



COMPACT UNIT SUBSTATION

for medium-voltage underground distribution system

MGS20-A



COMPACT SIZE

LOW LOSS &
ECONOMICAL

LONG-TERM
RELIABILITY

SCADA
READY

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UNIT SUMMARY

COMPACT UNIT SUBSTATION (CUS) is a facility for 24kV, 3-phase 3-wire, 50Hz underground distribution system, which is composed of three components: RMU (medium-voltage switchgear), transformer, and L/V switchgear.

CUS is designed to be compact (narrow in depth) in order to install in the crowded busy metropolitan areas where the underground power distribution lines are mostly deployed for enhancing the stability and reliability of power supply and for improving the city scenery.

UNIT FEATURES and ADVANTAGES

COMPACT SIZE

The size of narrower CUS is **Depth (990mm)** × Width (3000mm) × Height (2700mm) enabled by our unique technology.

SCADA READY

RMU can be operated remotely from utilities' control center or locally at sites through the digital microprocessor controlled **INGETEAM DA-AU relay**.

LOW LOSS AND ECONOMICAL

The best quality silicon steel sheet is used for transformer tank achieving **Load loss: 4,200W** and **No load loss: 790W** for the narrower CUS type. These low loss performance can contribute to reduce the running cost and be economical.

LONG-TERM RELIABILITY

Our patented and simplified pressure releasing structure reduces a risk of gas leakage of RMU. The experience of no gas leakage of RMU and no oil leakage of transformer **ensures the long-term reliability in CUS**.

ECO FRIENDLY

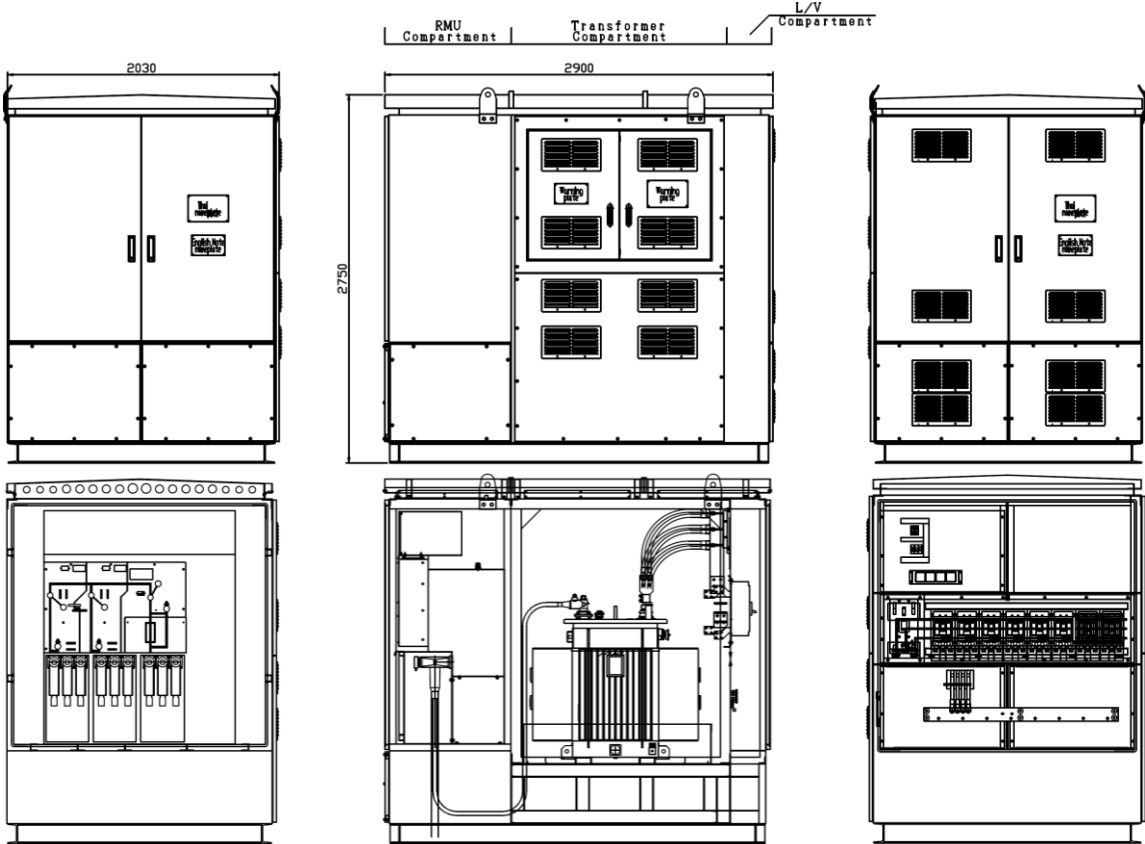
Biodegradable oil (with reduced flammability) is used as the insulation oil in transformer. The oil is more ECO friendly than the mineral oil because the biodegradable oil is easy to be degraded by microorganisms living in the soil.

SELF-SUPPORTED STRUCTURE

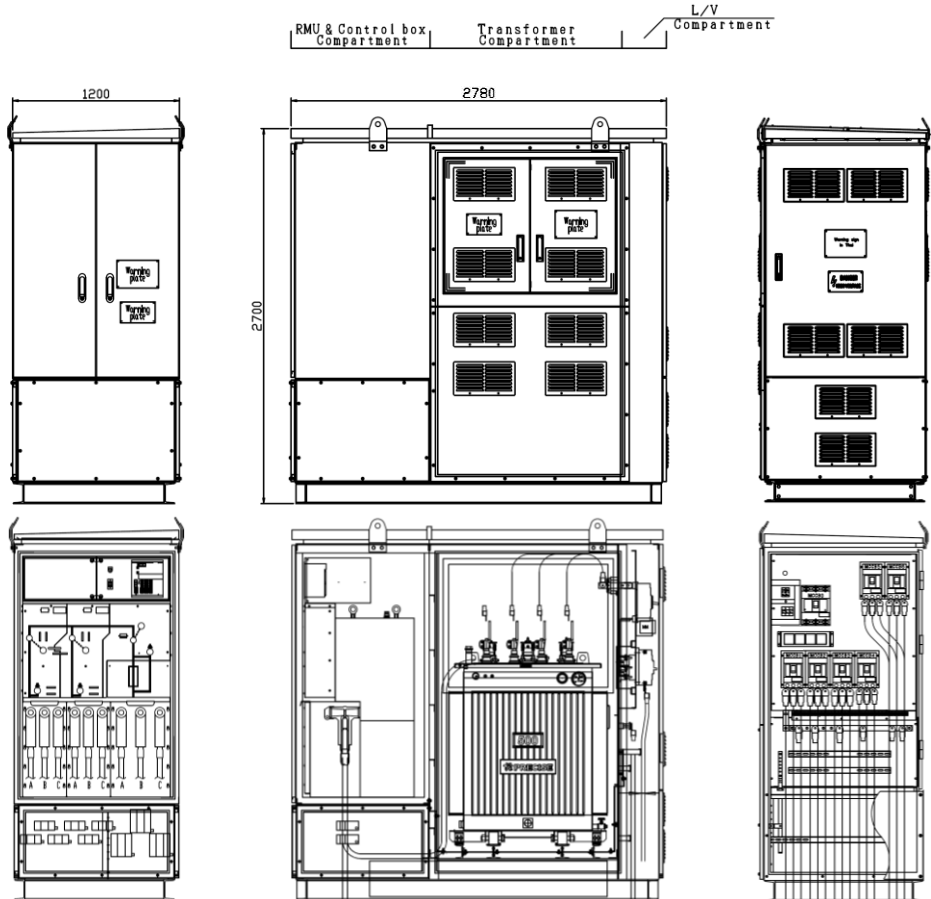
Prefabricated structure of the enclosure enables to remove the cover, which provides for the replacement of the internal equipment of CUS.

APPEARANCE AND INTERNAL STRUCTURE

Unit substation (US): 500, 750 and 1,000kVA (COMMON ENCLOSURE)

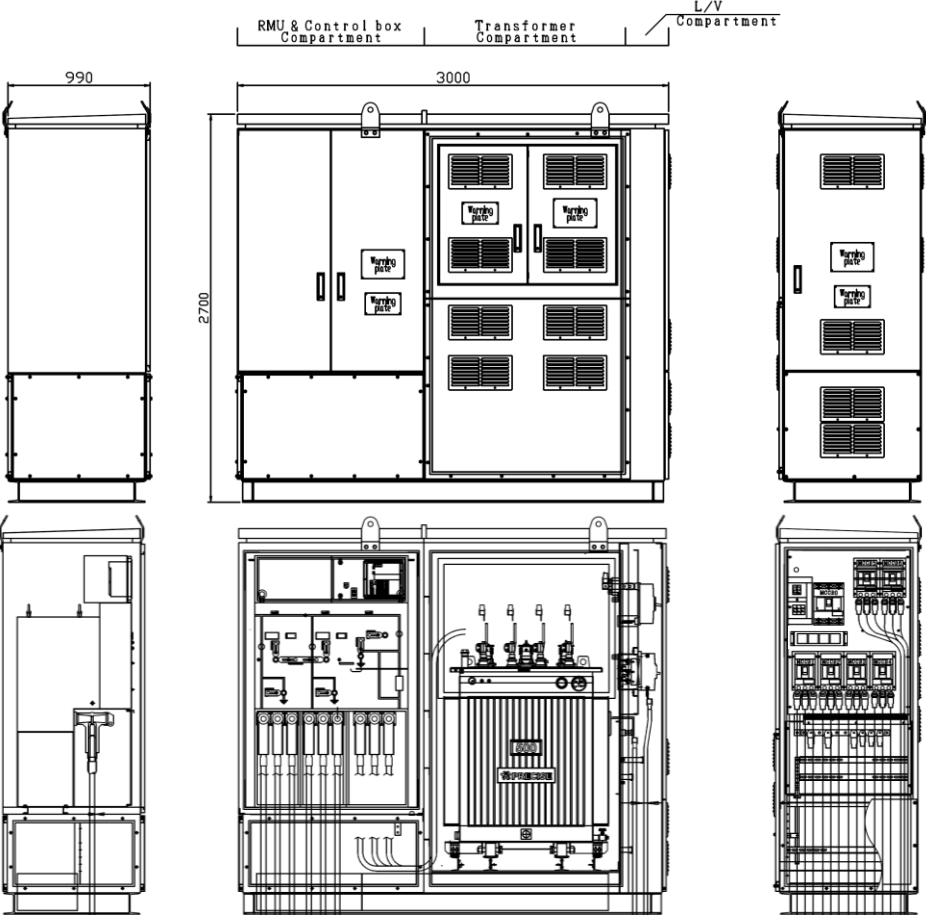


CUS: 500kVA



** Design is subject to change without notice.

CUS: 500kVA (NARROWER TYPE)



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CUS: 500kVA



CUS: 500kVA (NARROWER TYPE)



SPECIFICATIONS

TRANSFORMER

Item		Rating and feature			
Rated voltage	Primary	24,000V			
	Secondary	416V/240V			
Percent of rated voltage each tapping		-4 x 2.5%			
Rated frequency		50Hz			
Connection symbol		Dyn1			
Type of cooling		KNAN			
Rated power		Three phase 500kVA [For CUS]	Three phase 500kVA [For US]	Three phase 750kVA [For US]	Three phase 1,000kVA [For US]
Limit of temperature rise		Oil: 50K, Winding: 50K			
Rated lightning impulse withstand voltage		High-voltage: 125kV, Low-voltage: 30kV			
Rated power frequency withstand voltage		High-voltage: 50kV, Low-voltage: 10kV			
Insulation oil		Biodegradable oil (less flammable)			
Load loss at rated current at 75°C (Max.)		4,200W	3,030W	4,370W	6,400W
No load loss at rated voltage (Max.)		790W	670W	840W	1,000W
Impedance voltage at 75°C		3.25% or more		6.5% or more	
Efficiency in % at 75°C	50% of rated power, PF=1	99.27%	99.43%	99.49%	99.48%
	100% of rated power, PF=1	99.01%	99.27%	99.31%	99.27%

LOW-VOLTAGE MCCB UNIT

Item	Main circuit breaker	Branch-circuit breaker
Frame A	1,600AF / 800AF	400AF
Rated insulation voltage	690V	
Frequency	50Hz	
Rated current (Adjustable)	800, 1,000, 1,200, 1,400, 1,500, and 1,600A / 400, 450, 500, 600, 700, and 800A	250, 300, 350, and 400A
Rated short-circuit breaking capacity (I _{cu})	30kA (400V applied)	30kA (400V applied)

RMU

Item	Rating
Rated voltage	24kV
Rated current	630A (2-IN), 200A (1-OUT)
Rated frequency	50Hz
Number of circuit	3 circuits (2-IN 1-OUT)
Rated short time withstand current	16kA (r.m.s.) — 1 sec.
Rated short circuit making current	40kA (peak)
Rated active load current	630A (LBS1,2)
Rated power frequency withstand voltage	50kV (Dry)
Lightning impulse withstand voltage	125kV
SF6 gas pressure	50kPa · G(at 20°C)
Fuse (For 500kVA transformer [Narrower type])	Rated current: 31.5A, Rated breaking current: 63kA Standard: DIN 43 625 complied
Interlock function	All feeder: main circuit and earthing switch Transformer feeder: main circuit, fuse component cover
Handle operating force	250N or less
Fault indicator	Display in case of overcurrent
Voltage measuring terminal	Indication whether the voltage is applied

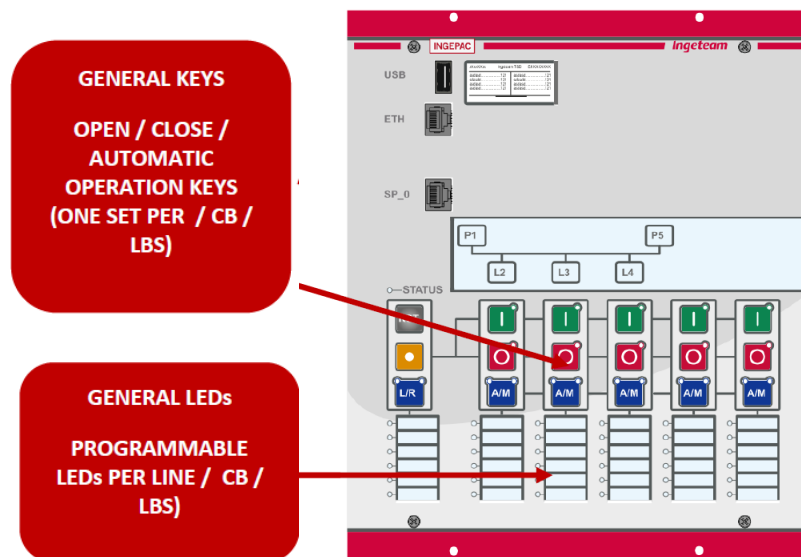
RMU CONTROLLER

Item	Ratings
Range of phase current measurement	2.4A– 720A (Primary side)
Range of neutral current measurement	0.12A– 720A (Primary side, measurement range)
Measurement accuracy for V and I (Only FRTU)	0.2% (up to 120% nominal) 3% (in the protected range)
Communication port	Front : RJ45, USB Port Rear : RS232/RS485 Rear (Optional) : GFO/ST, PFO/HP, GFO/LC, RJ45,
Communication protocol	IEC60870-5-104, DNP3.0, IEC61850, Web Server/Web Services, 61850 client, IEC60870-5-101, IEC60870-5-103, PROCOME , Master Modbus, GOOSE

CONTROLLER FUNCTIONS

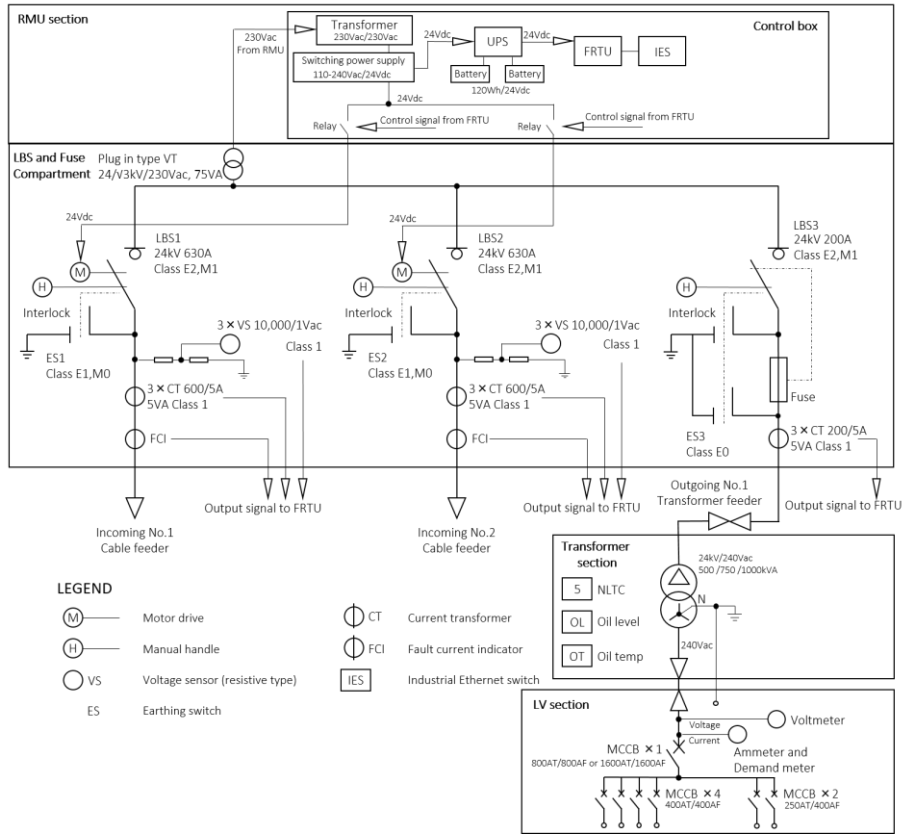
Data Acquisition Functions
Measurements of phase current and neutral
Measures voltage phases and neutral
Active, reactive, and apparent power
Power Factor
Oscillography
Historical measures

FRTU front Panel

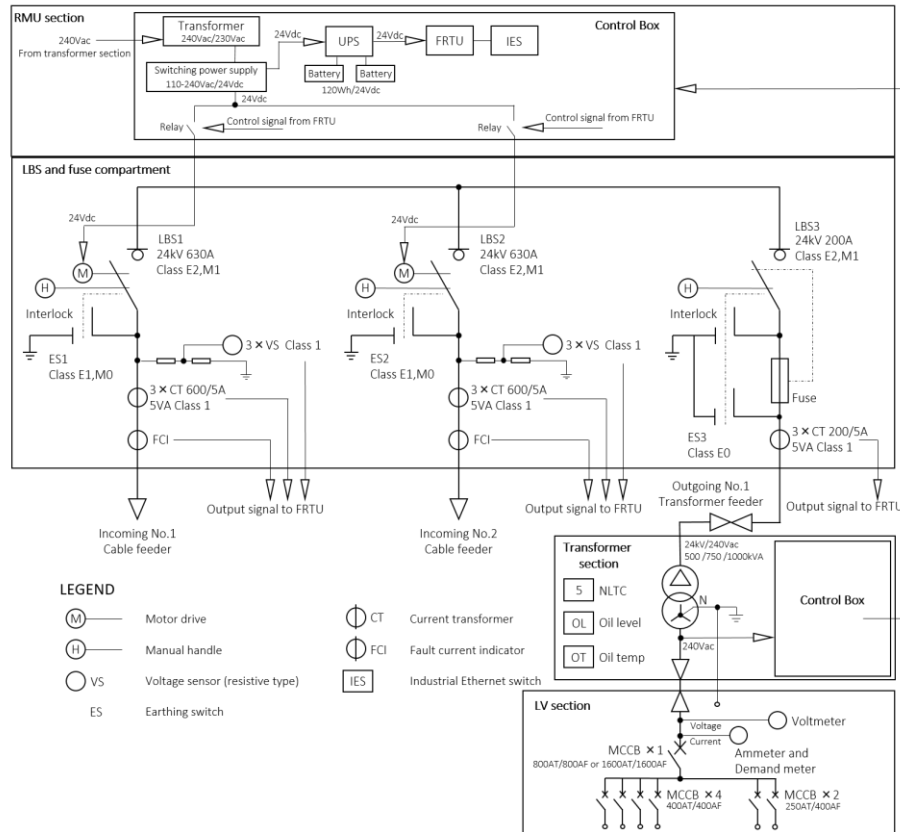


WIRING DIAGRAM

Single line diagram of CUS [RMU with plug in voltage transformer]



Single line diagram of CUS



SITE AND SERVICE CONDITION

Item	Site and service condition
Installation site	Outdoor
Altitude	Less than 1,000m above sea level
Maximum ambient temperature	40°C
Average ambient temperature in any 1 year	30°C
Average relative humidity in any one year	79%
Average maximum relative humidity in any 1 year	94%
Maximum ambient temperature inside the enclosure	45°C

REFERENCE STANDARD

COMPACT UNIT SUBSTATION

IEC62271-202	(2014)	High-voltage switchgear and controlgear - Part 202: High-voltage/low-voltage prefabricated substation
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TRANSFORMER

IEC60076-1	(2011)	Power transformers – Part 1: General
IEC60076-2	(2011)	Power transformers – Part 2: Temperature rise
IEC60076-3	(2013)	Power transformers – Part 3: Insulation level and dielectric tests
IEC60076-5	(2006)	Power transformers – Part 5: Ability to withstand short circuit

RMU

IEC62271-1	(2017)	High-voltage switchgear and controlgear – Part 1 Common specifications for alternating current switchgear and controlgear
IEC62271-102	(2001)	High-voltage switchgear and controlgear – Part 102 Alternating current disconnectors and earthing switches
IEC62271-103	(2011)	High-voltage switchgear and controlgear – Part 103 Switches for rated voltages above 1kV up to and including 52kV
IEC62271-105	(2012)	High-voltage switchgear and controlgear – Part 105: Alternating current switch-fuse combinations
IEC62271-200	(2011)	High-voltage switchgear and controlgear- Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1kV and up to and including 52kV

LOW-VOLTAGE MCCB UNIT

IEC60947-2	(2009)	Low-voltage switchgear and controlgear Part2- Circuit-breakers
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