed face showing vent blades in open position

Exposed face of vent prior to testing

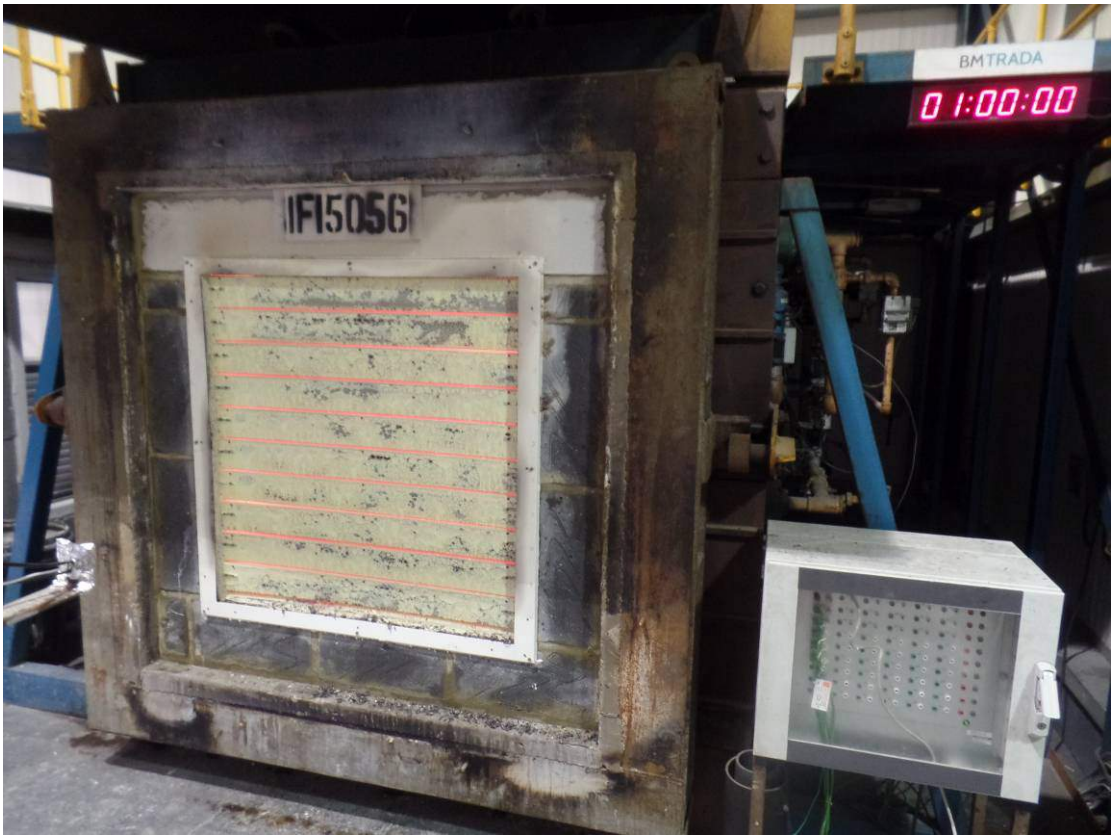
At start of test

After 15 minutes

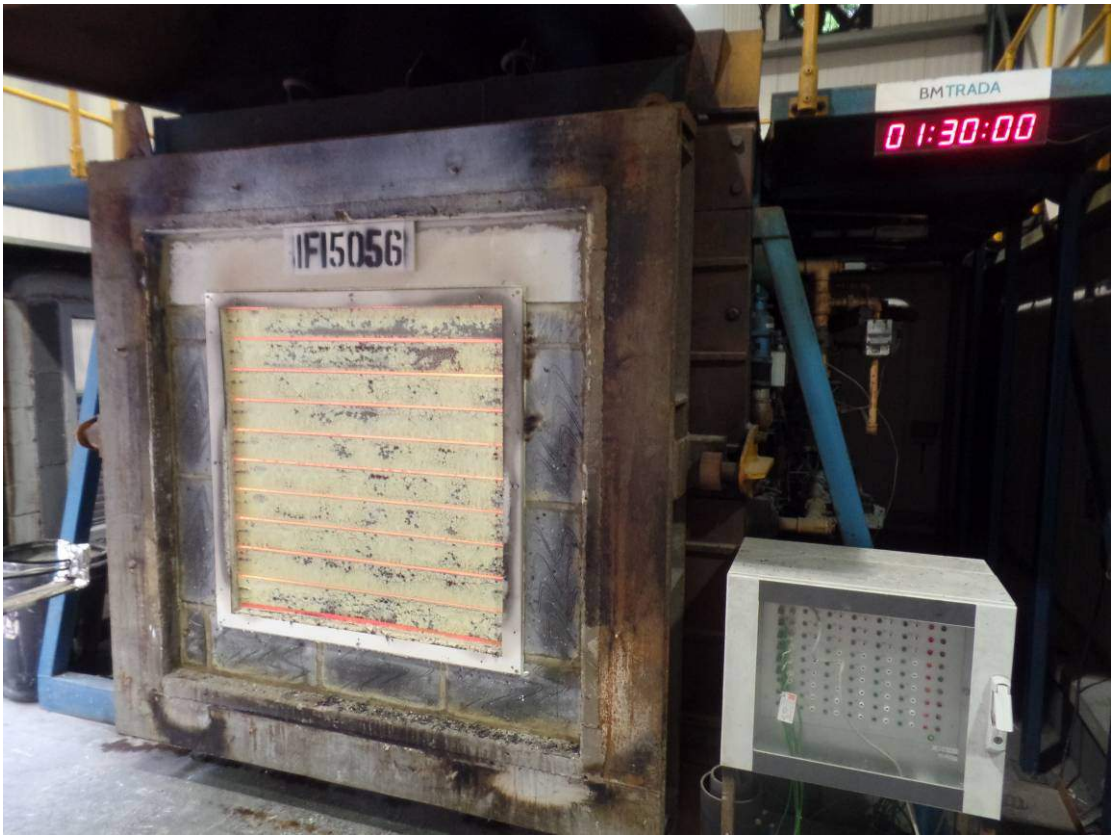
After 30 minutes



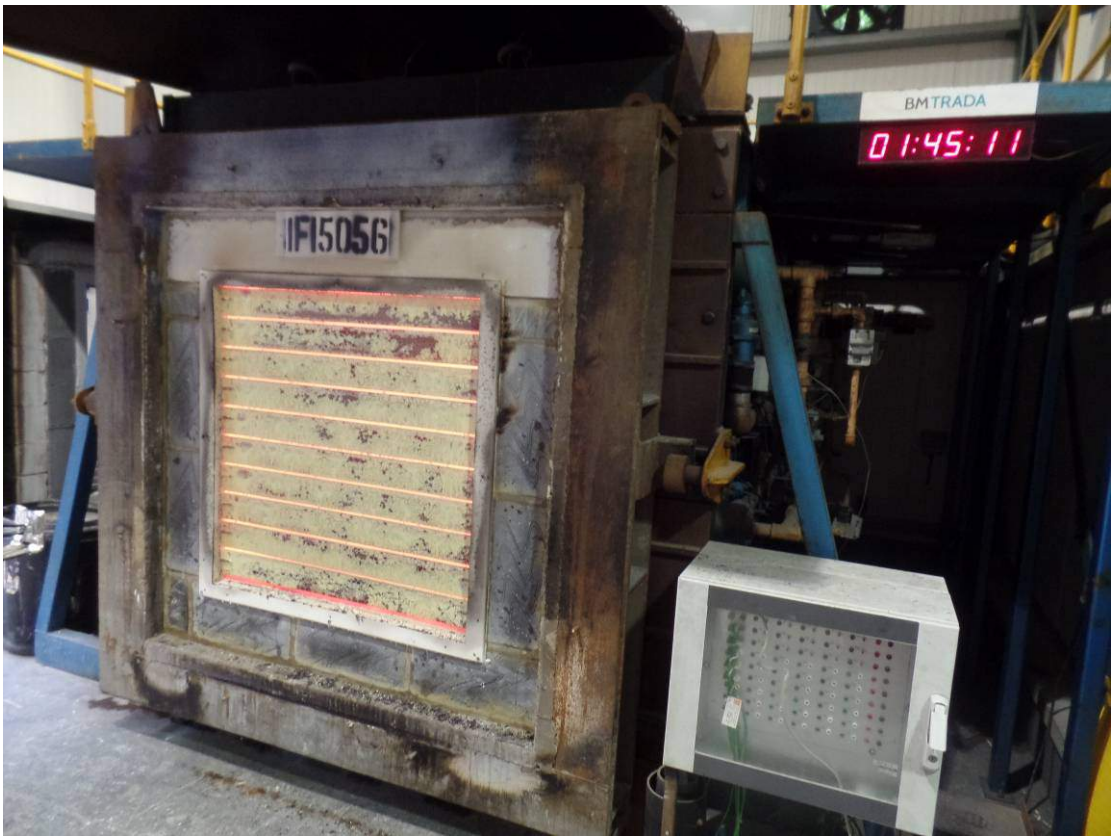
At 60 minutes



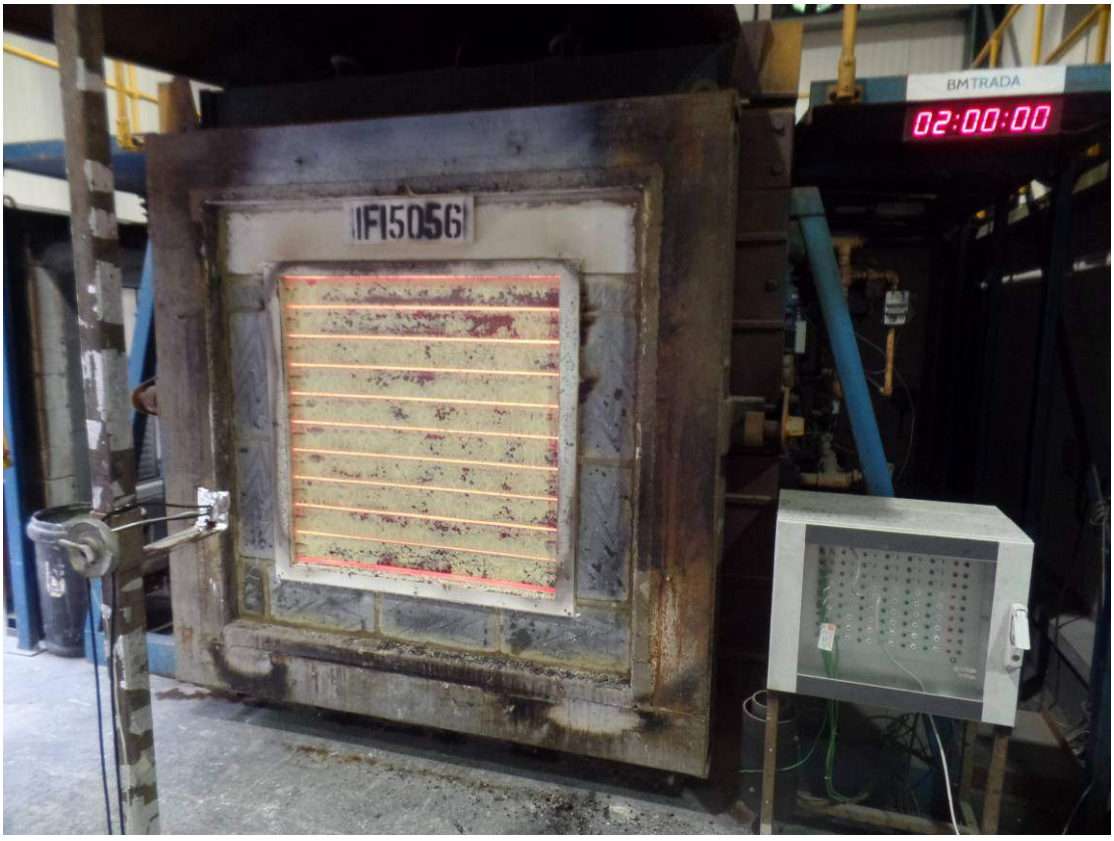
At 90 minutes



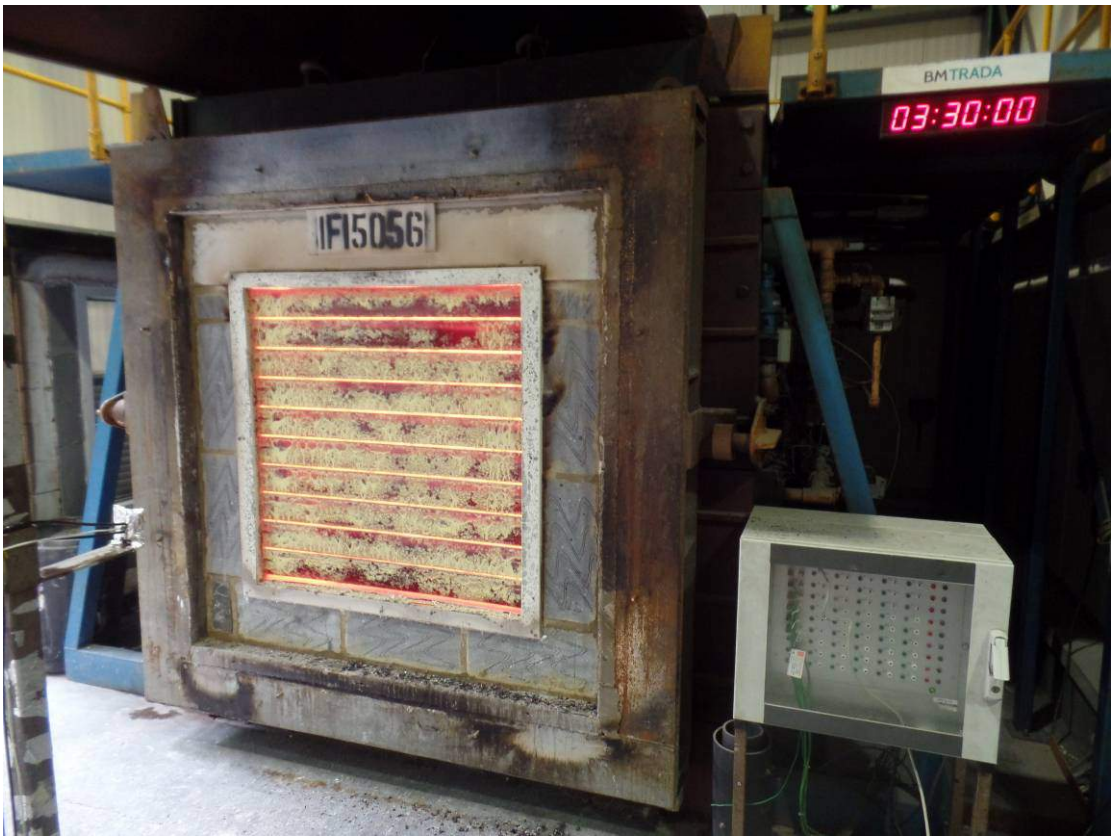
After 105 minutes



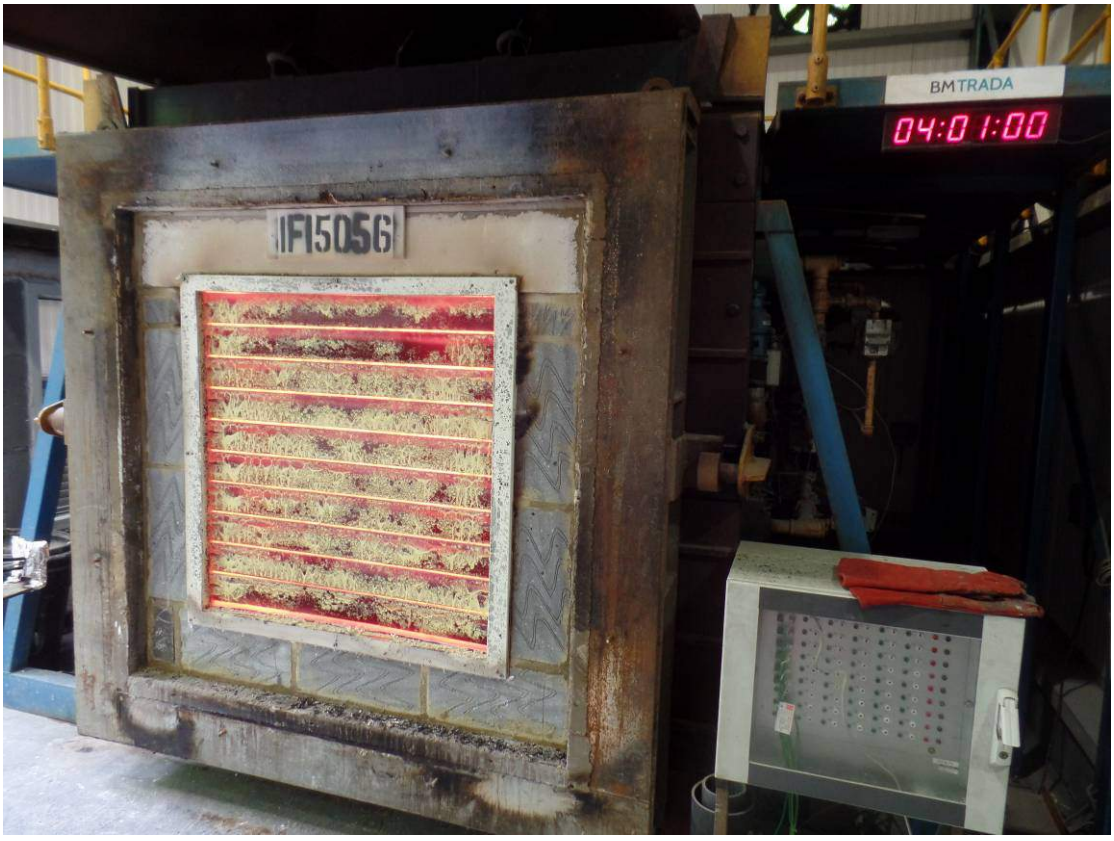
At 120 minutes



At 210 minutes



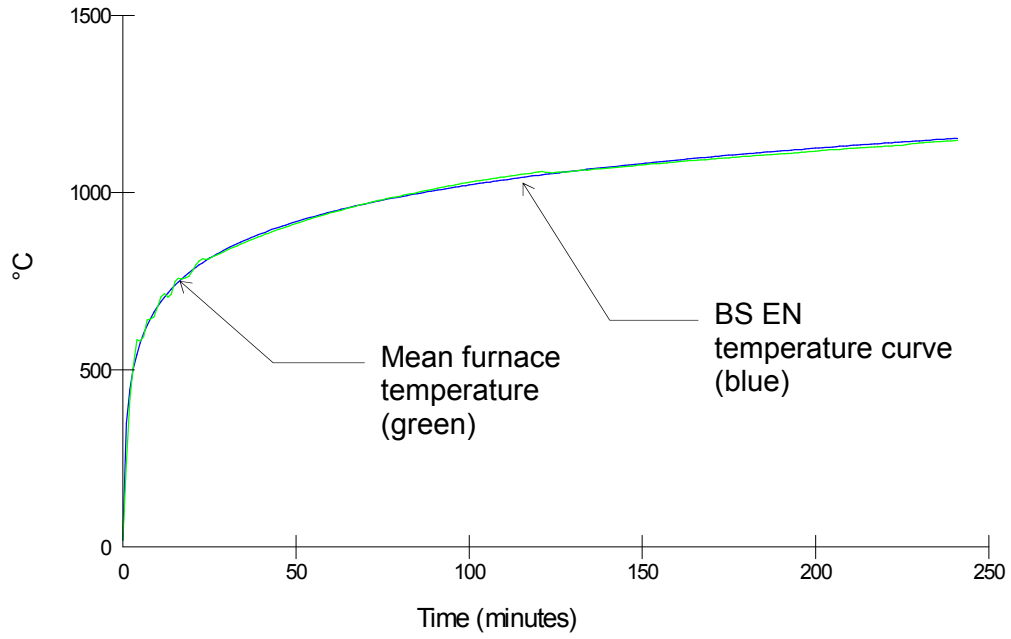
After 241 minutes

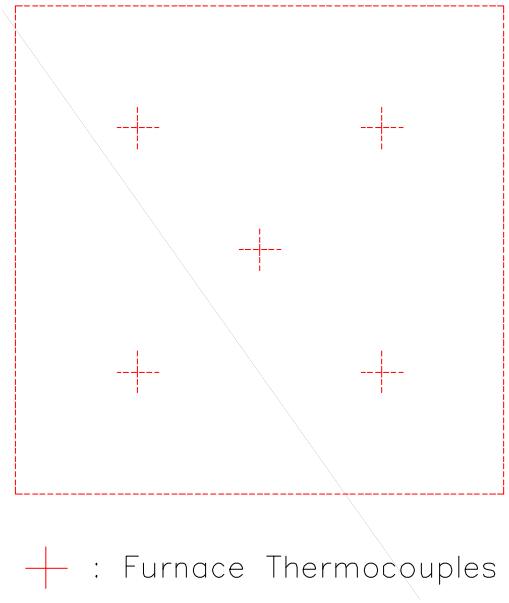


6 Test conditions

6.1 Furnace temperature

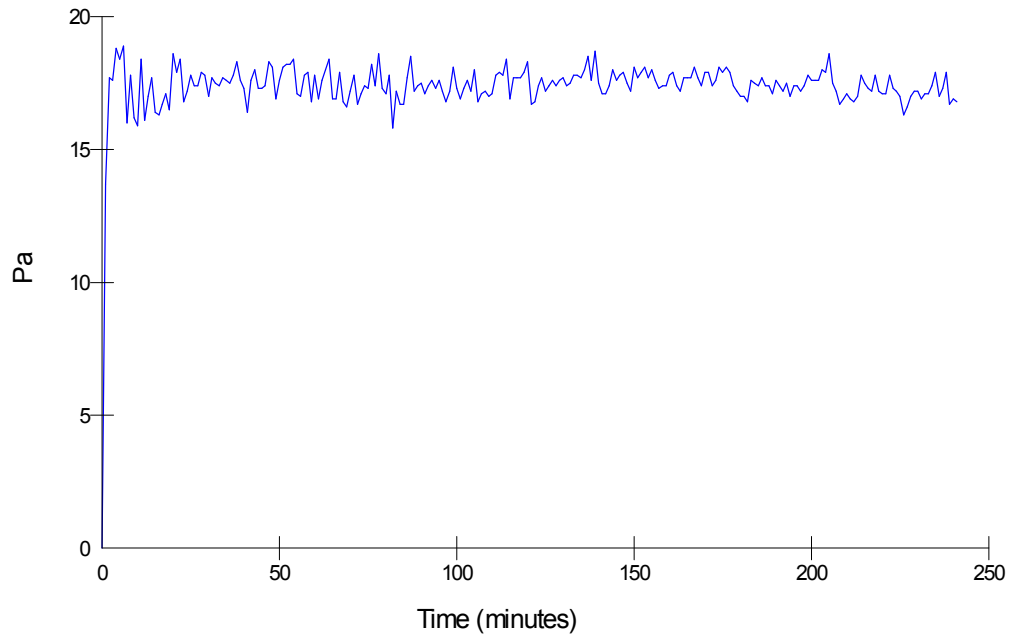
The furnace was controlled to follow the temperature/time relationship specified in BS EN 1363: Part 1: 2012 Section 5.1.1 as closely as possible, using the average of five plate thermometers suitably distributed within the furnace. The temperatures recorded have been tabulated in Appendix 2 and are shown graphically below:





6.2 Pressure readings

After the first 5 minutes of the test, the furnace pressure was maintained at 18 ± 2 Pa with respect to atmosphere, equating to 20Pa at the head of the specimen.



6.3 Ambient temperature

The ambient temperature of the test area at commencement of test was 19°C.

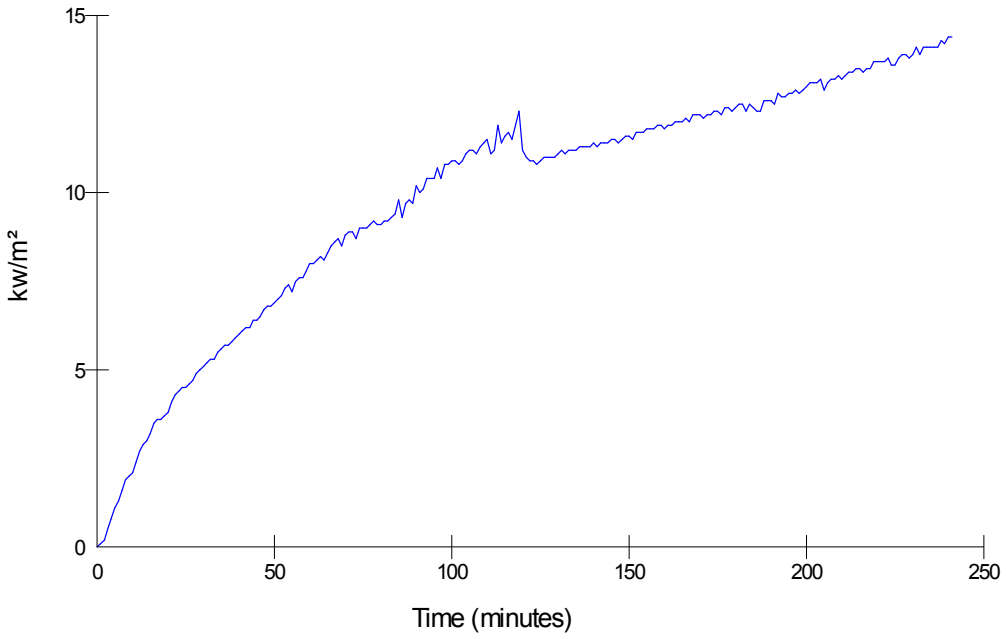
6.4 Thermocouple positions

At the client's request, no thermocouples were attached to the specimen.

6.5 Radiation

A radiometer was used to measure the radiation 1m away from the specimen.

The results of the radiometer are shown graphically below:



7 Observations

All comments relate to the unexposed face unless otherwise specified, (reference to clients drawings in Appendix 1).

Time (minutes)	Comments
00.00	Test started.
01:54	There is smoke issuing from the perimeter of the vent.
02:15	There is smoke issuing from the vent blades.
03:15	There is an increase in smoke issuing from between the vent blades.
03:40	There is discolouration to all 10 vent blades.
04:40	There is further discolouration to the top 5 vent blades.
05:30	There is discolouration to the frame.
06:30	There is further discolouration to the bottom 5 vent blades.
07:00	Unexposed face, paint on all the vent blades is beginning to bubble.
10:00	Unexposed face, the paint on vent blades 1-7 is starting to burn away.
12:00	Unexposed face, the paint on blades 8-10 is starting to burn away.
15:00	All blades are now fully discoloured.
19:07	Blades 5-8 are beginning to glow at the left side.
20:30	The entirety of the paint on the unexposed face has now burnt away.
22:30	There is a glow at the top left corner.
24:20	The paint on the frame is starting to bubble and burn away.
26:15	All blades are now glowing at both the left and right sides.
27:00	There is smoke issuing from the right side of frame where there is deflection between blades 3 & 4.
30:00	There is discolouration to the frame.
45:00	No visual change.
60:00	No visual change.
75:00	No visual change.
90:00	No visual change.

105:00	No visual change.
120:00	No visual change.
135:00	No visual change.
150:00	No visual change.
165:00	No visual change.
180:00	No visual change.
195:00	No visual change.
210:00	No visual change.
225:00	No visual change.
240:00	No visual change.
241:00	Test terminated.

8 Expression of results

Overall performance

Integrity Cotton pad Continuous flaming Gap gauges	 241 (two hundred and forty one) minutes* 241 (two hundred and forty one) minutes* 241 (two hundred and forty one) minutes*
Insulation	0 (zero) minutes
Radiation – time to 15kW/m^2	241 (two hundred and forty one) minutes*

* Failure criteria was not achieved upon termination of the test at 241 minutes

9 Limitations

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outline in EN 1363-1, and where appropriate EN 1363-2. Any significant deviation with respect to size, construction details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.
The results only relate to the behaviour of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires.
The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over 5 years old should be considered by the user. BM TRADA will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

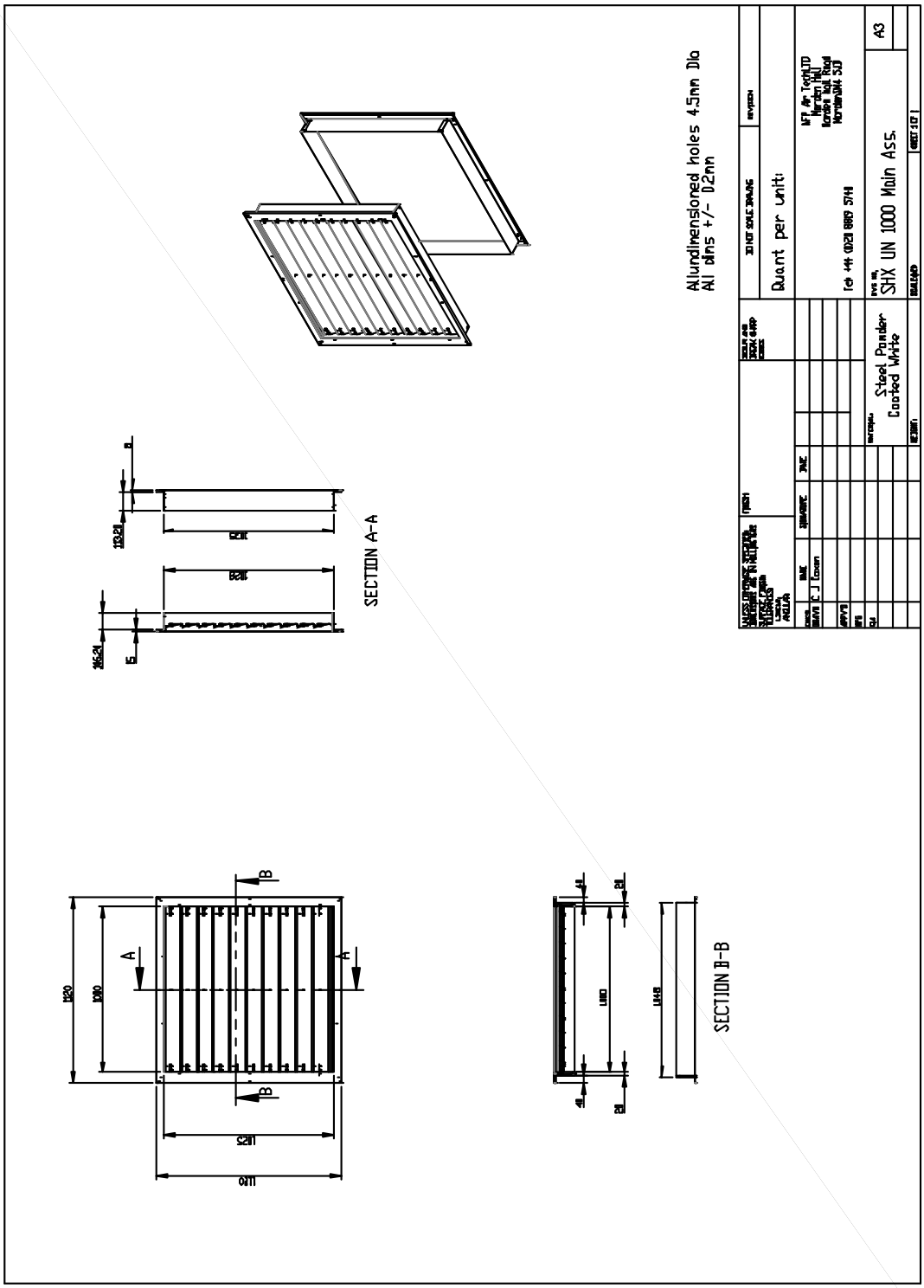
Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

	Written by:	**Checked and authorised by:**
Signature:		
Name:	Ashley Babb	Mark Cummings
Title:	Senior Technical Officer	Deputy Technical Manager
Date of issue:	20th July 2015	20th July 2015

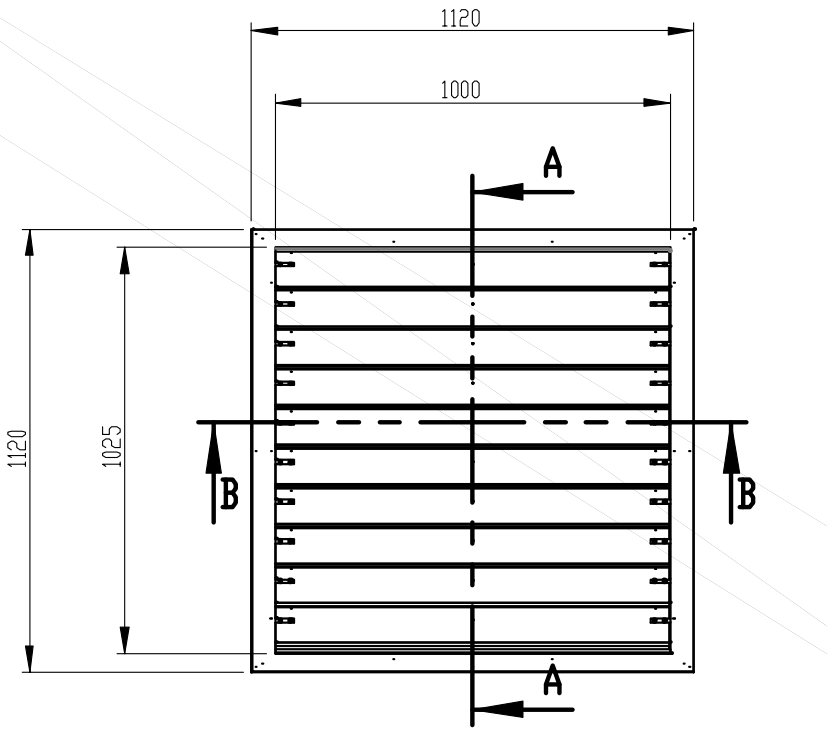
10 Field of direct application of test results

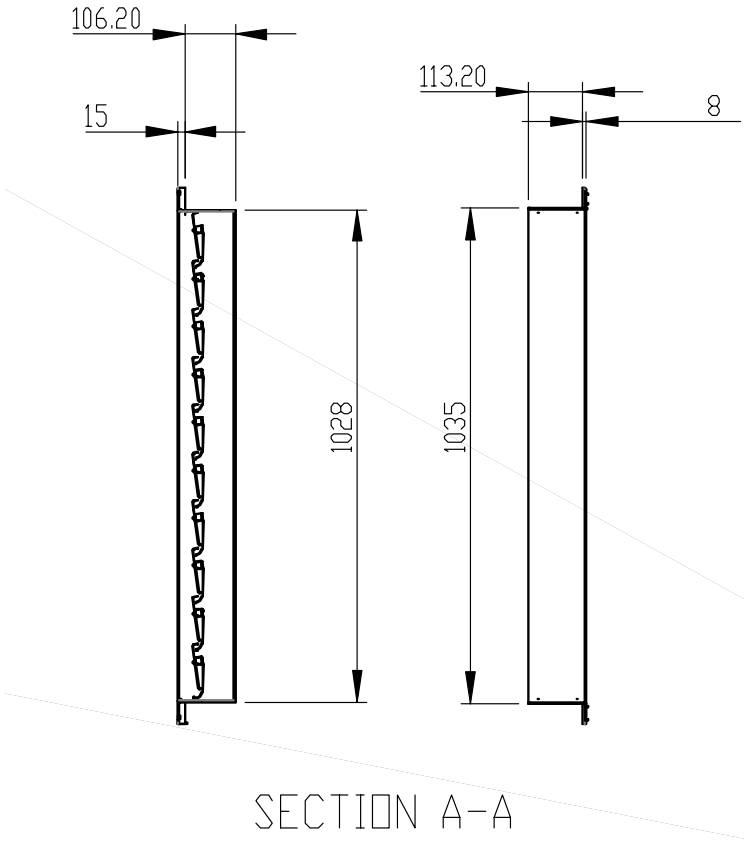
The results of the test are directly applicable to similar constructions where one or more of the changes listed in BS EN 1634-1: 2014, Clause 13, are made and the construction continues to comply with that appropriate design code for its stiffness and stability. Other changes are not permitted by the document. A copy of the field of direct application is available from BM TRADA upon request

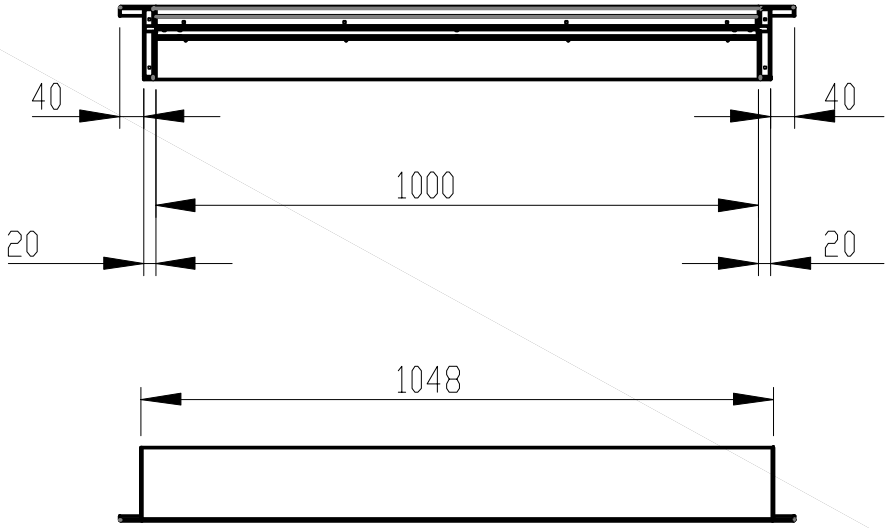
Appendix 1 – clients drawing



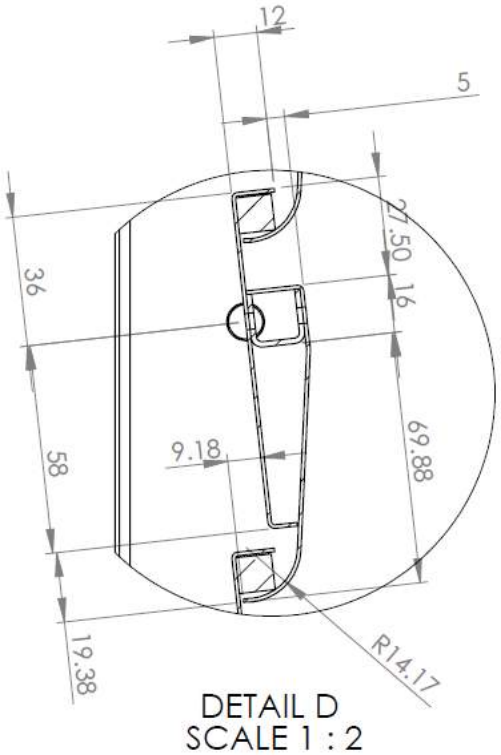
Expanded cross section views



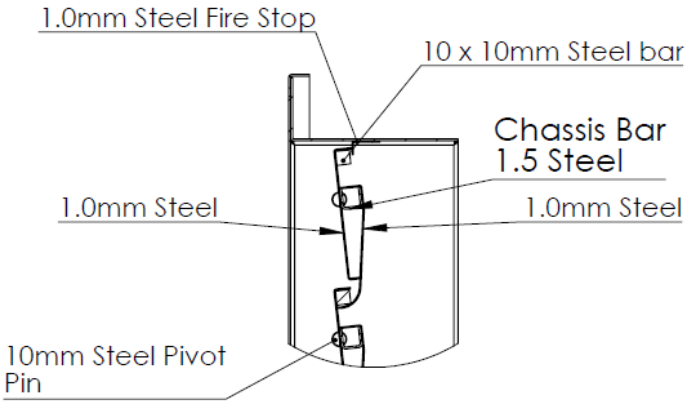




SECTION B-B



DETAIL D
SCALE 1 : 2



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Appendix 2 - raw test data (5 pages)

Furnace thermocouples

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
0	0	23	23	23	22	22	19	0
1	13.7	240	231	291	191	229	19	0.1
2	17.7	456	419	446	378	391	19	0.2
3	17.6	549	507	522	473	475	19	0.5
4	18.8	625	592	604	551	557	19	0.8
5	18.4	635	590	588	553	545	19	1.1
6	18.9	638	602	602	565	566	19	1.3
7	16	681	652	653	610	613	19	1.6
8	17.8	686	651	649	618	616	19	1.9
9	16.2	688	655	653	627	623	19	2
10	15.9	702	681	690	650	657	19	2.1
11	18.4	719	711	727	680	694	19	2.4
12	16.1	730	720	732	691	702	19	2.7
13	17	732	712	715	682	688	19	2.9
14	17.7	736	718	727	688	699	19	3
15	16.4	762	756	761	725	743	19	3.2
16	16.3	773	764	771	735	748	19	3.5
17	16.7	769	763	769	734	747	19	3.6
18	17.1	772	765	772	738	750	19	3.6
19	16.5	776	769	777	745	756	19	3.7
20	18.6	786	782	791	758	770	19	3.8
21	17.9	807	804	804	777	792	19	4.1
22	18.4	820	816	811	788	804	20	4.3
23	16.8	823	820	820	794	810	20	4.4

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
24	17.2	826	818	817	795	807	20	4.5
25	17.8	826	821	819	797	810	20	4.5
26	17.4	833	827	824	802	815	20	4.6
27	17.4	838	830	827	807	820	20	4.7
28	17.9	838	833	834	813	825	20	4.9
29	17.8	844	836	837	815	829	20	5
30	17	849	843	840	823	835	20	5.1
31	17.7	850	846	848	827	839	20	5.2
32	17.5	856	851	852	831	843	20	5.3
33	17.4	859	855	856	836	847	20	5.3
34	17.7	864	859	860	843	853	20	5.5
35	17.6	865	863	866	847	855	20	5.6
36	17.5	872	867	867	850	859	20	5.7
37	17.8	875	871	873	854	863	20	5.7
38	18.3	879	874	876	859	867	20	5.8
39	17.6	884	878	880	865	872	21	5.9
40	17.3	888	884	878	868	876	21	6
41	16.4	890	886	887	873	882	21	6.1
42	17.6	895	889	890	873	882	21	6.2
43	18	898	894	894	878	887	21	6.2
44	17.3	900	897	897	883	890	21	6.4
45	17.3	903	899	899	887	895	21	6.4
46	17.4	905	902	905	890	897	21	6.5
47	18.3	909	907	907	894	902	21	6.7

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
48	18.1	908	910	910	898	904	21	6.8
49	16.9	917	915	912	900	908	21	6.8
50	17.6	919	917	916	903	910	21	6.9
51	18.1	921	920	920	906	915	21	7
52	18.2	923	922	923	911	918	21	7.1
53	18.2	925	926	928	915	922	22	7.3
54	18.4	928	930	930	919	924	22	7.4
55	17.1	934	932	933	922	927	22	7.2
56	17	936	935	935	924	931	22	7.5
57	17.8	938	936	939	928	935	22	7.6
58	17.9	939	940	940	930	937	22	7.6
59	16.8	942	941	945	932	940	22	7.8
60	17.8	945	944	949	937	943	22	8
61	16.9	946	946	951	940	946	22	8
62	17.6	950	951	954	940	949	22	8.1
63	18	952	952	955	943	950	23	8.2
64	18.4	953	953	960	949	954	23	8.1
65	16.9	952	957	963	953	958	23	8.3
66	16.9	956	962	967	954	960	23	8.5
67	17.9	958	962	970	957	962	23	8.6
68	16.8	960	965	972	960	964	23	8.7
69	16.6	962	968	976	963	968	23	8.5
70	17.2	964	969	977	965	970	23	8.8
71	17.8	967	971	978	968	972	23	8.9
72	16.7	969	974	982	971	976	23	8.9
73	17.1	973	977	982	972	977	23	8.7
74	17.4	974	979	987	977	980	24	9
75	17.3	975	980	988	978	983	24	9
76	18.2	978	983	991	981	986	24	9

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
77	17.4	981	986	991	982	987	24	9.1
78	18.6	982	986	995	984	988	24	9.2
79	17.3	984	987	996	987	990	24	9.1
80	17.1	985	990	999	987	993	24	9.1
81	17.8	987	993	1001	991	994	24	9.2
82	15.8	989	994	1003	992	997	24	9.2
83	17.2	991	996	1005	994	999	24	9.3
84	16.7	993	998	1005	995	1000	25	9.4
85	16.7	994	999	1007	999	1002	25	9.8
86	17.7	997	1003	1010	1001	1004	25	9.3
87	18.5	999	1005	1012	1002	1008	25	9.7
88	17.2	1001	1006	1013	1007	1010	25	9.8
89	17.4	1006	1010	1015	1005	1010	25	9.7
90	17.5	1005	1010	1018	1010	1014	25	10.2
91	17.1	1008	1013	1020	1011	1016	25	10
92	17.4	1009	1015	1022	1013	1017	25	10.1
93	17.6	1012	1017	1023	1016	1019	25	10.4
94	17.3	1014	1018	1025	1017	1022	25	10.4
95	17.6	1015	1020	1026	1019	1023	25	10.4
96	17.2	1017	1023	1029	1020	1024	26	10.7
97	16.8	1019	1024	1029	1023	1027	26	10.4
98	17.2	1021	1027	1032	1023	1027	26	10.8
99	18.1	1023	1027	1034	1027	1030	26	10.8
100	17.3	1023	1028	1035	1028	1032	26	10.9
101	16.9	1027	1031	1037	1029	1034	26	10.9
102	17.3	1026	1032	1039	1032	1036	26	10.8
103	17.6	1029	1033	1040	1032	1036	26	10.9
104	17.2	1030	1035	1041	1035	1039	26	11.1
105	18	1033	1037	1043	1036	1040	26	11.2

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
106	16.8	1034	1039	1044	1038	1041	26	11.2
107	17.1	1036	1040	1045	1039	1043	26	11.1
108	17.2	1037	1041	1047	1040	1044	26	11.3
109	17	1039	1043	1049	1044	1047	26	11.4
110	17.1	1039	1044	1050	1044	1047	26	11.5
111	17.8	1041	1046	1052	1045	1049	27	11.1
112	17.9	1041	1047	1053	1047	1049	27	11.2
113	17.8	1045	1048	1055	1049	1052	27	11.9
114	18.4	1045	1048	1055	1048	1054	27	11.4
115	16.9	1045	1051	1058	1053	1055	27	11.6
116	17.7	1047	1052	1059	1053	1055	27	11.7
117	17.7	1049	1053	1059	1053	1057	27	11.5
118	17.7	1050	1054	1060	1055	1060	27	11.9
119	17.9	1052	1056	1062	1057	1061	27	12.3
120	18.3	1052	1057	1062	1058	1061	27	11.2
121	16.7	1053	1059	1066	1061	1063	27	11
122	16.8	1052	1055	1062	1056	1060	27	10.9
123	17.4	1053	1057	1063	1054	1059	27	10.9
124	17.7	1053	1055	1061	1055	1059	27	10.8
125	17.2	1054	1057	1062	1054	1060	28	10.9
126	17.4	1054	1057	1062	1057	1060	28	11
127	17.6	1054	1057	1063	1058	1062	28	11
128	17.4	1056	1057	1062	1057	1061	28	11
129	17.6	1056	1059	1064	1057	1062	28	11
130	17.7	1057	1058	1064	1059	1063	28	11.1
131	17.4	1059	1061	1067	1059	1064	28	11.2
132	17.5	1059	1063	1067	1061	1065	28	11.1
133	17.8	1059	1063	1068	1064	1068	28	11.2
134	17.8	1059	1062	1068	1063	1067	28	11.2

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
135	17.7	1062	1065	1070	1063	1068	28	11.2
136	18	1062	1064	1070	1065	1069	28	11.3
137	18.5	1063	1066	1071	1067	1070	28	11.3
138	17.6	1063	1066	1072	1067	1071	28	11.3
139	18.7	1063	1067	1072	1068	1071	28	11.3
140	17.5	1064	1068	1074	1069	1072	28	11.4
141	17.1	1065	1069	1075	1071	1074	28	11.3
142	17.1	1067	1070	1076	1071	1074	28	11.4
143	17.4	1068	1071	1076	1071	1075	28	11.4
144	18	1069	1071	1077	1073	1077	28	11.4
145	17.6	1071	1073	1077	1072	1077	28	11.5
146	17.8	1070	1073	1079	1075	1078	28	11.5
147	17.9	1071	1075	1080	1074	1079	28	11.4
148	17.5	1073	1074	1080	1077	1080	29	11.5
149	17.2	1073	1076	1082	1078	1081	29	11.6
150	18.1	1073	1077	1082	1079	1082	29	11.6
151	17.7	1074	1078	1083	1079	1083	29	11.5
152	17.9	1075	1080	1085	1081	1084	29	11.7
153	18.1	1077	1080	1087	1081	1085	29	11.7
154	17.7	1077	1081	1087	1082	1086	29	11.7
155	18	1077	1082	1086	1083	1086	29	11.8
156	17.6	1078	1081	1087	1084	1086	29	11.8
157	17.3	1079	1083	1088	1086	1088	29	11.8
158	17.4	1080	1084	1089	1085	1088	29	11.9
159	17.4	1080	1085	1089	1086	1089	29	11.9
160	17.8	1082	1086	1091	1088	1091	29	11.8
161	17.9	1082	1087	1093	1088	1092	29	11.9
162	17.4	1084	1088	1094	1088	1092	29	11.9
163	17.2	1085	1088	1094	1089	1094	29	12

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
164	17.7	1086	1090	1095	1091	1094	29	12
165	17.7	1088	1090	1095	1090	1095	29	12
166	17.7	1088	1091	1096	1092	1096	30	12.1
167	18.1	1089	1091	1096	1094	1097	30	12
168	17.7	1089	1092	1096	1093	1097	30	12.2
169	17.4	1089	1092	1098	1095	1098	30	12.2
170	17.9	1089	1093	1099	1095	1099	30	12.2
171	17.9	1090	1094	1099	1097	1099	30	12.1
172	17.4	1091	1095	1101	1098	1101	30	12.2
173	17.6	1092	1096	1101	1098	1101	30	12.2
174	18.1	1093	1097	1103	1098	1102	30	12.3
175	17.9	1093	1096	1102	1100	1102	30	12.3
176	18.1	1095	1098	1103	1100	1104	30	12.2
177	17.9	1095	1098	1104	1101	1105	31	12.4
178	17.4	1096	1100	1105	1102	1106	30	12.4
179	17.2	1096	1101	1106	1103	1106	30	12.3
180	17	1098	1101	1106	1103	1106	30	12.4
181	17	1098	1101	1106	1105	1107	31	12.5
182	16.8	1099	1102	1108	1105	1108	31	12.5
183	17.6	1101	1104	1109	1104	1108	31	12.3
184	17.5	1101	1104	1109	1106	1109	31	12.5
185	17.4	1101	1105	1111	1107	1110	31	12.4
186	17.7	1103	1105	1109	1108	1111	31	12.3
187	17.4	1103	1106	1110	1107	1111	31	12.3
188	17.4	1104	1107	1111	1109	1112	31	12.6
189	17.1	1105	1108	1112	1109	1112	31	12.6
190	17.6	1106	1109	1112	1110	1114	31	12.6
191	17.4	1106	1108	1114	1111	1114	31	12.5
192	17.2	1106	1109	1113	1112	1115	31	12.8

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
193	17.5	1108	1110	1115	1111	1115	31	12.7
194	17	1108	1112	1115	1114	1116	31	12.7
195	17.4	1108	1112	1117	1114	1117	32	12.8
196	17.4	1109	1112	1118	1114	1118	31	12.8
197	17.2	1110	1112	1118	1116	1118	32	12.9
198	17.4	1111	1114	1119	1116	1120	31	12.8
199	17.8	1112	1115	1119	1116	1120	31	12.9
200	17.6	1112	1115	1120	1118	1121	31	13
201	17.6	1114	1116	1121	1119	1122	31	13.1
202	17.6	1114	1118	1123	1121	1124	31	13.1
203	18	1115	1118	1124	1121	1124	31	13.1
204	17.9	1116	1119	1124	1121	1125	31	13.2
205	18.6	1116	1120	1124	1122	1126	31	12.9
206	17.5	1118	1120	1125	1122	1125	31	13.1
207	17.2	1118	1121	1126	1123	1126	31	13.2
208	16.7	1119	1122	1126	1124	1127	31	13.2
209	16.9	1119	1123	1127	1125	1128	31	13.3
210	17.1	1120	1123	1128	1125	1129	31	13.2
211	16.9	1120	1122	1129	1126	1129	31	13.3
212	16.8	1121	1123	1130	1127	1130	31	13.4
213	17	1122	1125	1129	1128	1131	31	13.4
214	17.8	1123	1125	1129	1128	1132	31	13.5
215	17.5	1124	1126	1131	1128	1132	31	13.5
216	17.3	1123	1128	1132	1130	1134	31	13.4
217	17.2	1126	1127	1132	1130	1133	32	13.5
218	17.8	1126	1128	1133	1131	1134	31	13.5
219	17.2	1126	1129	1133	1131	1135	32	13.7
220	17.1	1127	1129	1134	1131	1135	32	13.7
221	17.1	1127	1129	1134	1132	1135	32	13.7

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Ambient	Radiometer
min	Pa	°C	°C	°C	°C	°C	°C	kw/m²
222	17.8	1128	1131	1135	1133	1136	32	13.7
223	17.3	1128	1130	1136	1134	1137	32	13.8
224	17.2	1129	1130	1136	1134	1137	32	13.6
225	17	1129	1131	1135	1133	1137	32	13.6
226	16.3	1131	1134	1137	1136	1140	32	13.8
227	16.6	1132	1135	1140	1139	1141	32	13.9
228	17	1134	1137	1142	1140	1143	32	13.9
229	17.2	1135	1137	1142	1141	1143	32	13.8
230	17.2	1135	1138	1143	1141	1144	32	13.9
231	16.9	1137	1137	1144	1141	1145	32	14.1
232	17.1	1138	1140	1144	1143	1146	32	13.9
233	17.1	1138	1140	1145	1143	1147	32	14.1
234	17.4	1138	1141	1147	1145	1148	32	14.1
235	17.9	1139	1142	1146	1146	1148	32	14.1
236	17	1141	1142	1146	1146	1149	33	14.1
237	17.3	1141	1143	1148	1147	1150	33	14.1
238	17.9	1141	1144	1149	1146	1150	33	14.3
239	16.7	1141	1144	1149	1148	1151	33	14.2
240	16.9	1144	1145	1150	1148	1152	33	14.4
241	16.8	1143	1146	1151	1148	1153	33	14.4

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