



# THREE-PHASE OIL-IMMERSED SMALL SUBSTATION TRANSFORMER

CSA/AS/UL/DOE

CUTTING EDGE SERVICE/ SPEED

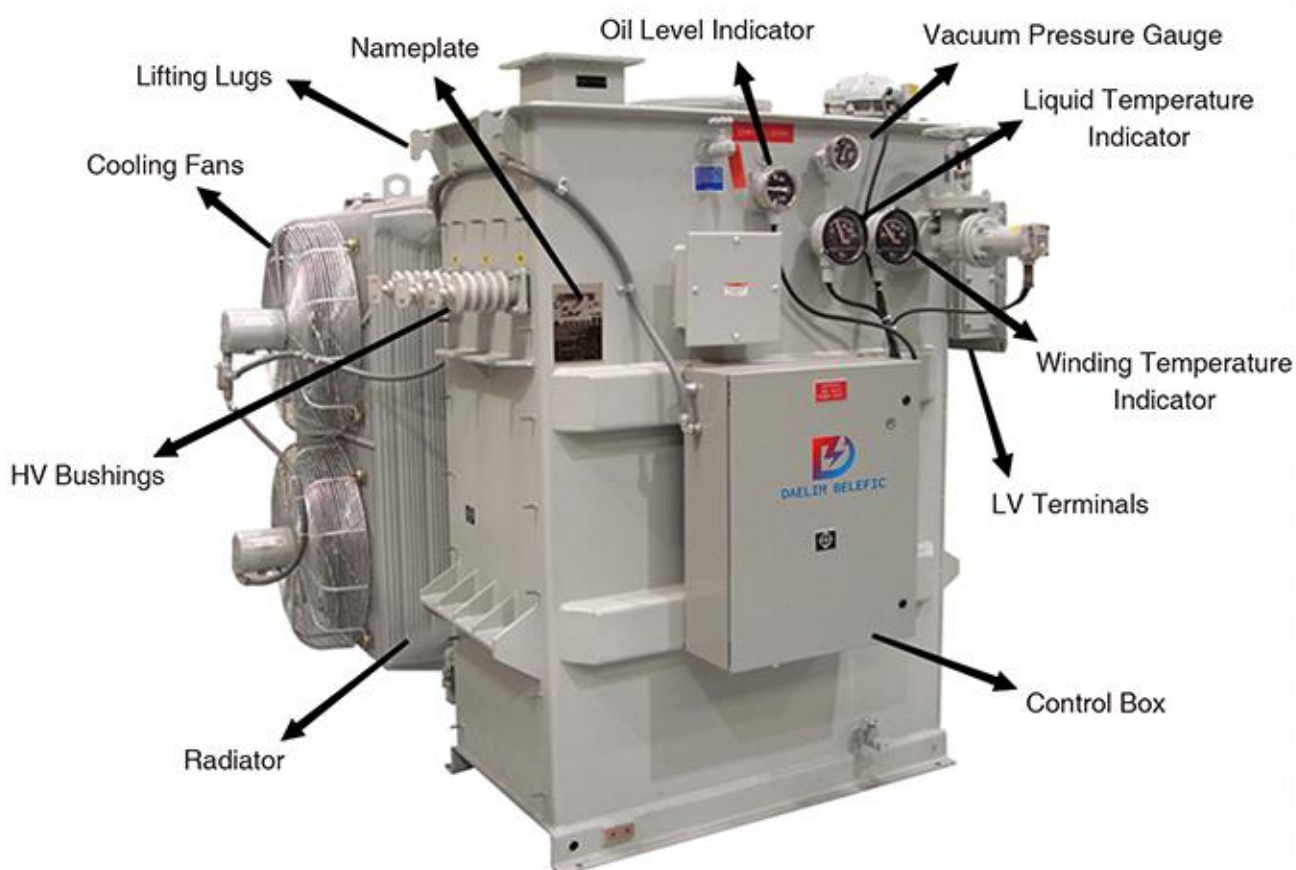
PRODUCTION LINE CUSTOMIZATION

# GENERAL

Daelim Belefic three-phase oil-immersed small substation transformer is designed to use in the power distribution system.

A substation is a component of a system that generates, transmits, and distributes electricity. Substations convert high to low voltage – or vice versa – and conduct a variety of other critical duties. Electricity may travel through many substations at varying voltage levels between the generating station and the customer. Transformers may be used in a substation to convert voltage levels between high transmission and low distribution voltages or to connect two separate transmission voltages.

A utility company or a major industrial or commercial customer can own and operate a substation. Substations are typically unattended, with remote supervision and control provided by a control system.



# 01 DESIGN CAPABILITY

- Carbon steel, optional stainless steel tank
- Capacity: 750kVA ~15,000kVA
- Primary Voltage: 13800V,23000V,34500V or others
- Secondary Voltage: 208V ,12,470V,132,00V,13,800Vor others
- Bushings: Top-mounted / Side-mounted
- Insulation Fluids: mineral insulating oil, Envirottemp™ FR3™ fluid,
- Standards: ANSI/IEEE, CSA, AS/NS, IEC, etc...



# 02 APPLICATION

- Data Center
- Cryptocurrency Mining (Bitcoin)
- Public Utilities
- Power Substation
- Solar Farms
- Industry



# 03 STANDARD FEATURES

- Insulating mineral oil
- 60/50 Hertz operation
- Externally operated de-energized tap changer with (2) 2.5% full capacity taps above and below nominal
- 65°C average winding rise
- HV and LV bushings
- HV and LV flange connections
- Pressure-vacuum gauge
- Liquid level gauge
- Liquid temperature gauge
- Pressure test valve
- Drain / filter valve with sampling device
- Tank lifting lugs
- Corrosion resistant nameplate
- Hydran provision (above 7.5 MVA)



# 04

## OPTIONAL ACCESSORIES

- High-fire point fluid, such as silicone, hydrocarbon or vegetable fluids. (up to 10 MVA)
- 55° C 55/65° C average winding rise
- Forced air cooling
- Forced air cooling with 2 stages (from 7.5 MVA and up to 15 MVA)
- Removable radiators
- Pressure relief device
- Winding temperature device
- Sudden pressure relay with or without seal in
- Devices with alarm contacts
- Top filter press valve
- HV & LV air terminal compartments
- HV lightning arresters
- Current transformers
- Neutral grounding resistor
- Special impedances
- Low losses
- Special environment (i.e: classified areas)
- Special / low sound level
- Retrofit to specific dimensions
- Non-standard loading conditions such as harmonic loading or specified K-factor
- Stainless steel removable radiators
- Galvanized steel removable radiators
- Special paint for marine ambient
- Special paint thickness
- Special colors
- CSA compliance
- Other special features upon request



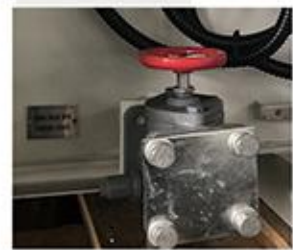
LV Terminals



Tap Changer



Nameplate



Drain Valve



Oil Fill Valve



Liquid Level Indicator



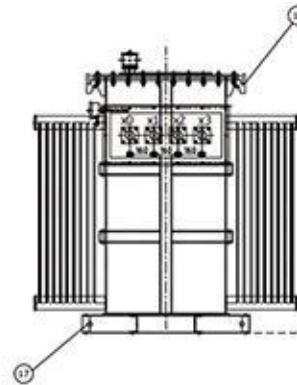
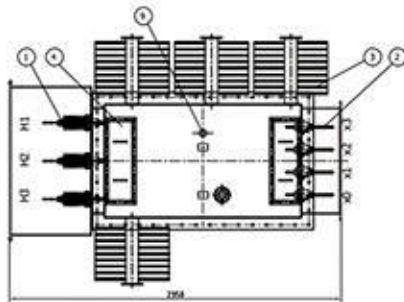
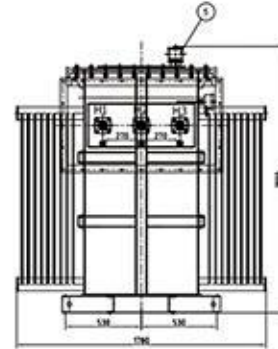
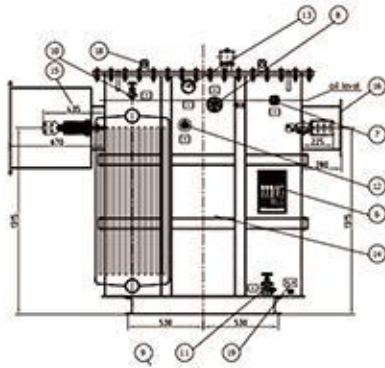
Liquid Temperature Indicator



Pressure Relief Valve

## 04

## OPTIONAL ACCESSORIES



No.	Name	No.	Name
1	HV BUSHING	11	1" DRAIN VALVE WITH 3/8" SAMPLER
2	LV BUSHING	12	TAP CHANGER
3	RADIATORS	13	VACUUM PRESSURE GAUGE
4	HANDHOLE	14	LIFTING HOOK FOR COMPLETE TRANSFORMER
5	PRESSURE RELIEF DEVICE	15	CABLE CONNECTION BOX, H.V
6	NAME PLATE	16	THROAT FLANGE, L.V
7	LIQUID LEVEL INDICATOR	17	BASE WELDED TO TANK
8	LIQUID TEMPERATURE INDICATOR	18	LIFTING EYE FOR ACTIVE PART WITH TANK COVER
9	POCKET	19	GROUND PAD ON TANK WALL
10	1" UPPER FILL VALVE		

# 05

## TECHNICAL DATA

**Technical Data for 15/25/35KV Class  
Three Phase Oil-Immersed Distribution Transformer**

(KVA) Rated Power	(KV) High Voltage	(KV) Low Voltage	Connection Symbol	Short Circuit Impedence	(W) Loss		Reference Dimension (W*H*D) mm	Reference Weight kg
					(W) No-load Loss	(W) On-load Loss		
800	4.16 12.00 12.47 13.2 13.8 14.4 23.0 24.94 34.5 34.8 44 or others	208/120 415/240 480/277 400 600 12000 12470 13200 13800 or others	Dyn1 Ynyn0 Dyn11 Dd0 Ynd11 or others	2.7 3.1 4.35 5.75 6.0	980	9350	1060*1500*1780	2050
1000					1160	11500	1085*1570*1800	2450
1250					1380	13900	1160*1610*1890	2900
1600					1660	16600	1190*1630*1950	3400
2000					2030	18300	1260*1700*2090	4100
2500					2450	19600	1150*2150*2250	4750
3000					3240	26500	1900*2600*2150	6500
5000					4500	27000	2500*2210*3180	9500
7500					7200	32000	3660*3100*5100	13600
10000					8500	35500	3830*2640*2216	15800

\* Dimension, weight, and loss are for reference. Will based on actual project, design and standard.



# 06

## CONSTRUCTION

### 1 CORE

Cores are manufactured with precision cut, burr-free, grain-oriented silicon steel. Many grades of core steel are available for optimizing core loss efficiency.

### 2 COIL

Substation transformers feature a rectangular coil configuration with wire-wound, high-voltage primaries and sheet-wound secondaries. The design minimizes axial stress developed by short circuits and provides for magnetic balancing of tap connections.

Coils are wound using the highest quality winding machines providing exacting tension control and conductor placement for superior short-circuit strength and maximum efficiency.

Extra mechanical strength is provided by diamond pattern, epoxy coated paper insulation, used throughout the coil, with additional epoxy at heavy stress points. The diamond pattern distribution of the epoxy and carefully arranged ducts, provide a network of passages through which cooling fluid can freely circulate.

Coil assemblies are heat-cured under calculated hydraulic pressure to ensure performance against short-circuit forces.

### 3 CORE AND COIL ASSEMBLIE

Substation transformers core and coil assemblies are braced with heavy steel ends to prevent the rectangular coil from distorting under short-circuit conditions. Plates are clamped in place using presses, and welded or bolted to form a solid core and coil assembly. Core and coil assemblies exceed ANSI® and IEEE® requirements for short-circuit performance. Due to the rigidity of the design, impedance shift after short-circuit is comparable to that of circular wound assemblies.

### 4 TANK

Transformer tanks are designed for high strength and ease of handling, installation, and maintenance. Tanks are welded using precision-cut, hot rolled, pickled and oiled steel. They are sealed to protect the insulating fluid and other internal components. Transformer tanks are pressure-tested to withstand 7 psig without permanent distortion and 15 psig without rupture.

# 06

## CONSTRUCTION



### TANK FINISH

An advanced multi-stage finishing process exceeds ANSI/IEEE standards. The eight-stage pre-treatment process assures coating adhesion and retards corrosion. It converts tank surfaces to a nonmetallic, water insoluble iron phosphate coating.

The paint method consists of two distinct layers of paint. The first is an epoxy primer (E-coat) layer which provides a barrier against moisture, salt and corrosives. The two-component urethane final coat seals and adds ultraviolet protection.



### VACUUM PROCESSING

Transformers are dried and filled with filtered insulating fluid under vacuum, while secondary windings are energized. Coils are heated to drive out moisture, ensuring maximum penetration of fluid into the coil insulation system.



### INSULATING FLUID

Maximum penetration of fluid into the coil insulation system.

Transformers from Daelim Belefic are available with electrical-grade mineral insulating oil or Envirotemp™ FR3™ fluid. The highly refined fluids are tested and degassed to assure a chemically inert product with minimal acid ions. Special additives minimize oxygen absorption and inhibit oxidation. To ensure high dielectric strength, the fluid is re-tested for dryness and dielectric strength, refiltered, heated, dried, and stored under vacuum before being added to the completed transformer. Daelim Belefic transformers filled with Envirotemp™ FR3™ fluid enjoy unique fire safety, environmental, electrical, and chemical advantages, including insulation life extending properties.

A bio-based, sustainable, natural ester dielectric coolant, Envirotemp™ FR3™ fluid quickly and thoroughly biodegrades in the environment and is non-toxic per acute aquatic and oral toxicity tests.



# 06

## CONSTRUCTION

### 8 TEST

Daelim Beleric performs routing testing on each transformer manufactured including the following tests:

- **Ratio, Polarity, and Phase Relation:** Assures correct winding ratios and tap voltages; checks insulation of HV and LV circuits. Checks entire insulation system to verify all live-to-ground clearances.
- **Resistance:** This test verifies the integrity of internal high-voltage and low-voltage connections; provides data for loss upgrade calculations.
- **Applied Potential:** Applied to both high-voltage and low-voltage windings, this test stresses the entire insulation system to verify all live-to-ground clearances.
- **Induced Potential:** 3.46 times normal plus 1000 volts for reduced neutral designs.
- **Loss Test:** These design verification tests are conducted to assure that guaranteed loss values are met and that test values are within design tolerances. Tests include no-load loss and excitation current along with impedance voltage and load loss.
- **Leak Test:** Pressurizing the tank to 7 psig assures a complete seal, with no weld or gasket leaks, to eliminate the possibility of moisture infiltration or fluid oxidation.
- **Operation tests of all devices:** All electrical and electro-mechanical devices shall be operated both in auto and manual mode for proper sequencing/staging and function.

### 9 DESIGN PERFORMANCE TEST

- The design performance tests include the following.
- **Temperature Rise:** Our automated heat run facility ensures that any design changes meet ANSI® and IEEE® temperature rise criteria.
- **Audible Sound Level:** Ensures compliance with NEMA® requirements.
- **Lightning Impulse:** To assure superior dielectric performance, this test consists of one reduced wave, two chopped waves and one full wave in sequence, precisely simulating the harshest conditions.
- The performance tests such as short-circuit capability test, lifting and moving devices test can be executed while specified by the customer.

**DB Transformer, with an Edge**



Quality  
ISO 9001



Environment  
ISO 14001



Health & Safety  
ISO 45001



DAELIM BELEFIC

## CONTACT US

**TEL:** +86-10-65002471/65001715

**FAX:** +86-10-65001719

**CELL:** +86-17600626876 +86-13051965423

**EMAIL:** SERVICE@DAELIM-ELECTRIC.COM

**WEBSITE:** WWW.DAELIM-ELECTRIC.COM

**ADD:**

BEIJING OFFICE:

2707, No.4 BUSINESS BUILDING, CHINA CENTRAL PLACE, CHAOYANG DISTRICT, BEIJING, CHINA

JIANGSU FACTORY:

169 XINLOU ROAD, QUTANG TOWN, HAI'AN CITY, NANTONG CITY, JIANGSU PROVINCE



### Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.  
Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise