SSU Secondary Skid Unit

In line with IEC62271-212
SSU Secondary Skid Unit

Typical topology

**Large scale with string inverters**
- Large scale of plant
- Ground mounted PV often with tracker systems
- No public access
- Step up with industrial look skid unit up to 7.5MVA

**Large scale with central inverter**
- Large scale of plant
- Ground mounted PV often with tracker systems
- No public access
- Step up with industrial look skid unit up to 7.5MVA with central inverter
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Typical customer requirements from step up solar skid

Customer requirements

- High reliability and safety
- Designed and tested according to IEC standards
- Reduced downtime – continuity of service and stable supply
- Space savings – compact dimensions
- Flexible solution – configurable per MV grid parameters
- Safe and easy for operators in existing networks and systems
- Optimized life cycle cost – reduced maintenance and easy installation
- Quick delivery time
- Low environmental impact
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Main concept

Main highlights

Standard:
– Inline with IEC 62271-212

MV:
– SafeRing up to 40.5 kV (up to 20 kA)

Transformer:
– Oil hermetically sealed up to 7500 kVA

Low voltage switchgear:
– UniPack LVS4 sized to 2800 A
– Nr. of string inverters at 800 V
  • 185 kVA – up to 40 PC
  • 250 kVA – up to 30 PC

Low voltage connection:
– Busduct
– Oil containment bund
– Anti-rodent and watertight cable inlets

Transportation:
– Flat rack ISO container or truck
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Standards

**Prefabricated skid unit**

In line with IEC 62271-212 Compact Equipment Assembly for Distribution Substation (CEADS)
IEC 60529 Degree of protection provided by an enclosure (IP code)
IEC 62262 Degree of protection against external mechanical impacts (IK code)
IEC 60721 Classification of environmental conditions

**Main components**

IEC 62271-162271-200 High-voltage switchgear and controlgear
IEC 61439-1 Low-voltage switchgear and controlgear
IEC 60076 Transformer
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Customer benefits

1. High safety
   - Internal arc fault tested
   - Key interlock for safe operation

2. Reliability
   - Pre-engineered product reduce a risk of failure

3. Maximal efficiency
   - Open air cooling for maximal efficiency of transformer

4. Easy and fast installation, commissioning
   - Factory assembled and tested product

5. Eco-friendly
   - Transformer oil pit
   - Low global warming potential MV SWG as an option
Internal arc classified substation
- Prescribed criteria for protection of persons are met in the event of an internal arc and demonstrated by appropriate tests

Internal arc classification IAC-A
- Protection to operators during normal operation on the HV side of the skid
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Internal Arc Classification (IAC)

Safety
- Internal arc classified Safe-Ring / Safe-Plus 12/24/36 in outdoor enclosure
- According to IEC62271-200 transferable to 212
- IAC-A 20kA 1 sec per IEC62271-212
- Protection of operation personnel
- Small footprint

Internal arc proof

Non-arc proof
Reduced risk of failure thanks to several type tests performed considering worst-case condition:

**Test done:**
- Heat run of LV power circuit and a busduct @ 2800A reduce a risk of overheating of LV parts during peak power generation
- Dielectric
- Short Time Current
- IP, IK
- Internal arc
- Seismic simulation per IEEE693 moderate seismic level as standard
- Seismic simulation per IEEE693 high seismic level as an option
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Maximum efficiency

- Maximum efficiency during peak power generation thanks to free air cooling of transformer
- Engineered for efficient cooling in order to extend the life of the equipment
- No derating due to enclosure
- Less risk of overheating
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Fast installation

- Compact and easily transportable using standard transportation equipment – flat rack container or truck
- On site assembly is minimized
- Pre-engineered products reduce commissioning time at site while reducing risks
- Complete factory-delivered solution with only external connection to be done at site, resulting in significantly reduced installation time
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Eco-friendly

- Transformer oil containment bund to minimize a risk of pollution
- Low global warming potential MV switchgear available as an option
- Renewable transformer oil available as an option – biodegradable and non-toxic on both soil and water
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Features
SSU Secondary Skid Unit
Medium voltage side

- Provision for secondary medium voltage switchgear per IEC62271-200:
  - SafeRing / SafePlus up to 3bay
  - SafeRing / SafePlus36 up to 3bay
  - SafeRing / SafePlusAir – SF6 free up to 3bay
  - SafeRingAirplus – SF6 free up to 3bay
- Internal arc gas release is arranged through the roof with a base frame and a chimney
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Low voltage side

Advantages
- Small footprint
- Reliable
  - Tested per IEC61439-1
  - Redundant cooling fans for low risk of failure

Available configuration LVS4:
- 800 VAC
- Main incomer with ACBs 3P fixed
- Inverter connection with a Fuse switch disconnectors up to 2800 A per LVS
- Inverter connection with a breaker up to 2400 A per LVS

1. Cooling fans
   Part of LV cabin
2. Auxiliary compartments
3. Fuse switch disconnectors for inverter connection
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Low voltage side

Advantages
- Busduct connection is rated to 2800 A @ 35°C ambient
- LV busduct and LV switchboard are heat run tested in the lab
- 2 LV winding busducts are segregated by metallic partition
- Busbar is contained in outdoor enclosure
  - IP55
  - IK10
- Design of busduct may need to be accommodated to different TR
  1. LV connection – copper busduct
  2. Ronis key interlock
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Oil containment bund

1. Oil/water separator to release the rainwater during normal service
2. Oil containment bund to reduce a risk of pollution in case of oil leakage
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Cable layout
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Automation and monitoring

**Medium voltage**
- Status monitoring
- Remote operation
- SF6 level alarm
- Event recorder
- Oscillography
- MV bushing temperature monitoring

**Transformer**
- Gas formation alarm
- Low oil level alarm
- Overpressure alarm
- Overtemperature alarm
- Oil temperature analog value with PT100

**Low voltage**
- Power values, U, I, THD
- Main breaker control
- Electronic fuse status monitoring
- Insulation monitoring alarm and trip
- UPS health monitoring

**Skid cabin enclosure**
- Door open status
- Smoke detection inside the cabins
- LV cooling fan failure signal

**Connection towards customer DMS using:**
- Modbus TCP
- IEC 60870-5-104/-101
- IEC 61850
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Pre-engineered skid unit variants
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Pre-engineered skid unit variants

There are 3 pre-engineered skid unit variants available

7500kVA for string inverters
- 40x185 kVA string inverters
- 30x250 kVA string inverters

3750kVA for string inverters
- 20x185 kVA string inverters
- 15x250 kVA string inverters

6000kVA prepared for central inverter