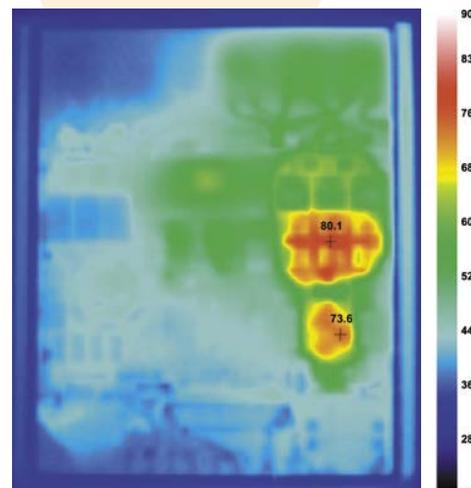
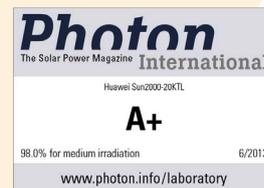
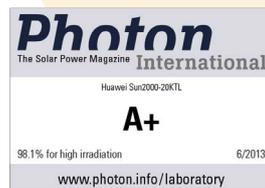


WATCH OUT, SMA

Huawei is a player in the global telecommunication market that decided to dabble in inverters. On its first try, its device makes it into the top three of PHOTON's ranking – even without SiC transistors-



When a company like Chinese-based Huawei Technologies Co. Ltd. decides to start a new venture, one can be sure it doesn't aim to just sell a few thousand devices. With revenue of \$35.4 billion in 2012, a profit of about \$2.48 billion, and more than 150,000 employees, Huawei is a new player in the inverter market that has the potential to give market leader SMA Solar Technology AG a run for its money, if not outright scare it. Not surprisingly, the PHOTON engineers were very eager to get their hands on one of the first devices from Huawei's new inverter series, which was tested under the usual agreement.

And they were not disappointed. Not only the high efficiency – achieved without using silicon carbide (SiC) transistors, no less – caught the engineer's attention, but also the overall impression of the inverter. Many inverters coming out of China show poor workmanship and use a large amount of glue to attach electrical components. Getting these devices to work is usually complicated and often success is only achieved on a second try. There is no way to objectively factor these things into a rating, so the PHOTON grade does not reflect them.

When an inverter doesn't show any of these flaws, like the one from Huawei, its »A+« grade is all the more valuable.

OPERATION

The Sun2000-20KTL is delivered well packaged and includes a wall-mounting bracket. At 48 kg, the inverter is lightweight given its nominal power. Once the solar generator is properly configured and the internal DC disconnect is activated, the device begins to operate. At the lab, the candidate took 63 seconds to run a series of tests before connecting to the grid.

SUMMARY

Overall the Sun2000-20KTL presented itself as an outstanding inverter. Even though it is designed with two levels of circuit boards, it remains well sorted. Since it does not need active cooling, the inverter can be mounted indoors as well as outdoors. Only if the temperature rises above about 60 °C does the inverter start to reduce its output, which does not pose a problem in real life. The overload capacity, 8.8 percent, turns out to be on the smaller side.

There are no limitations when designing PV systems with crystalline silicon mo-

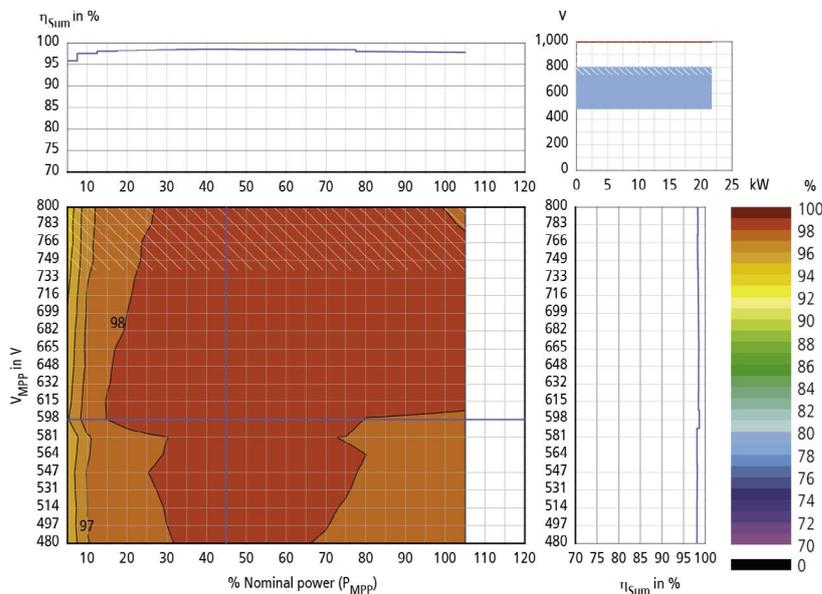
HIGHLIGHTS

- ▶ The Sun2000-20KTL, with 22.5 kW nominal DC power, is the most powerful inverter of the first series of devices produced by Chinese company Huawei
- ▶ The inverter has three MPP trackers and no transformer, and it feeds on three phases into the grid
- ▶ The PHOTON efficiency for medium irradiation is 98.0 percent and for high irradiation 98.1 percent, which makes the Sun2000-20KTL one of only four inverters ever to receive an »A+«; and the device ranks third in the list overall
- ▶ As both of the higher ranked inverters – from SMA and the other from Refusol – use silicon carbide transistors, Huawei could easily kick the SMA Sunny Tripower STP 2000TLHE-10 off the throne, if it did the same with its device

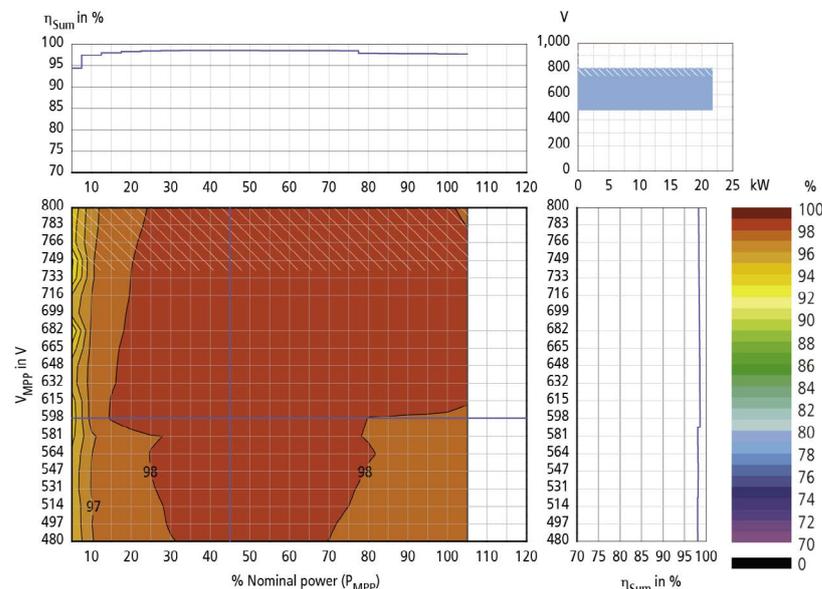
dules: the maximum MPP voltage of 800 V keeps a healthy distance from the maximum DC input voltage of 1,000 V. Only for thin-film modules does the difference turn out to be a little too small. But according to the manufacturer, thin-film modules can only be used if the module outs do not have any connection to the ground or if there is to be an electrical isolation installed on the inverter output side.

The inverter display only shows a small margin of error and can be used to track the yield without hesitation. When it comes to the efficiencies, it turns out that they are almost identical in all three different modes (symmetrical, asymmetrical and parallel) with the asymmetrical mode being the least efficient. The maximum conversion efficiency, 98.6 percent, offers exactly what the manufacturer promised. The MPPT adjustment efficiency in all three modes is equally as high over the whole working range and never falls below 99.8 percent for any of the trackers. The European efficiency reaches its maximum in the range of 598 to 648 V MPP voltages and confirms the manufacturer's specs with 98.3 percent yet again. The overall efficiency is 98.6 percent.

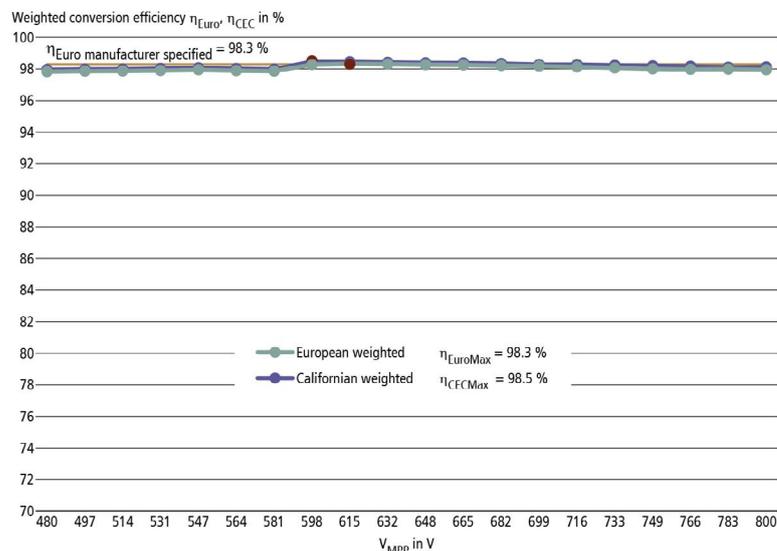
To determine the PHOTON efficiency, only the symmetrical mode is used. For medium irradiation the PHOTON efficiency is 98.0 percent, for high irradiation it is 98.1 percent. That makes the Sun2000-20KTL the fourth inverter ever tested to achieve an »A+« for medium irradiation. In the overall test ranking, the inverter comes in third, surpassed only by two inverters that both use silicon carbide transistors. Huawei does not build these transistors into their devices yet. In the end this is the first inverter from China that has the chance to give SMA a run for its money.



▲ = Overall efficiency (symmetrical)
Due to the high MPP adjustment efficiency, there is almost no difference between the conversion efficiency and the overall efficiency, which tops out at 98.6 percent.



▲ = Overall efficiency (parallel)
In parallel mode, the vertical line at 45 percent nominal power and the horizontal line at 598 V MPP voltage mark the maximum of 98.6 percent – which is identical to that achieved under symmetrical mode.



▲ Weighted conversion efficiency
The European efficiency tops out in the range of 598 to 648 V MPP voltages and meets the manufacturer's spec of 98.3 percent. The maximum California efficiency is 98.5.