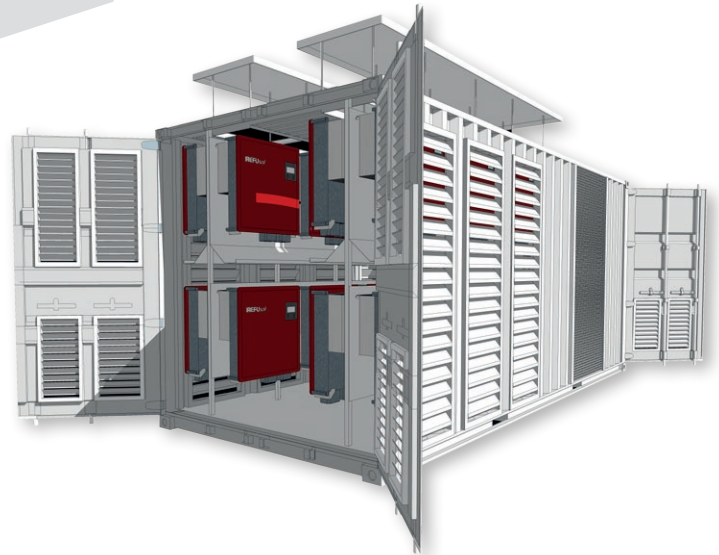


REFUcube

No either / or decision.

- Reduced costs and risk
- Easy installation thanks to plug & play preparation
- Reduced maintenance



Up to now, solar plant designer always had to decide between central and string (i.e. distributed) inverter solutions and accept the respective disadvantages of the chosen version. The REFUcube now combines both solutions – by integrating string inverters with transformers and MV and LV switchgears into a container. The resulting compact plug&play solution combines the best while diminishing the negative aspects of each system.

Ease and celerity of installation: The REFUcube comes already as pre-wired container, internally all DC cables, AC wiring and distribution as well as data communication are already installed. It can be transported easily to and handled at the solar plant location thanks to its low weight and compact design. The REFU CombinerBoxes are positioned close to the solar panels and therefore allow short PV string cables and only one cable pair (+/-) from each DC CombinerBox to the container. Thanks to the centralized concept cold and hot commissioning activities are significantly facilitated.

Reduced maintenance: Thanks to the natural convection cooling of the REFU^{sol} 46K inverters and the intelligent ventilation concept of the container don't require fans or air conditioning for the inverter compartment. This means the need for maintenance is kept to a minimum.

Risk reduction: The REFUcube ensures an optimal compatibility of all components in the system and is conceptualized as a plug & play solution. The integration of string inverters allows on the one hand an easy replacement in case of problems, while on the other hand guaranteeing a continuous operation of the remaining inverters. Therefore the overall system availability will be close to 100 %.

Cost savings: The design and easy installation of the REFUcube provides several areas of cost savings: the reduction of cabling, minimized set-up and installation effort as well as reduction of commissioning costs.

TECHNICAL DATA

REFUcube
S1000 REFUcube
S1600 REFUcube
S2000 REFUcube
S3000

INTEGRATED STRING INVERTERS

String inverters REFUsol 40K/REFUsol 46K	22	35	44	66
--	----	----	----	----

DC DATA

Max recommended PV power (kW)	1,500	2,400	3,000	4,500
Max input voltage (V)	1,000			
DC start voltage (V)	350			
MPPT range at nominal power (V)	575... 850			
Max. total operational current DC per inverter (A)	82			
Number of independent MPP Trackers	22	35	44	66
Number of DC inputs	22	35	44	66

AC DATA

AC Nominal power LV (kVA) [power reduction optional]	1,012	1,610	2,024	3,036
Nominal voltage AC LV (V)	460			
Nominal voltage AC MV (kV)	10... 33			
Nominal frequency / Frequency range (Hz)	50, 60 / 45... 65			
Max. Efficiency (without transformer) (%)	98.3			
European Efficiency (without transformer) (%)	98.1			
Transformer type	Oil (including oil pan) / Cast resin			
Oil type (for oil transformers)	Mineral (optional: organic oil)			
Transformer nominal power (kVA)	1,250	1,600	2,000	3,000
Max. THD (%)	< 3			
Nominal power factor / range	1 / 0.8c ... 0.8i			
Feed-in start inverters (W)	40			
Feed-in phases	3			

AMBIENT CONDITIONS

Elevation (m above sea level)	1,000*
Ambient operating temperature (°C)	-15... 50
Rel. air humidity (%)	4... 100
Degree of protection	IP00 (transformer and inverter compartments), IP23 (MV compartment), IP 65 (inverters)

SAFETY AND PROTECTION

DC circuit breaker	Inverter-integrated and in DC boxes (option)
PV isolation monitoring	On inverter base
String fuses	DC boxes with fuses (option)
Grid monitoring	Voltage, Frequency, Anti-islanding, DC injection inverter-integrated acc. To VDE 0126-1-1 and external grid
Grid separation	Protection relay
Residual current monitoring (RCD)	Inverter-integrated
Overvoltage protection DC and AC	DC type 1+2, AC LV type 2
Protection class inverters (IEC 62103)	I
MV input	Overcurrent / Short circuit

*Higher altitudes available as option

	REFUcube S1000	REFUcube S1600	REFUcube S2000	REFUcube S3000
--	-------------------	-------------------	-------------------	-------------------

GENERAL DATA

Container type	Standard 20 ft metal		Standard 40 ft metal	
Weight (kg)	< 9,000	< 15,000	< 17,000	< 20,000
Installation type	Concrete basement or metal feet			
Certification container	CSC certification according to ISO 668			
Electrical certification	Country specific			

STANDARD FEATURES

- Integrated string inverter rack with optimized natural air convection system
- Minimized maintenance – no forced air cooling
- Suitable for all climate types
- Fast DC connection: DC distribution panel incl. SPDs type. 1+2
- LV switchboard (LV circuit breakers and main switch)
- Plug & play: complete internal DC, AC and Ethernet cabling
- Grid protection relay
- MV switch gear line + transformer with SF6 circuit breaker
- Cold commissioning: complete functionalities and connections pre-tested prior to delivery

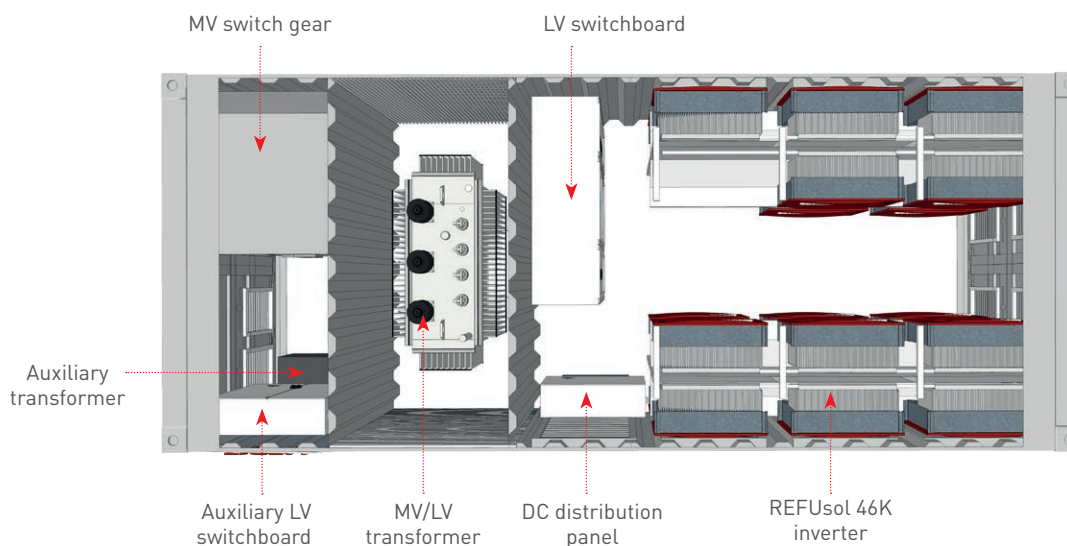
OPTIONAL FEATURES ON REQUEST

- Q @ night
- Anti PID device
- Auxiliary transformer 6–30kVA
- SCADA
- TLC-RTU cabinet
- Daisy chain MV configuration
- Energy meter
- Intrusion detection
- Anti-rodent device

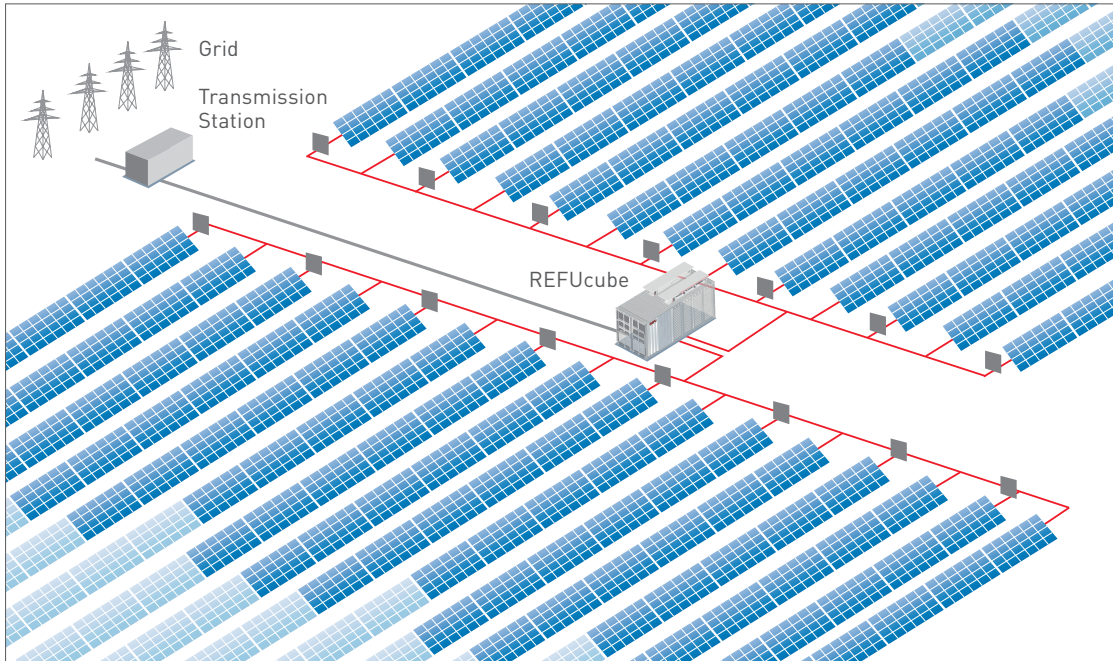
Different configurations without transformer and medium switch gear available upon request.

ALL IN ONE – COMPONENTS WITH OPTIMAL COMPATIBILITY

Everything you need to connect solar panels to the grid is assembled in one enclosure – a 20" or 40" metal container.



CENTRALIZED STRING INVERTER SYSTEM ARCHITECTURE



EASY PLANT MONITORING

Using string inverters allow a more flexible system design, as multiple MPP trackers are available compared to a standard central system solution. Our intelligent monitoring algorithms allow a rapid failure detection if any of the inverters should show underperformance.

Our cloud-based monitoring portal REFUlog lets you keep an eye on the data and productivity of your system. A wide range of analyses and visualization options give you the perfect overview – check it out on www.refu-log.com.

