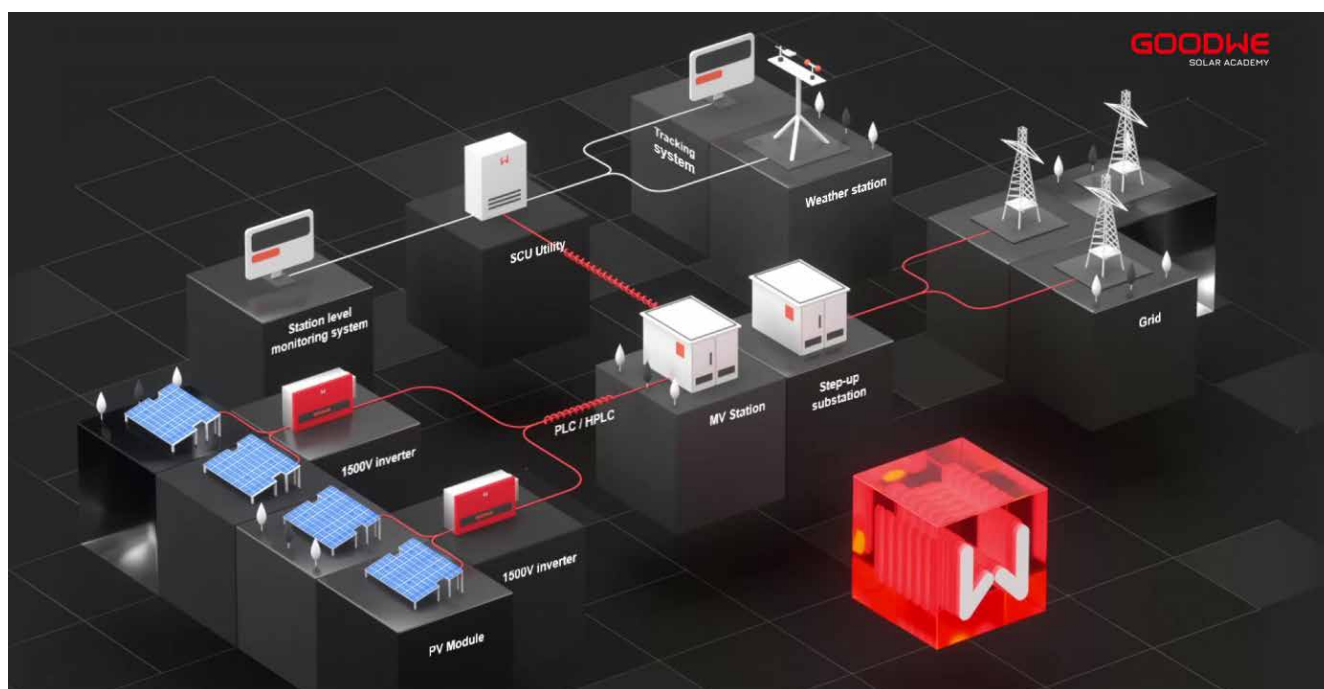

MV Station-Reliable support for Utility PV Station



Background

With rapid global development, the demand for power supply continues to grow, especially for PV power generation, according to various organizations predicted that by 2030, the global capacity of PV power station will increase from 1,055GW in 2022 to 5,457GW, PV generation full-speed development is still the general trend.

The PV station is mainly composed of PV modules, structures, inverters, MV stations, monitoring systems, cable accessories, etc. Comparing with traditional power stations, one big difference of PV station is that the planning and deployment are faster, with the increasing demand for PV station, flexible and reliable European type MV station become a popular choice.



European type MV station is a kind of closed power equipment, using standard 20 feet container as the enclosure, integrating transformers, RMU, LV switchgear, auxiliary transformer, protection devices and other power equipment inside, convenient for installation, compact structure, reliable performance, suitable for utility PV power station scenarios.

GoodWe to meet the market demand, launched GW9100K-MVS MV station, the capacity of transformer is up to 9152kVA, the maximum voltage in high voltage side can reach 40.5kV. The larger capacity, the lower LCOE, which not only meets the market demand, but also perfectly match GoodWe UT350kW series inverter, it can support up to 26 UT series inverters.



Figure 1 GW9100K-MVS

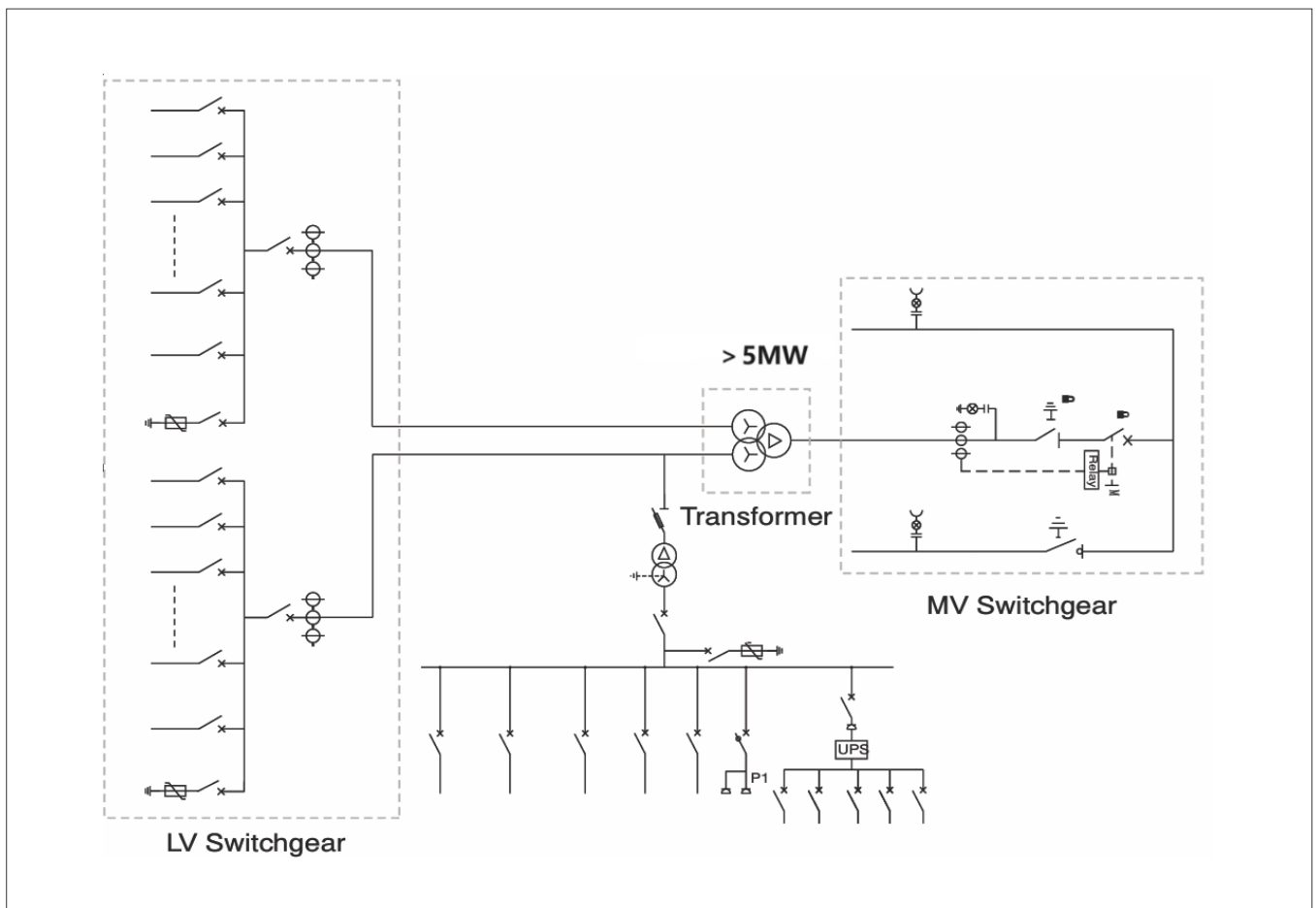


Figure 2 SLD of transformer with 2 LV winding

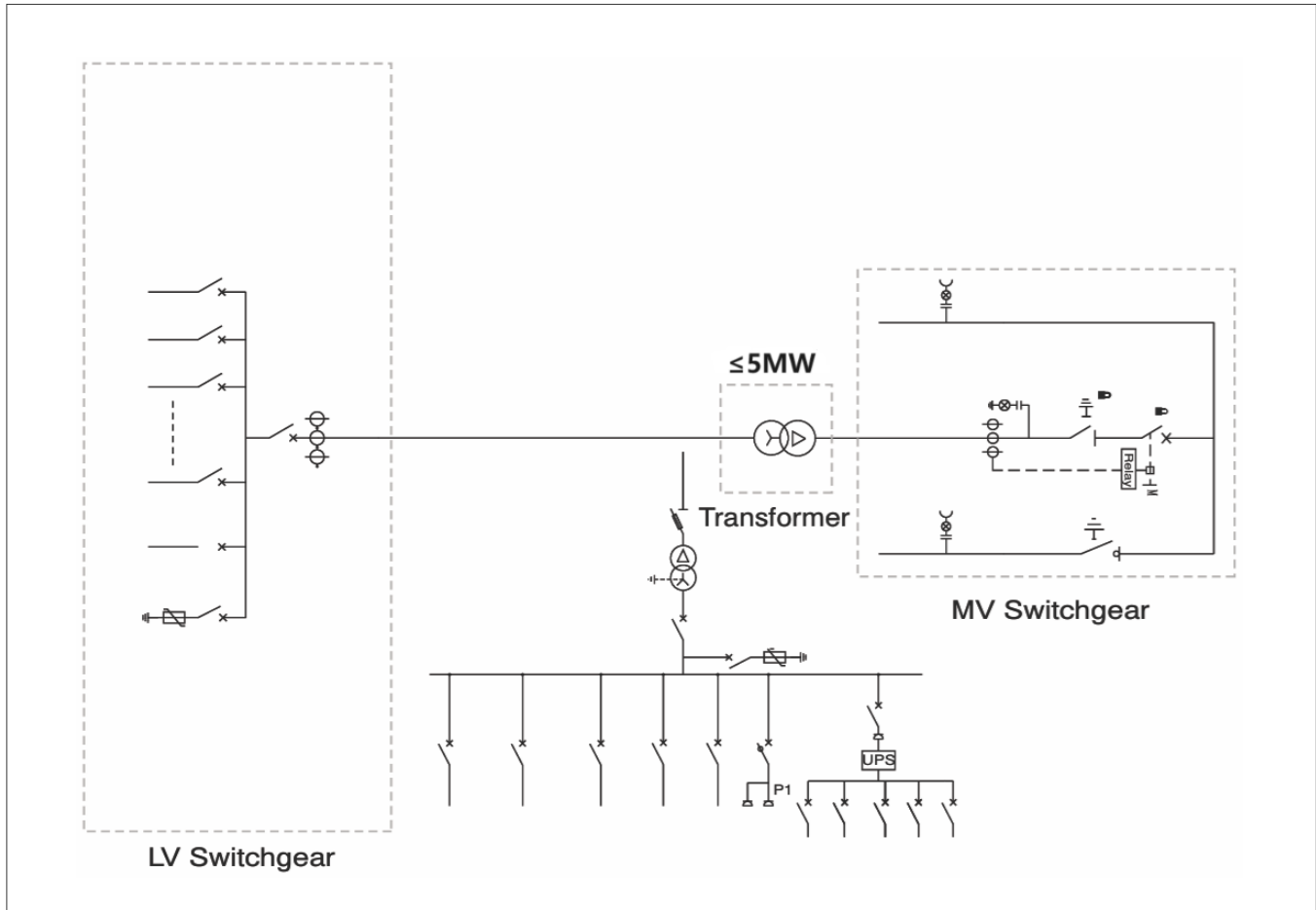


Figure 3 SLD of transformer with 1 LV winding

Features of GW9100K-MVS

1. Highly integrated

GoodWe MV station adopts the modular design principle, through the modular combination of various power equipment, like transformers, switchgear, auxiliary transformer, UPS, MCCB, protection devices and other power equipment, integrated in the standard 20-foot container, it can be easily transported and installed. In the meanwhile, it can be customized according to different requirements to meet the requirements of different application scenarios. This design improves the flexibility and adaptability of the system. The majority assembly and testing work is done in factory, greatly reduce the workload of on-site installation and commissioning, can be built in a short time, quickly put into use, improve the reliability and stability of the equipment.

1.1 MV design

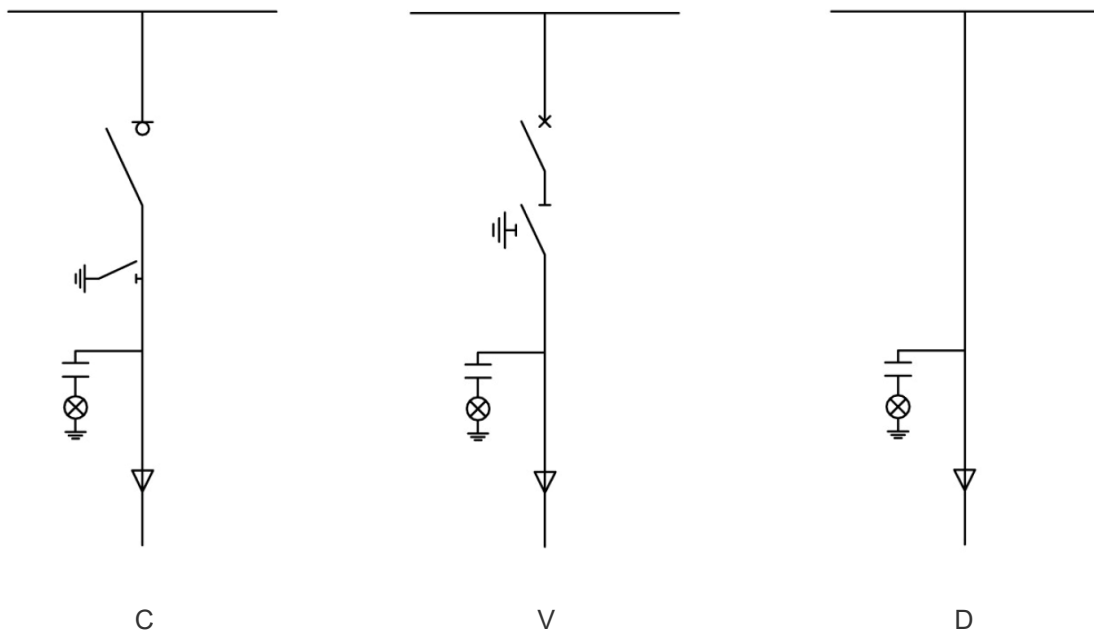
The MV side design adopts the gas-insulated ring main unit(RMU). According to different application scenarios, the RMU can be flexible, we can configure CVC, DVC, CV, DV etc.

C- Cable load break switch

V- Vacuum circuit breaker

D- Direct connection

At the same time, it is also equipped with a certain capacity of auxiliary transformers and UPS, which are used to supply power to the secondary circuit of the MV station, lighting, heating, air conditioning cooling and other devices.



Here's a system view of a sample station

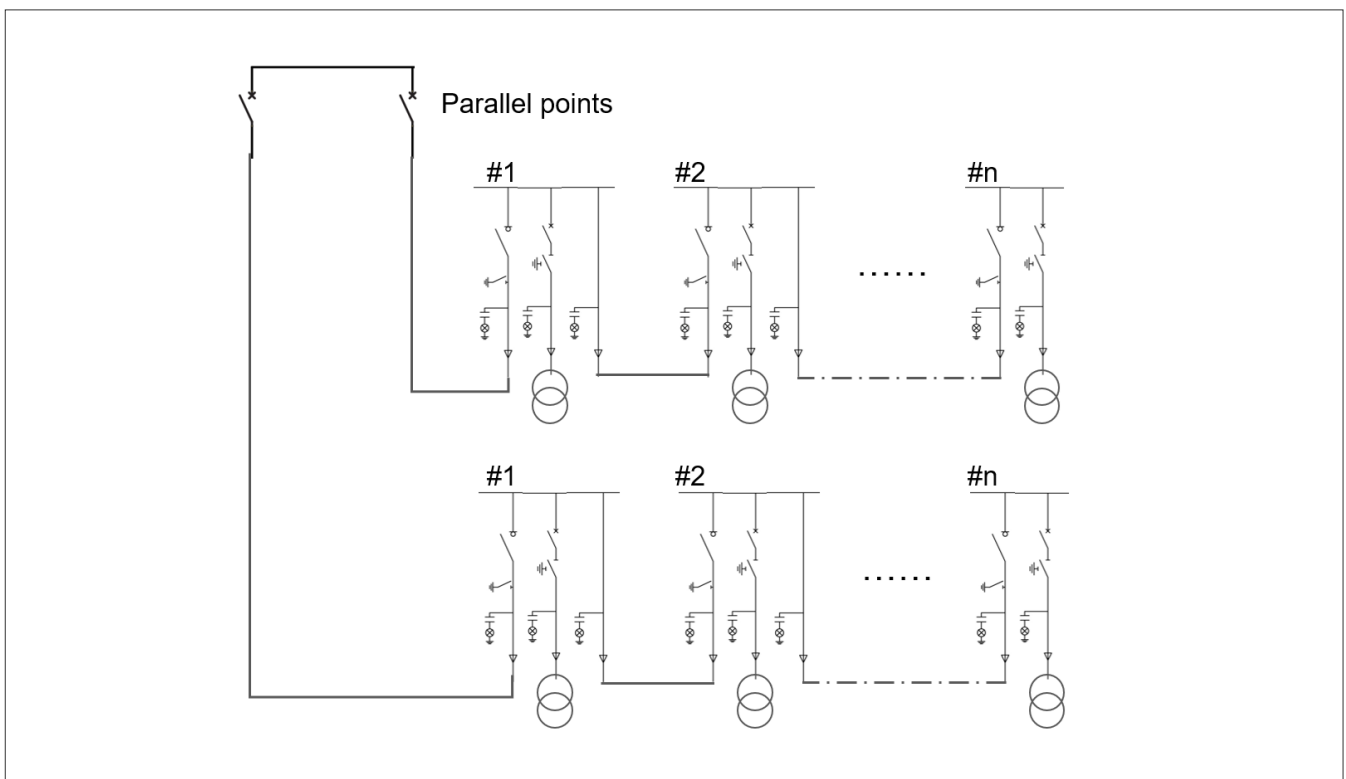


Figure 4 system view of a sample station

1.2 Transformer design

The transformer is an oil-immersed with no-load tap changer with a European efficiency of 99.606% (meeting the Tier 2 energy efficiency requirements), using Dy11 or Dy11y11 vector group. The capacity can be flexible, the maximum can be 9152kVA. And for the needs of different scenarios, the transformer can provide mineral oil and vegetable oil two kinds of insulation and heat dissipation media, natural air cooling. The main parameters are as follows:

Item	Data	Optional
Capacity	9152 kVA@40°C	<9152 kVA@40°C
Voltage in MV side	33kV	10/20/22/30/34.5/35kV/40.5kV
Frequency	50Hz	60Hz
Tap changer	0,±2*2.5%	/
Voltage in LV side	800V	/
Transformer type	Oil immersed, conservator type	/
Cooling type	ONAN	/
Vector group	Dy11-y11	/
PEI	Tier 2(EU548-2014)	/
Load loss	75.08kW(≤+15%)@Tier 2	/
None-load loss	4.3kW(≤+15%)@Tier 2	/
Oil type	No.25 mineral oil	No.45 mineral oil/vegetable oil
Winding material	Al/Al	/

1.3 LV design

There are two LV rooms for connecting to inverters. The LV room is equipped with MCCBs for connection with the inverter to ensure that each inverter is an independent loop and does not interfere with each other.

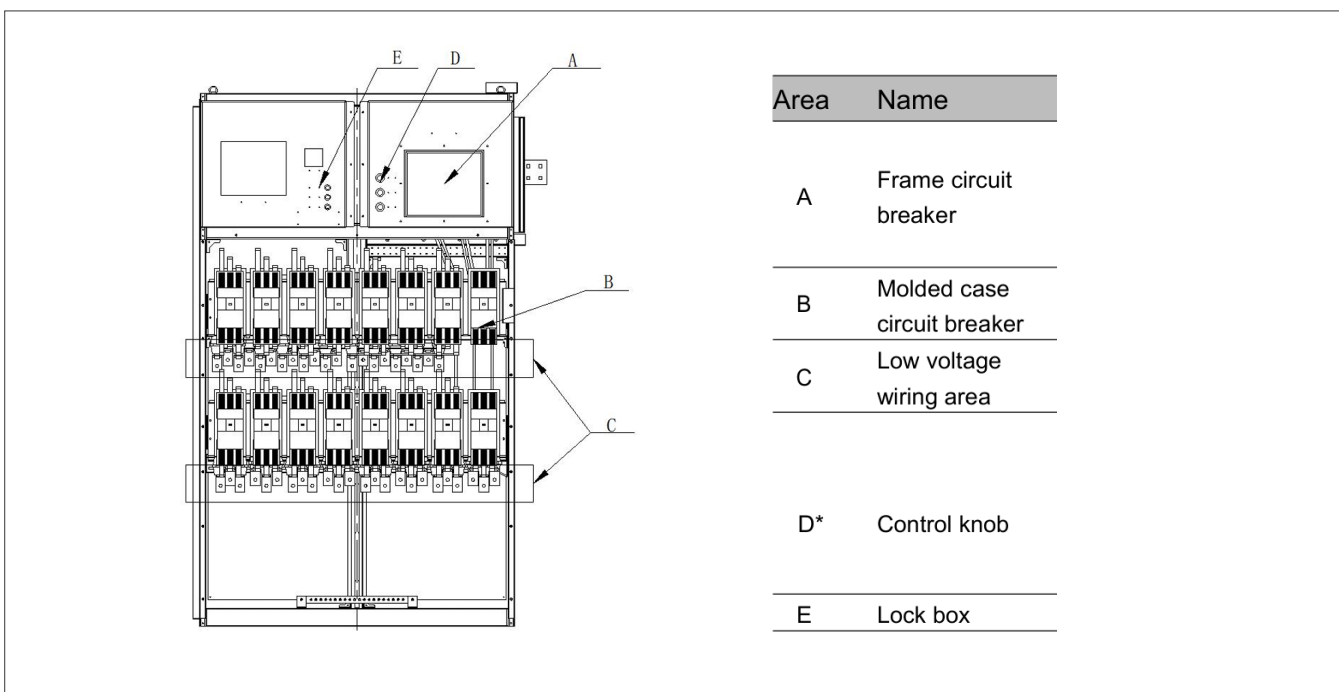


Figure 5 LV design

1.4 Protection and control design

GoodWe MV station not only has the function of measurement and control, it is also equipped with a complete relay protection function to protect the electrical safety of the MV station itself and the the equipment connected to it. It includes overcurrent protection, overvoltage protection, undervoltage protection, overload protection, over-frequency protection, underfrequency protection etc. For the transformer itself, it is equipped with gas protection, oil temperature, winding temperature protection etc. Protection setting can be adjusted flexibly according to project requirements. These protection functions enable the MV station to respond in time and take measures under various abnormal conditions to ensure the safe and stable operation of the power system and equipment. The design and implementation of protection function is an important part of MV station, which can effectively protect the equipment and extend the life of the equipment. Fully ensure the safety of equipment operation to prevent the expansion of accidents.

The MV station is equipped with a mechanical interlocking device, which can effectively prevent mis-operation , resulting in electrical accidents, and ensure equipment and personal safety. We also providing the interlocking between MV stations, as shown in below figure.

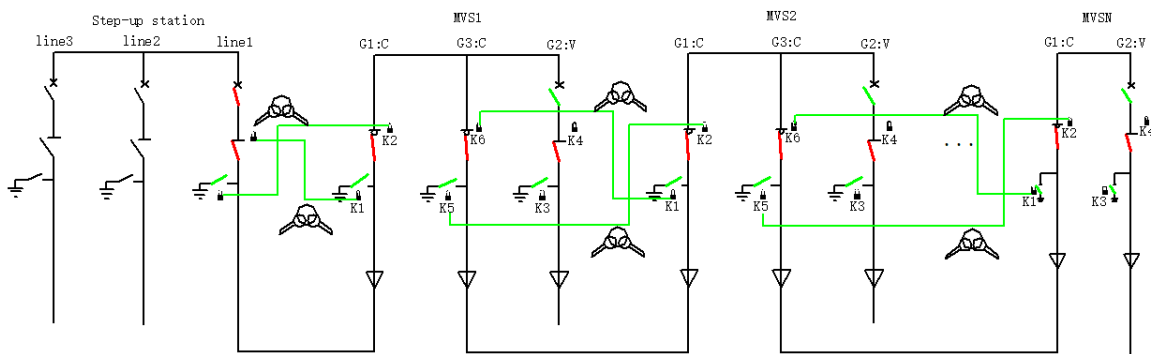


Figure 6 Interlocking between MVS

1.5 Communication design

GoodWe MVS integrates the overall communication solution of PV area, supporting GoodWe SCU3000 series communication box. This communication box integrates a variety of communication methods and communication protocols. It can access the inverter data through the PLC, and also provides a multi-channel RS485 communication interface to facilitate access to various equipment in the PV area. At the same time, it also has optical fiber ring network switches and optical fiber welding boxes, which can complete the needs of optical fiber communication in the PV area, and provide one-stop communication solutions in the PV area.

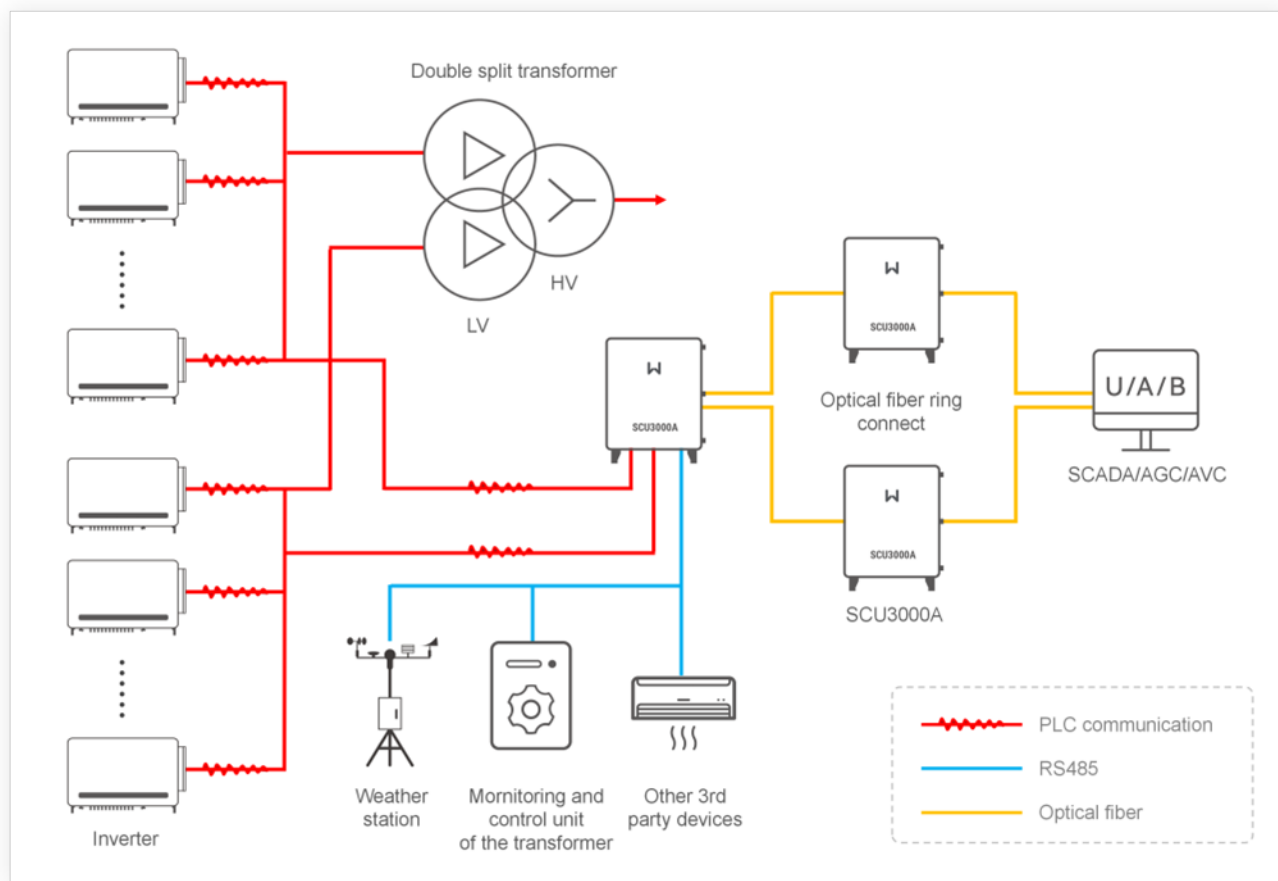


Figure 7 System design of communication

2. Stability

By using high-quality power equipment and advanced technology, GoodWe ensures the stable operation of MV station in various environments. The overall protection degree of the MV station is IP54, and the protection degree of the transformer is IP68, which effectively prevents the influence of the external environment on the equipment, improves the reliability and safety of the equipment, and ensures the reliability and stability of the power supply.

3. Safety

The MV station have passed the type test according to IEC62271-202, and obtained the internal arc test report, also the component inside MV station like transformer, switchgear etc has also type tested according to relevant IEC standard. The highest corrosion level is up to C5. It can reliably boost the voltage in PV station side and integrate it into the power grid. In case of power failure, the internal protection device can locate and cut off the fault in time, ensure the safe operation of the PV station, and realize the reliable connection between the PV station and the power grid.



Test Verification of Conformity

Verification Number: 230914006GZA-VOC003

On the basis of the tests undertaken, the sample(s) of the below product have been found to comply with the requirements of the referenced specification(s)/standard(s) at the time the tests were carried out. This verification is part of the full test report(s) and should be read in conjunction with it/them.

Applicant Name & Address:	Eaglerise Electric & Electronic (China) Co., Ltd. Industrial Park West, Ji'an County, Ji'an City, Jiangxi, China
Product Description:	A three phase, 9152 kVA, (33000±2.5%)/800/800 V (Ur), 50 Hz, Category II, ONAN, Dy11y11, oil type transformer. The high voltage winding has 5 taps and the principal tap is tap 3.
Ratings & Principle Characteristics:	Rated power: 9152 kVA Rated voltage: (33000 +/- 2x2.5%) / 800 V
Models/Type References:	SFL-0152/33
Brand Names:	EAGLERISE
Specification(s)/Standards:	IEC 60076-1:2011 Clauses 11.1.3 e), 11.1.4 c), 11.1.4 d), 11.1.4 h), 11.1.4 n), 11.2 to 11.5, 11.8 and 11.10 IEC 60076-2:2011 Clauses 6 and 7 IEC 60076-3:2013-AM:2018 Clauses 10, 11.2 and 13.3 IEC 60076-10:2015 Clauses 11 and 12 Intertek Testing Services (Guangzhou) Ltd. No. 3-1, Xinhai Xinyi Road, Huangge Town, Nansha District, Guangzhou City, China
Verification Issuing Office Name & Address:	Intertek Testing Services (Guangzhou) Ltd. No. 3-1, Xinhai Xinyi Road, Huangge Town, Nansha District, Guangzhou City, China
Date of Tests:	30 October to 02 November 2023
Test Report Number(s):	230914006GZA-002

Additional information in Appendix.


Signature

Name: Jason Yan
Position: Manager
Date: 08 November 2023

This Verification is for the exclusive use of Intertek's client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party other than the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Verification. Only the Client is authorized to grant copies or distribution of this Verification. The seal of the Intertek office in case of a copy is not a guarantee for the validity of the test report, certificate or annex that has to be approved or verified by Intertek. The responsibility and identification results mentioned in this Verification are relevant only to the sample tested/inspected. This Verification by itself does not imply that the material, product, or service is in full compliance with the referenced standard.

Intertek Page 1 of 2 GFT-OP-11a (22-August-2019)



Intertek Testing Services (Guangzhou) Ltd.
No. 3-1, Xinhai Xinyi Road, Huangge Town,
Nansha District, Guangzhou City, China
Tel: (86 20) 020-28209114
www.intertek.com

Laboratory Ref: S24B-001 and 24XB0206-S Project No. 230914005GZA
Client Name & Address: 04 February 2024
GoodWe Technologies Co., Ltd. Page 1 of 3
No.90 Zjin Rd,New District Suzhou,215011,China Issue 1

DECLARATION OF "VERIFICATION BY TEST" FOR ASTA CERTIFICATION

MANUFACTURER: Eaglerise Electric & Electronic (China) Co., Ltd.
Industrial Park West, Ji'an County, Ji'an City, Jiangxi, China
APPARATUS: 9152 kVA, 33 kV / 800 V, 50 Hz, 3-phase High-voltage prefabricated substation.
DESIGNATION: GW9100K-MVS
TESTED BY: Zhejiang FangYuan Electrical Equipment Testing Co., Ltd.
No. 400 Guangqiong Road, Jiaxing City, Zhejiang, China
and
Suzhou Electrical Apparatus Science Research Institute Co., Ltd (EETI)
No. 5, Qianzhu Road, Yuexi, Wuzhong District, Suzhou, Jiangsu, Peoples Republic of China
DATES OF TESTS: 22 January to 2 February 2024

The apparatus, constructed in accordance with the description and drawings incorporated in this letter has been subjected to the series of proving tests in accordance with

IEC 62271-202:2014, Clauses 6.2, 6.5, 6.6, 6.7 and Annex B

The results of the verification by testing of the PSC-Assembly design are detailed on the following pages.



Doc. Control No. TDE-Form-002 Version b Effective Date: 12 Dec 2019

Page 1 of 3
R&A Testing Services (Guangzhou) Ltd.
No. 3-1, Xinhai Xinyi Road, Huangge Town, Nansha District, Guangzhou City, China
Tel: (86 20) 020-28209114 www.intertek.com

Figure 8 Certifications

Future Trend

With the development of clean energy and technological progress, the application of MV station in PV station will have more development opportunities, it will be in two aspects.

Application of intelligent technology: With the development of artificial intelligence, Internet of Things and other technologies, the MV station may gradually realize intelligent monitoring and management to improve operational efficiency and safety.

High efficiency and energy saving: The future MV station may pay more attention to the efficient use of energy and energy saving and emission reduction to deal with the limited energy resources and environmental pollution problems.



Summary

As the global demand for clean energy continues to increase, photovoltaic power plants, as an important representative of renewable energy, are increasingly receiving attention. As an indispensable part of photovoltaic power plants, the MV station plays a key role in converting and distributing photovoltaic power generation energy. At the same time, as an important part of photovoltaic power stations, the MV station provides a reliable power support for photovoltaic power stations with its advantages of reliable stability, rapid deployment and flexible application, as a reliable connection between photovoltaic power generation and the grid. In the future, MV station will continue to play an important role in promoting the process of energy transition and sustainable development.

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