ArcBox

solar connector enclosure

V 1.2

About Us

Marshalls

£600m Revenues, 2,500 People

Landscaping Division

Building Products Division

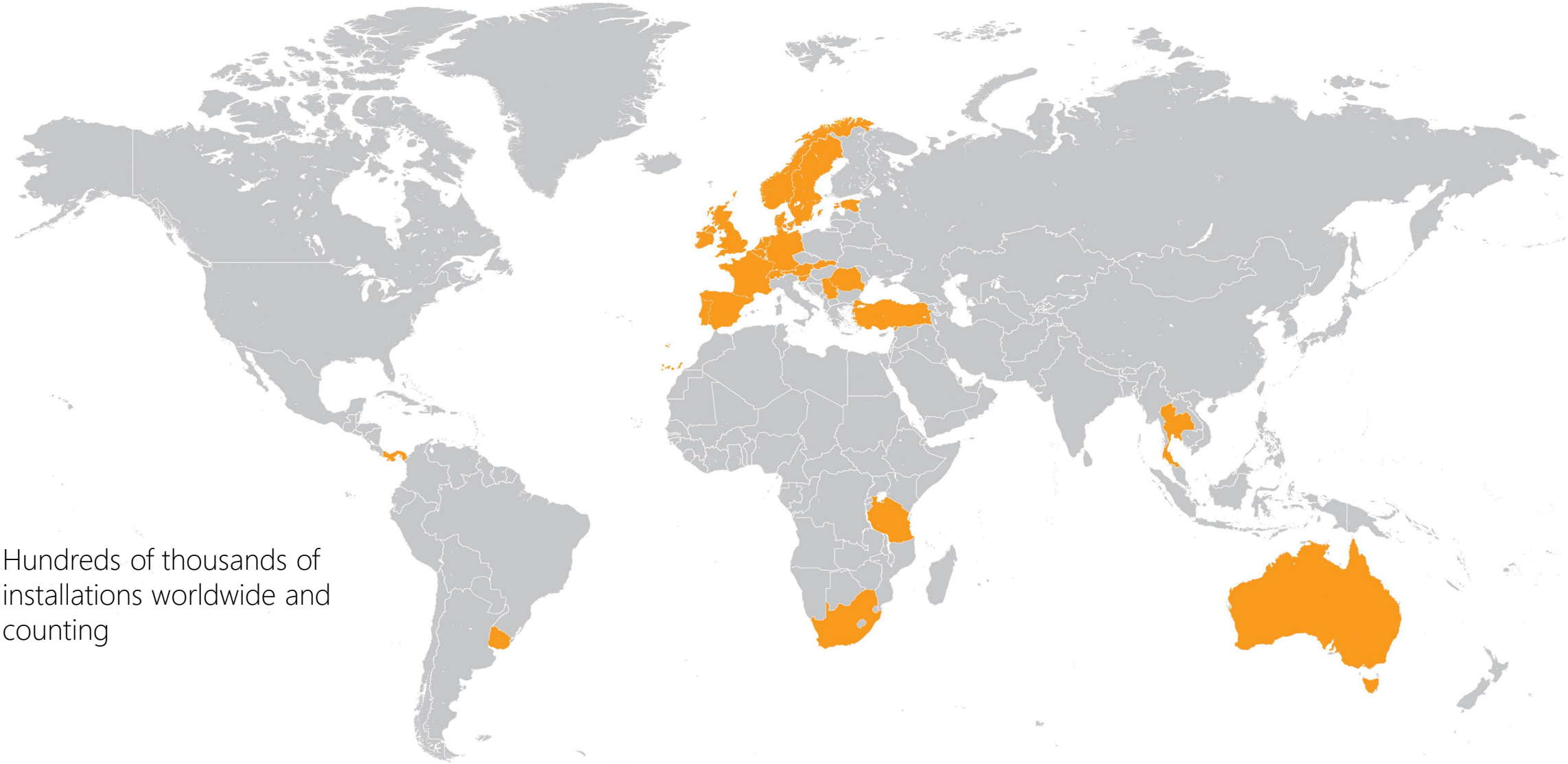
Roofing Division

Marley

viridian solar

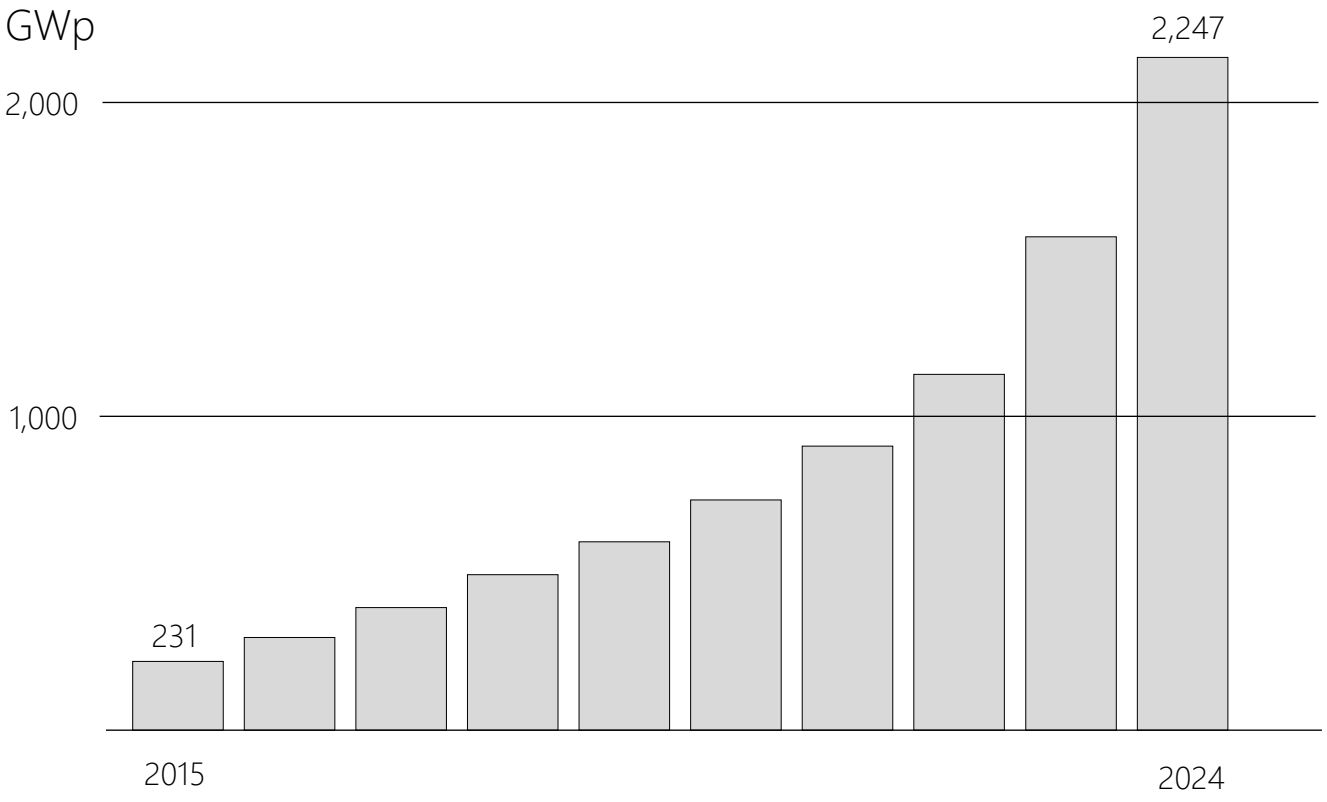
ArcBox

Active ArcBox Customers



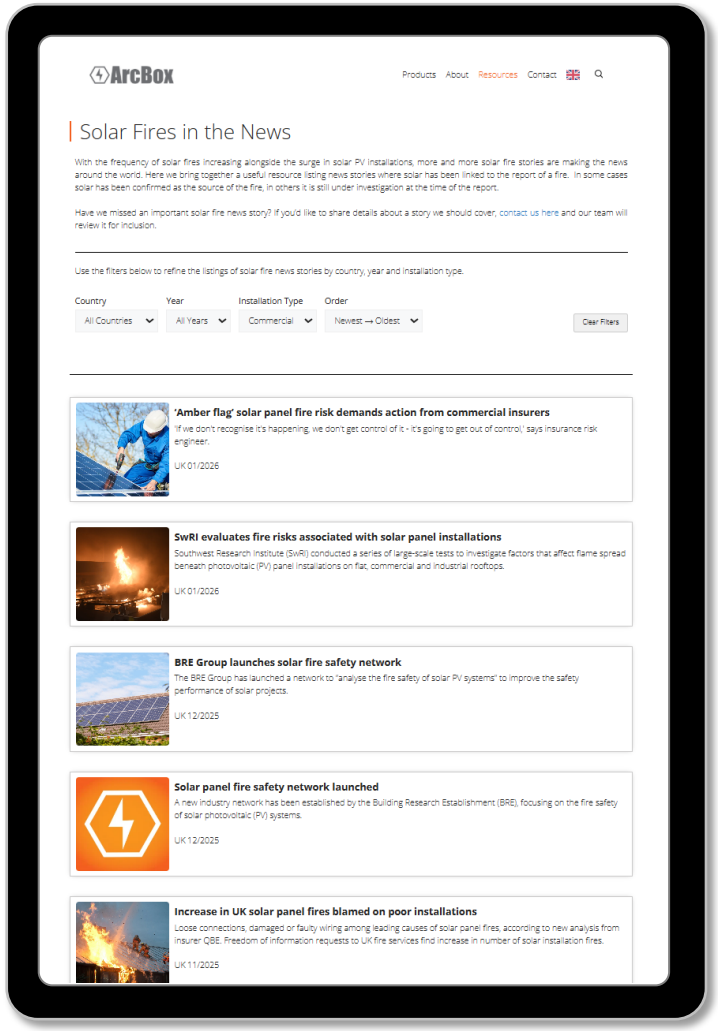
Hundreds of thousands of installations worldwide and counting

Scale Drives Absolute Incidents



Evolution of Cumulative Worldwide PV Solar Installations

Source: IEA PVPS



Rack Mounted Above Pitched Roof

Pembury Estate in Dalston Lane, Hackney, Social Housing
05/06/2024
https://www.bbc.co.uk/news/articles/c4ngx01m611o

Commercial Flat Roof

Lidl Distribution Centre, Waterworth Road in Peterborough
23/02/2024
https://www.bbc.co.uk/news/articles/c516jlrx45do
https://www.itv.com/news/anglia/2024-02-23/drone-footage-shows-fire-tearing-across-roof-of-70m-lidl-warehouse

New Build In-Roof Solar

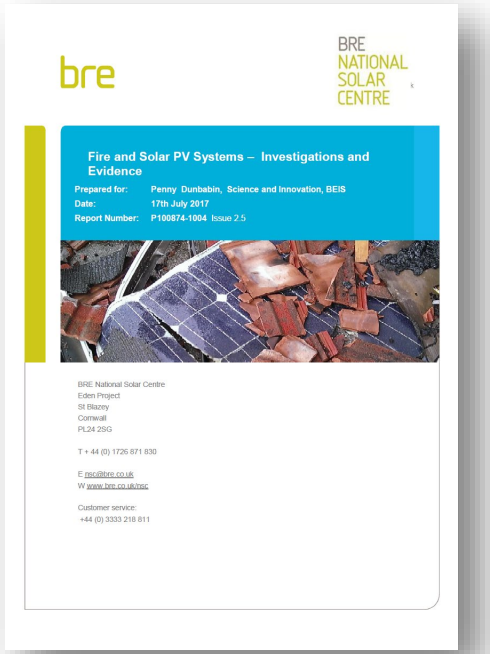
3 Newton Drive, Church Crookham, Fleet
13/07/2022
https://www.hantsfire.gov.uk/incident/partial-collapse-of-roof-following-fleet-flat-fire/

Ground Mount Utility Solar

Forest fire in Víznar (Granada), originating in a photovoltaic plant
20/07/2024
https://www.rtve.es/noticias/20240720/efectivos-aereos-trabajan-incendio-forestal-talavan-caceres-planta-fotovoltaica/16193089.shtml

Research Findings UK

2018


bre

BRE NATIONAL SOLAR CENTRE

Fire and Solar PV Systems – Investigations and Evidence

Prepared for: Penny Dunbabin, Science and Innovation, BEIS
Date: 17th July 2017
Report Number: P100874-1004 Issue 2.5

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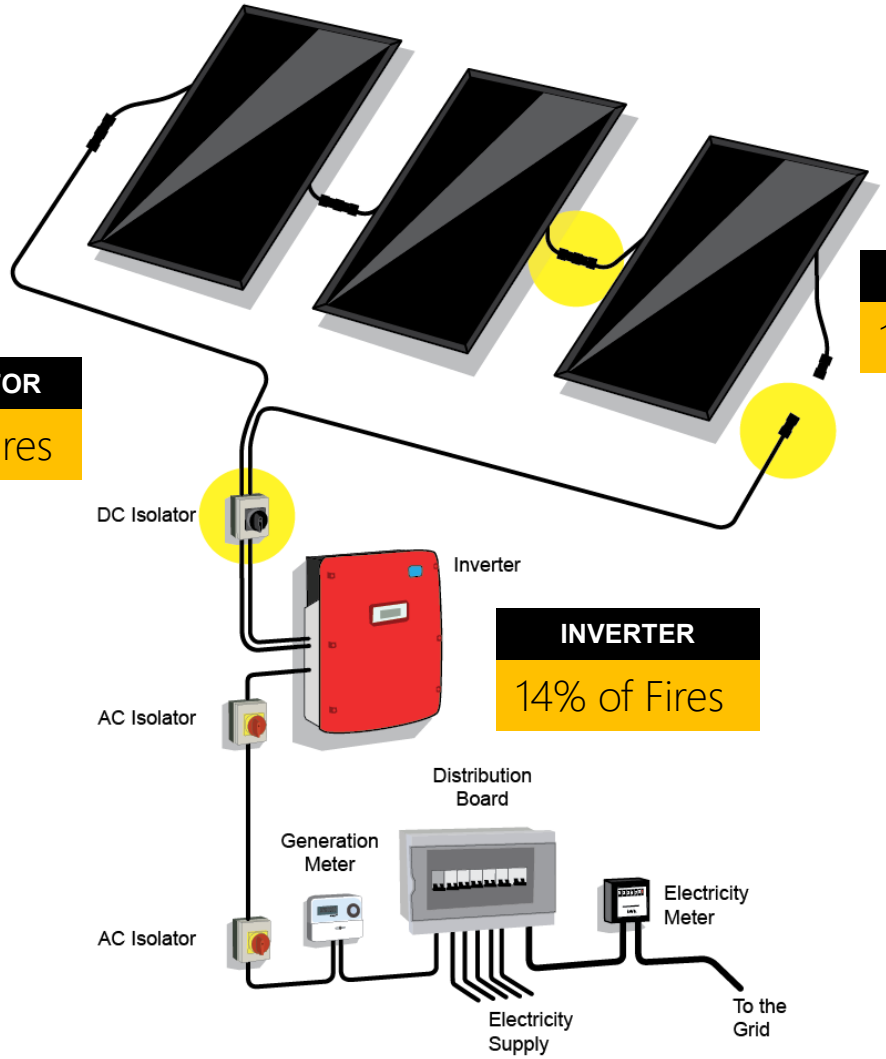
Customer service:
+44 (0) 3333 218 811

DC ISOLATOR

43% of Fires

CONNECTORS

17% of Fires

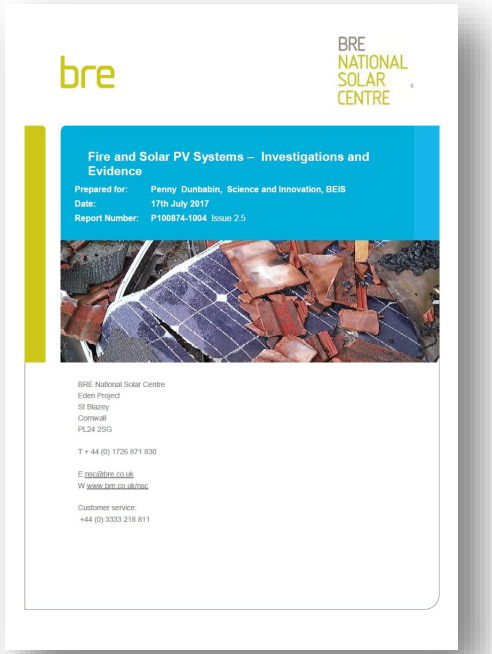


INVERTER

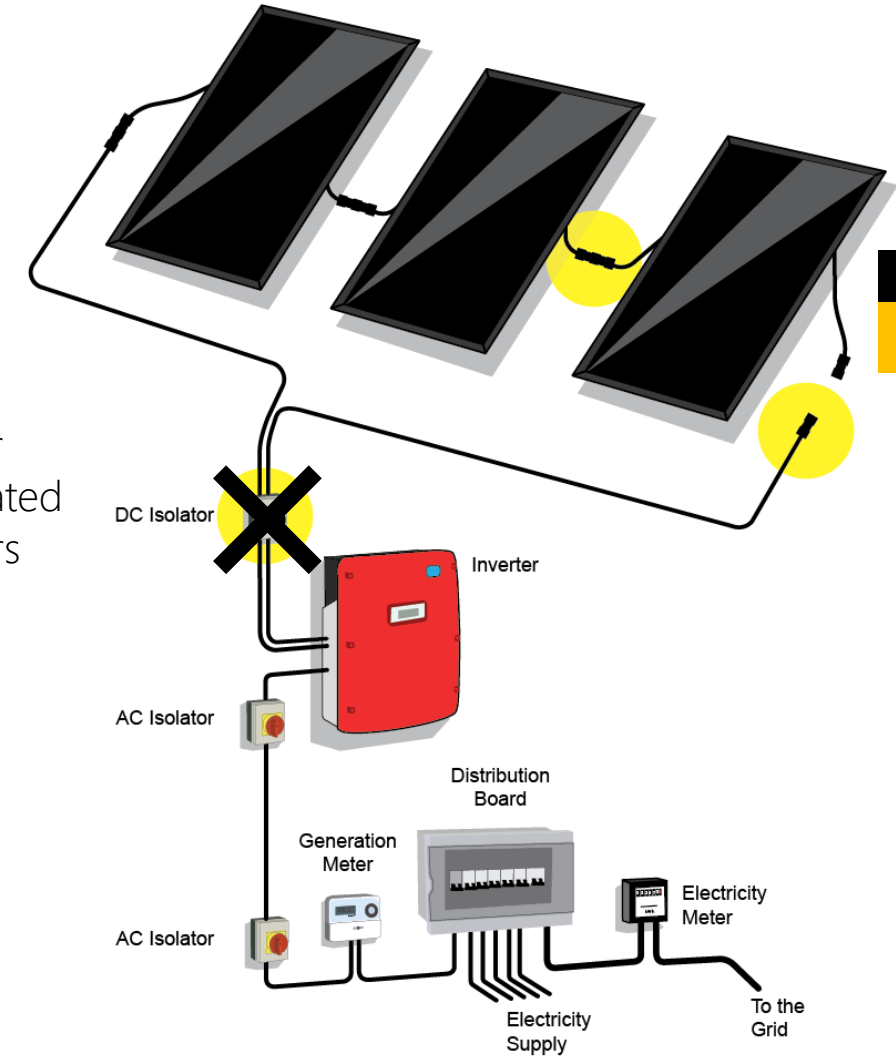
14% of Fires

Research Findings UK

2018



DC Isolator now incorporated into inverters



CONNECTORS
17% of Fires

CONNECTORS
35% of Fires

Leaving DC connectors as the main risk area

Research Findings Netherlands

2019

ECN | TNO innovation for life

Wiesterdijnweg 3
1755 LE Petten
Postbus 15
1755 ZG Petten

www.tno.nl

T +31 88 866 50 65

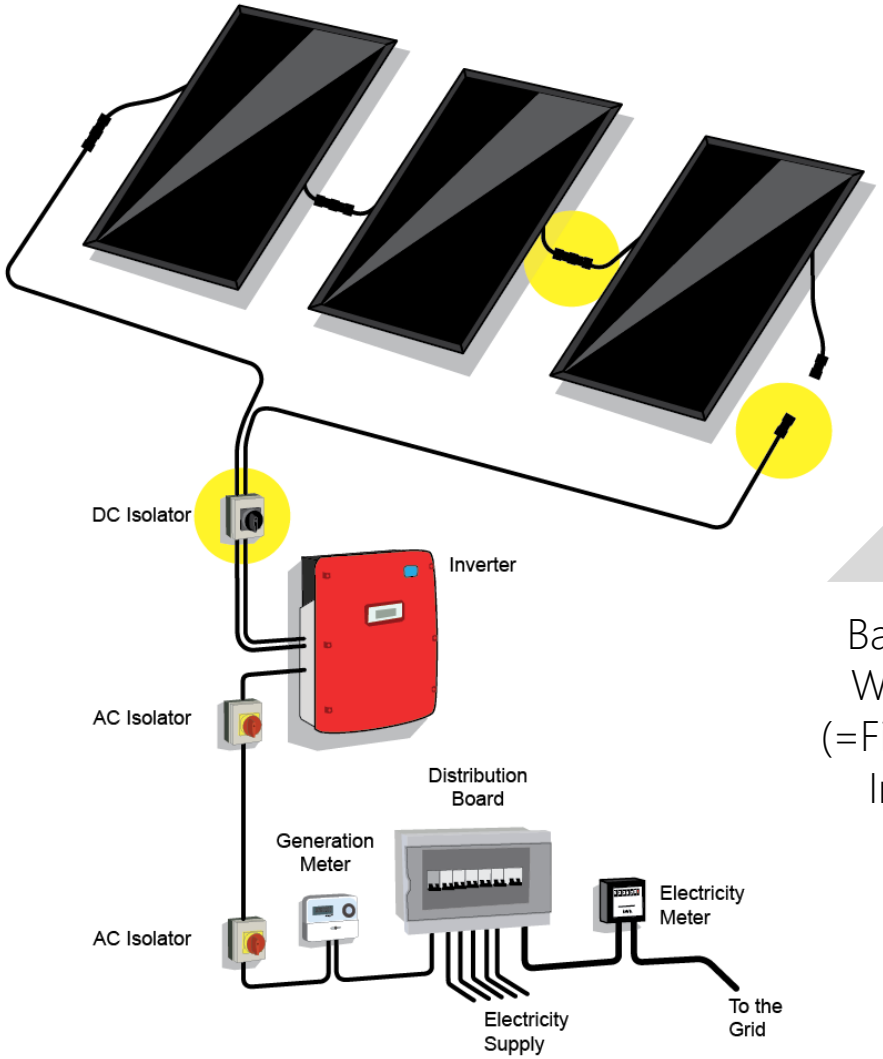
TNO-rapport

TNO 2019 P10287

Brandincidenten met fotovoltaïsche (PV) systemen in Nederland.

Een inventarisatie

Datum	13 maart 2019
Auteur(s)	E.E. Bende N.J.J. Dekker
Exemplaarnummer	1
Oplage	10
Aantal pagina's	65 (incl. bijlagen)
Aantal bijlagen	20
Opdrachtgever	Rijksdienst voor Ondernemend Nederland (RVO)
Projectnaam	PV-branden
Projectnummer	060.37017

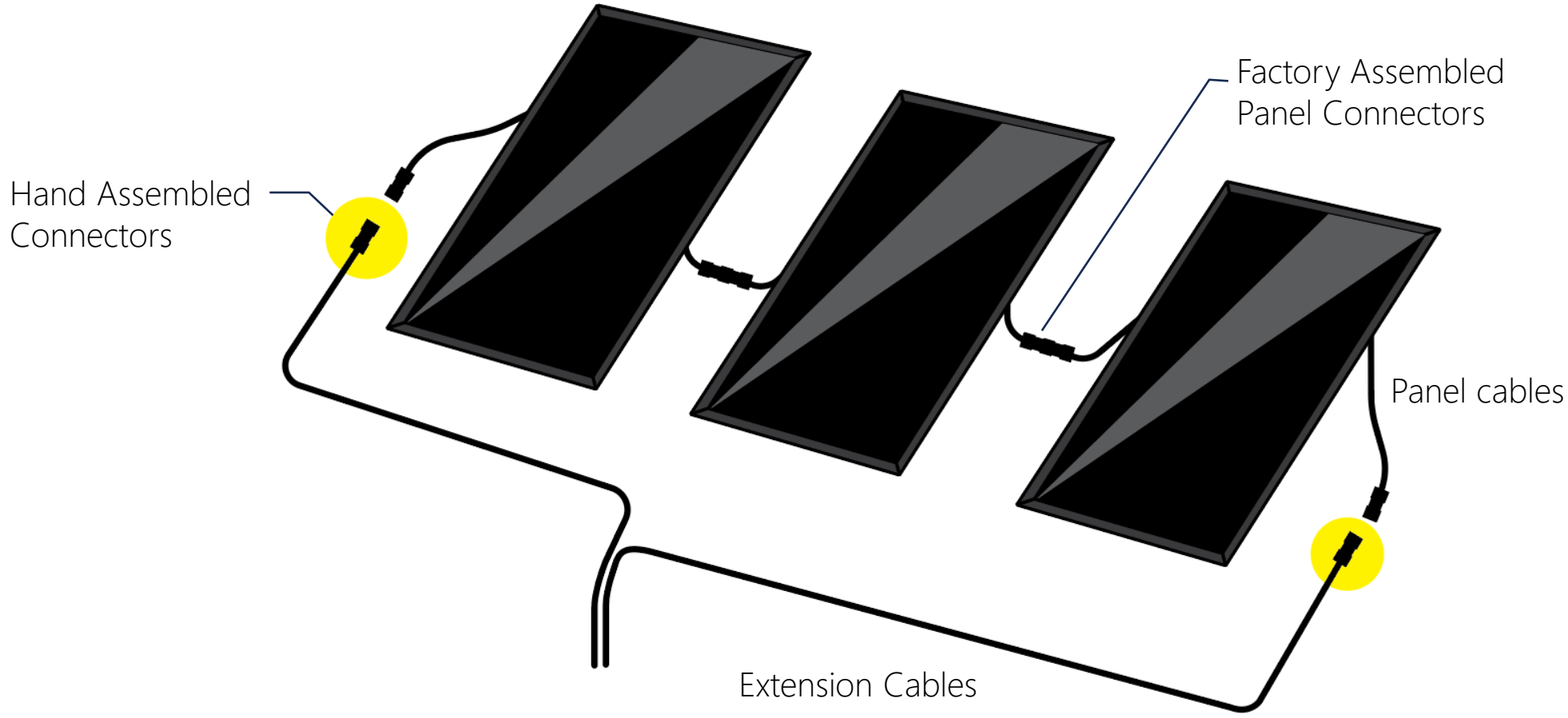


CONNECTORS

80% of Fires

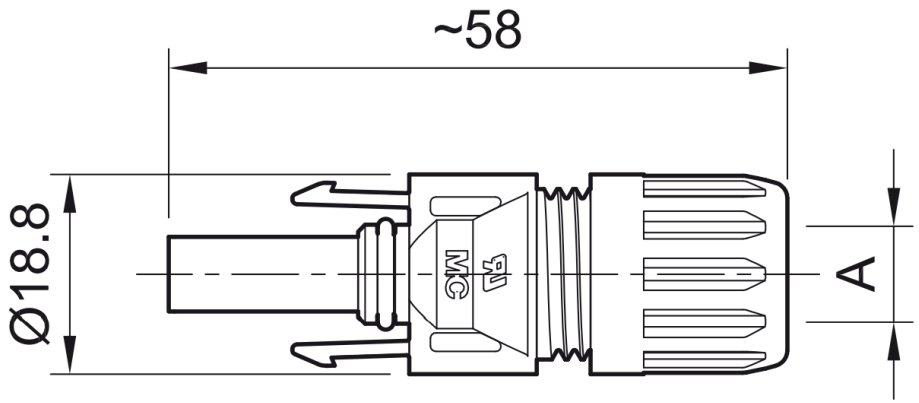
Based on Interviews With Loss Adjusters (=Fires that Resulted in Insurance Claims)

Two Connector Types



Proprietary Design – No Global Standard

MC4



STÄUBLI

MC4 "Compatible"

Kayal

Wenzhou Kangyu Electrical Co., Ltd.

Meanray

Yueqing Mingrui Electric Co., Ltd.

suntree

Suntree Electric Group Co., Ltd

EL Rongchang Group

Rongchang Solar Co., Ltd

Risk - Hand-made Connector Crimps

£938
RS Components

£5.49
Screwfix

Crimping: Lab Results

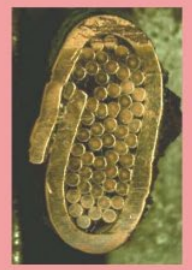
Multi-Contact MC STÄUBLI GROUP



Pull out force: 454N
Gas tightness
Long-term durability

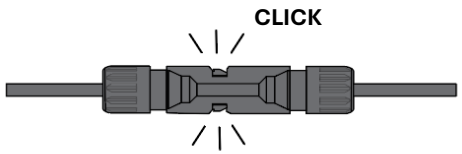
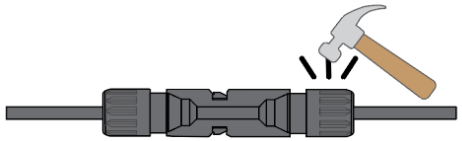
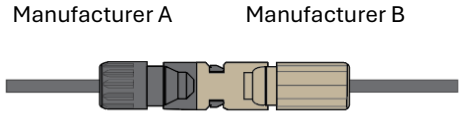
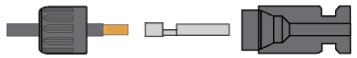
Demand of IEC 60352-2:
pull out force (4mm²) >310N





Pull out force: 94N
No gas tightness
→ corrosion, danger of electrical shock & fire

Potential Causes of Connector Failure

		Panel Connectors	Hand-Made Connectors
	Not Fully Engaged, Cable Under Tension	✗	✗
	Assembled Wet – with potential for corrosion	✗	✗
	Damage – post or pre installation	✗	✗
	Cross-mated Connectors	✗	✗
	Poor Quality Assembly & Crimp	✗	✗

Consequence Multipliers

Source: Birdblocker.eu

Combustible debris

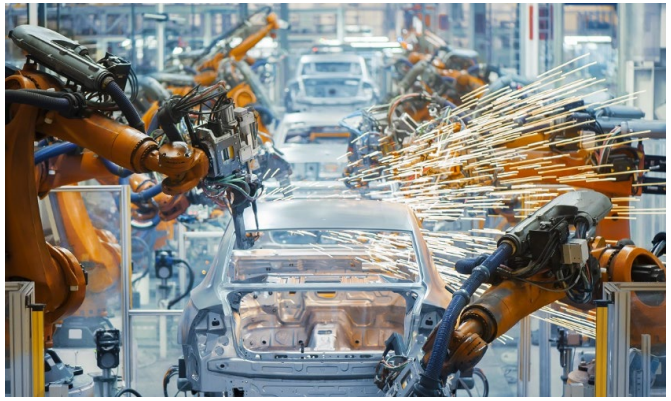
Combustible Mounting Materials

Combustible Roof Coverings

Consequence Multipliers

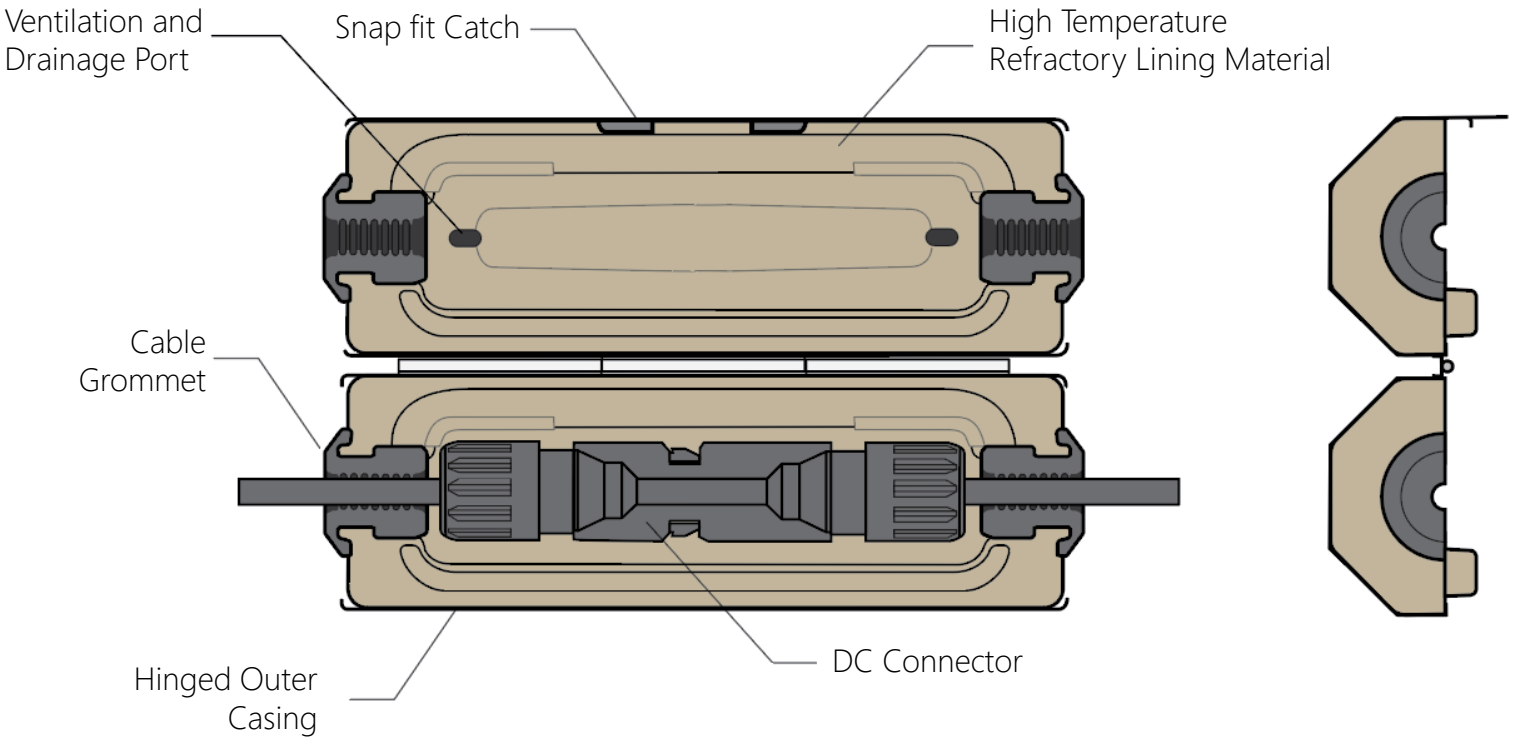




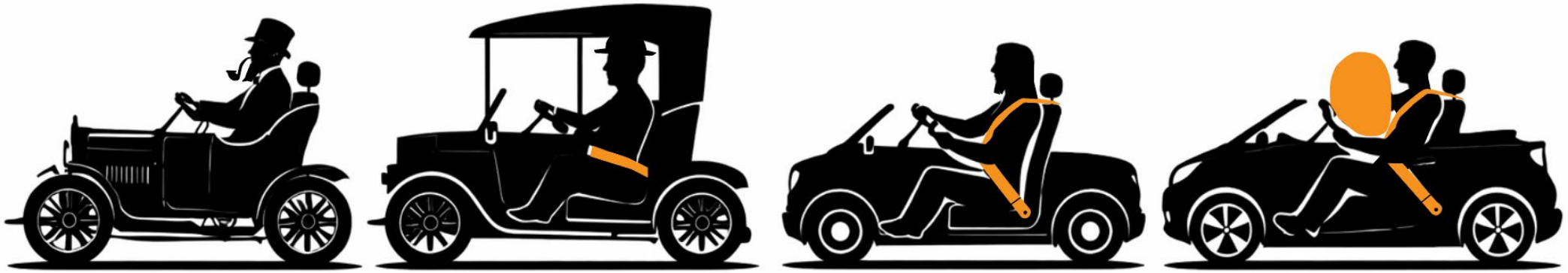



ArcBox


EN
ArcBox™
solar connector enclosure
Reducing Fire Risks
in Solar PV


Ventilation and
Drainage Port
Snap fit Catch
High Temperature
Refractory Lining Material
Cable
Grommet
Hinged Outer
Casing
DC Connector

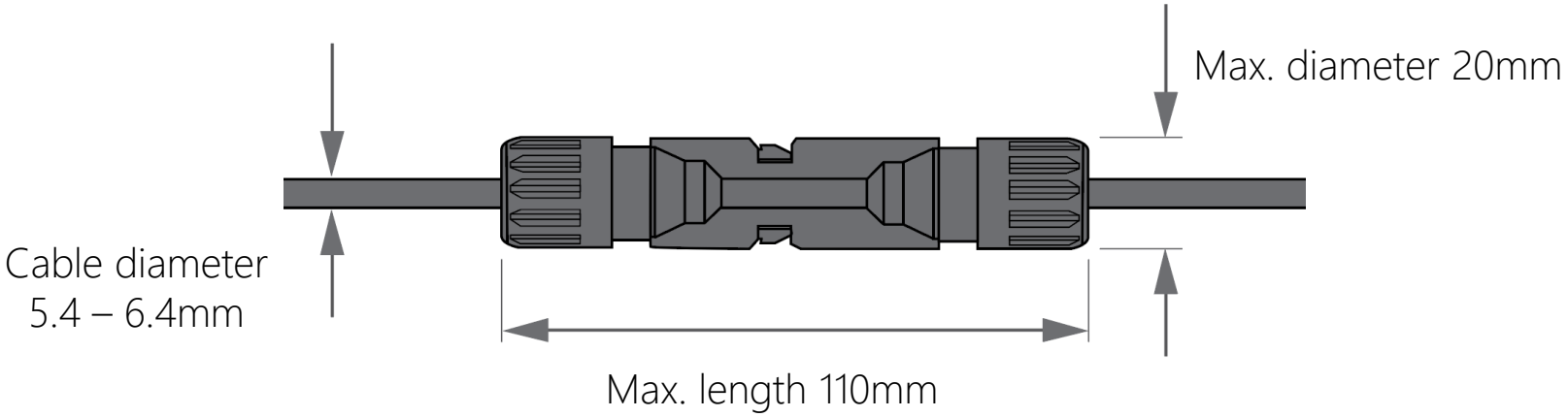
Evolution of Safety



No Safety Measures | Lap Belt | Three Point Seatbelt | Airbag

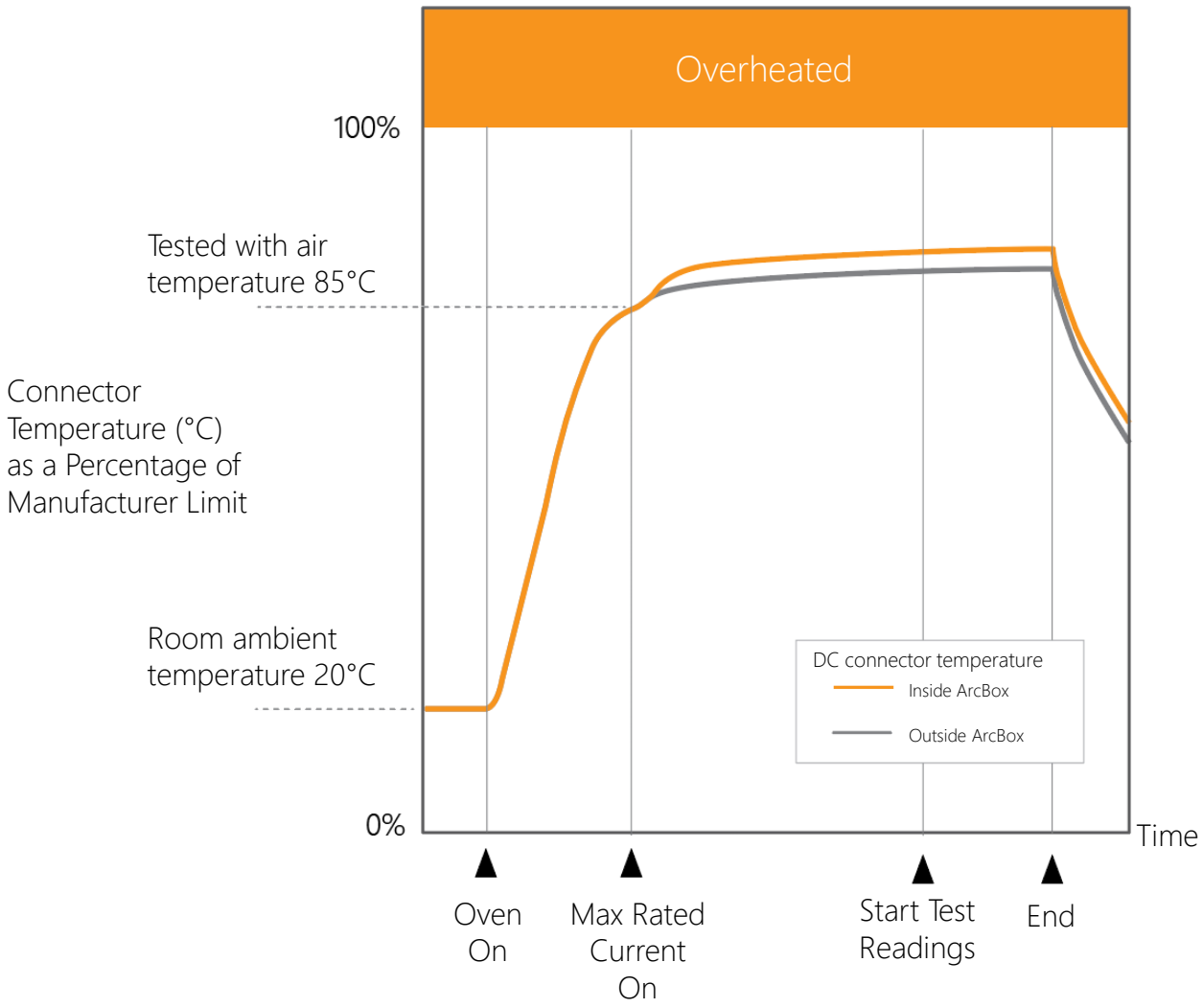
Lower Safety → Higher Safety

Compatibility



Product	Manufacturer	Dimension (Dia x Length)
MC4	Staubli	Ø18.8 x 95 mm ✓
TL-CABLE01	Tonglin	Ø19.1 x 90 mm ✓
CDC-M001	Shenzen Leader Technology	Ø19.0 x 95 mm ✓
MC4-Evo2	Staubli	Ø18.8 x 108 mm ✓
PV-JK03M	Jinko	Ø19.8 x 106 mm ✓
QC4.10	JA	Ø19.2 x 88 mm ✓
TS4	Trina	Ø19.2 x 105 mm ✓
T6	TLIAN (Canadian Solar)	Ø18.8 x 105 mm ✓

Compatibility – Operating Temperature



Independent tests performed by University of Loughborough CREST PV Measurement and Calibration Laboratory

Product	Manufacturer	
EMPV4N	Elkay	✓
TL-CABLE01	Tongling	✓
PV-ST01	Heangda Electrical	✓
PV-ST02	Heangda Electrical	✓
PV-ST03	Heangda Electrical	✓
PV-BN101A	Leader Technology	✓
MC4	Staubli	✓
MC4-Evo2	Staubli	✓
MC4-Evo ready	Staubli	✓

All tested connectors remain well below manufacturer's operating limits at maximum rated current and 80°C ambient

Effectiveness Confirmed

kiwa tested 0607-L-21

Tests of ArcBox with combustible plastic tray roof integrated solar PV at the Kiwa BDA Testing B.V. Fire Safety and Security Laboratory. Arcing connectors without ArcBox quickly spread to a roof fire while those with ArcBox were safely contained.

FRISSBE fire-safe sustainable built environment

Flat roof solar without ArcBox – rapid spread of fire from arcing connector to roof. There was no fire in same test with ArcBox

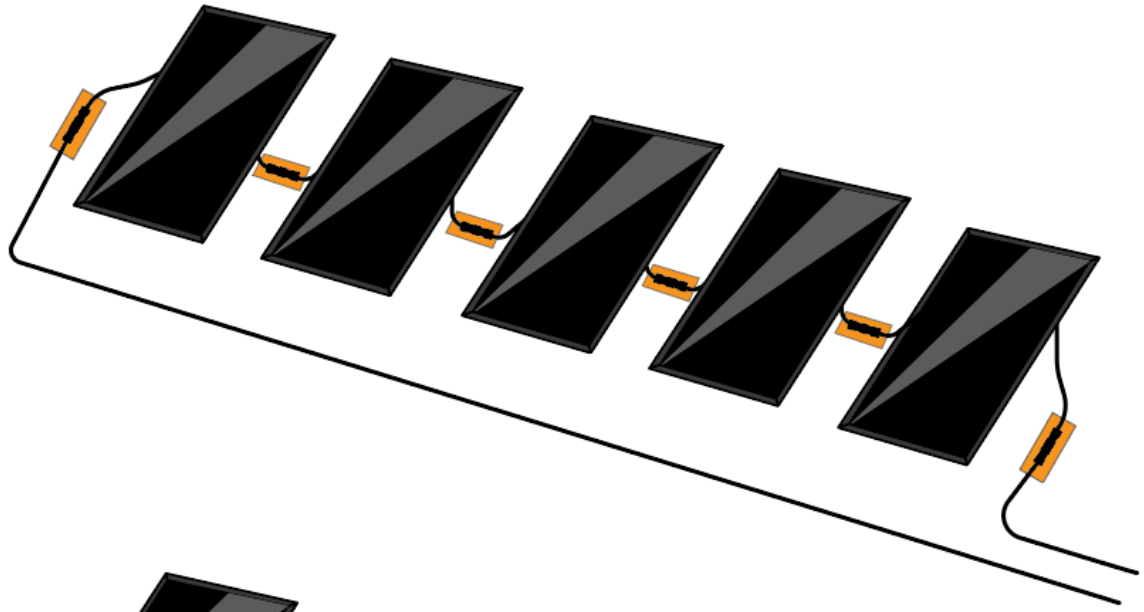
Certifications

ArcBox

Coverage Options

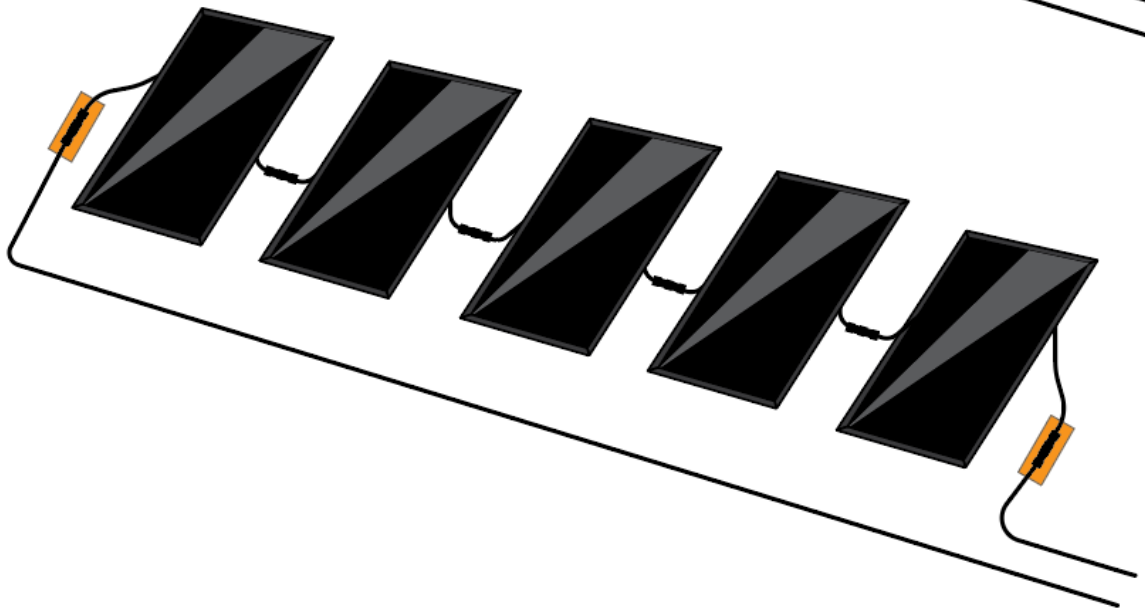
Every DC Connector in Installation

Maximum reduction of associated risks



Higher-Risk Connectors Only

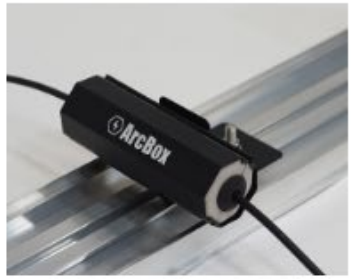
The solution favoured by many solar installers as balancing risk reduction and cost



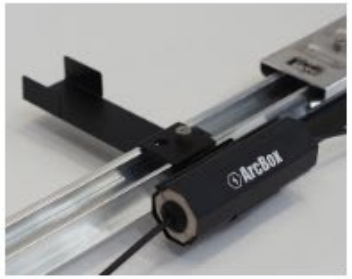
Snap Fit

Mounting Options

ARC-M01



ARC-M02



ARC-BM25
ARC-BM30
ARC BM40

ARC-M03

ARC-M04

Case Studies

ArcBox

Industrial Building, Madrid, Spain
100kWp, 36 ArcBox fitted
Installation: DSP Solar

Case Studies

ArcBox

Kings College Chapel, Cambridge UK
Rack Mounted Solar above Lead Roof with Optimisers
Installation: Photon Energy

Case Studies

ArcBox

Roof Integrated Solar Installation
New Build Housing Project
Installation: P4 Solar

Case Studies

ArcBox

BIPV roof on Alpine Chalet,
Switzerland
Installation: IWatt