MGM TRANSFORMER COMPANY

COMMERCE, CA MGM TRANSFORMER

BULLETIN 30

Dry Type Substation Transformers

ISO 9001:2008 REGISTERED

U.S. DEPARTMENT OF ENERGY DOE 2016 COMPLIANT

ENERGY STAR PARTNER

made in USA

Special Design

MGM Transformer Company manufactures transformers in six major categories:

Special Design Dry Type Transformers:
- 9 kVA to 10,000 kVA
- Single Phase & Three Phase
- 600 V to 34.5 kV
- K-Factor Ratings
- Retrofit Applications

Dry Type Substation Transformers:
- 225 kVA to 10,000 kVA
- 600 V to 34.5 kV
- Indoor and Outdoor

Liquid Filled Substation Transformers:
- 500 kVA to 10,000 kVA
- 2.5 kV to 34.5 kV
- Indoor and Outdoor

Dry Type Drives Isolation Transformers:
- 6, 12, 18, 24 and 36-Pulse
- 15 kVA to 7,500 kVA
- 600 V to 25 kV
- Indoor and Outdoor

Liquid Filled Drives Isolation Transformers:
- 6, 12, 18, 24 and 36-Pulse
- 200 kVA to 7,500 kVA
- 2.5 kV to 25 kV
- Indoor and Outdoor

600V Class Transformers:
- 15 kVA to 3,750 kVA, 3-Phase
- 10 kVA to 833 kVA, 1-Phase

MGM Transformer Company has established itself as a leading manufacturer of custom dry type transformers. With an exceptionally large and experienced engineering staff, MGM has the ability to design to the varying criteria of differing industries while maintaining short lead times. Core and coil applications for regulators and UPS systems, low loss/high efficiency drives isolation transformers. Special custom size K-factor rated substation transformers for retrofit are but a few of the special transformers MGM has designed and manufactured.

MGM employs three winding styles for Special Design Dry Type transformers, based on kVA, voltage and BIL requirements. The ability to select a specific winding style assures the highest degree of mechanical strength under short circuit stress conditions and suitability for different voltage classes.

Most transformer companies offer standard engineered products only, and ask the users to make it fit their applications. MGM can engineer the product both electrically and mechanically to fit virtually any application.

Dry Type Transformers

PRODUCT RANGE

Three Phase

Voltage Class	KVA
600 V thru 1.2 kV	9 thru 2,000
2.4 kV thru 5 kV	15 thru 10,000
8.7 kV thru 15 kV	45 thru 10,000
25 kV	225 thru 10,000
34.5 kV	500 thru 10,000

Single Phase

Voltage Class	KVA
600 V thru 1.2 kV	10 thru 833
2.4 kV thru 5 kV	15 thru 1,667
8.7 kV thru 15 kV	30 thru 1,667
25 kV	150 thru 1,667
34.5 kV	333 thru 1,667

Barrel wound

The rectangular barrel wound style is the most common method in the industry for 600V and 5kV applications.
MGM's standard is the superior oval barrel wound method for 600V class and 5kV class, 45kV BIL maximum.

Section wound

The section wound style is rarely used in the industry due to higher cost vs. barrel or random wound. May be used for special applications up to 125 kV BIL.

SPECIFICATIONS

- Aluminum/Copper
- 150°C / 115°C / 80°C or Special Request
- 220°C insulation
- NEMA standard/special sound levels
- ANSI standard/special BIL levels
- VPI
- UL K-factor ratings
- UL/CUL/CE/CSA listings (check with factory)
- Multi-voltage input/output
- 50/60/400 Hz
- OEM core and coil
- Multiple electrostatic shields
- Design to meet customer impedance and loss criteria
- Ultra Efficient Designs

Disk wound

Due to its superior design criteria, MGM uses this method on most 15kV class to 125kV BIL.

Substation Transformers

RANGE

225kVA-3,750kVA, 600 V

225kVA-10,000kVA, 2.4/5/15kV

500kVA-10,000kVA, 34.5kV

Dry Type Substation 1800 kVA

Primary 6.3kVΔ Secondary 400Y/231V 50Hz; 150°C Rise; Copper Wound; Digital Temperature Monitor; NEMA 3R Louvers; Low Voltage Transition Section with Flex Leads

SPECIFICATIONS

Aluminum/Copper
150°C / 115°C / 80°C
220°C insulation
Indoor/outdoor
ANSI standard/special BIL levels
VPI
UL K-factor ratings
UL/CUL/CSA listings
(check with factory)

BULL RUSH PROGRAM

Need it fast? We can deliver. Emergencies happen and we're here to respond. WE WILL WORK 24/7 TILL THE UNIT IS DONE OR YOUR MONEY BACK! Ask about our BULL RUSH program and let us know what you need.

For over two decades, MGM Transformer Company has been a reliable source for quality secondary unit substation transformers. Our standard designs cover the full range of requirements from 5kV to 34.5kV, 500kVA to 10,000kVA, in both liquid and dry type.

As an engineering oriented transformer company, we maintain a large engineering staff. Our experience in working with various switchgear manufacturers enables us to design the high voltage/low voltage switchgear interface, assuring the proper match in the field. Flex connectors can be supplied.

Non-standard substation designs are also available for special situations such as failed unit retrofitting or PCB replacement.

All manufacturing processes are done on the premises. This advantage, along with a large inventory of electrical steel and wire, assures our customers of the industry's **shortest standard lead times,** regardless of the interface requirements.

Ventilated Dry-Type Transformers

Approximate Enclosure Dimensions and Weights

Based upon 15kV class, 150°C rise. Al windings

KVA	Height Inches	Width* Inches	Depth Inches	Weight lbs
225	90	56	50	2,400
300	90	56	50	3,000
500	90	72	50	3,700
750	90	80	50	4,900
1000	90	90	50	6,000
1500	90	90	50	8,100
2000	100	100	60	9,700
2500	108	108	60	11,500
3000	108	108	60	12,800

*Add 18" to width for each ATC.

NOTES:

1. Coordination to HV/LV Switchgear may require Transition/Throats.
2. Depth and height dimension may increase for outdoor NEMA 3R enclosures.
3. Dimensions may vary with special requirements.
4. Dimensions and weights are subject to change without notice and should not be used for construction purposes.
5. Compact designs available.
6. Retrofit designs available. (with or without enclosures)
7. Special, totally enclosed enclosures available. (dimensions will vary)
8. MGM is now offering NEMA 1/3R/4 stainless steel enclosures.

Safe, Convenient and Environmentally Sound

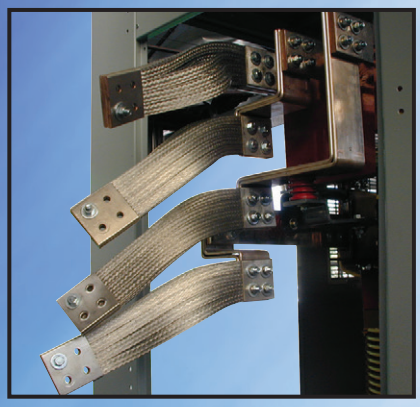
Installations of ventilated dry-type transformers do not require a liquid confinement area, automatic fire extinguishing system or fire vault. Dry-type transformers use no insulating liquids, virtually eliminating the risk of local environment contamination and simplifying routine maintenance by eliminating the need to check, replace or clean liquid. Dry-type units are relatively lightweight and can be conveniently installed on upper floors, balconies, roof trusses or roofs. Insurance companies generally offer lower premiums for installations of dry-types than for liquid-filled transformers.

General Construction

Coils are vacuum-pressure-impregnated (VPI) with solventless polyester resin, ensuring complete impregnation of the windings and insulation. The finished VPI coils are incredibly strong, readily dissipate heat and are protected against moisture, dirt and most industrial contaminants. Ventilated dry-type winding designs vary depending on the voltage, basic impulse level (BIL) and current of the individual winding and/or application of the transformer. For all units, the insulation system will be 220°C regardless of the average winding rise.

MGM ventilated dry-type transformers are designed for indoor or outdoor applications in schools, hospitals, industrial plants, commercial buildings and any place requiring safe and dependable power. Ventilated dry-type transformers offer an economical solution and are extremely reliable when properly installed and maintained.

DRY



ACCESSORIES OR OPTIONS

- Fans for 133% FA kVA rating
- Future fan wiring and control
- Ground bus - full length copper
- Impact indicator - Mechanical
- Outdoor enclosure NEMA 3R
- Paint — polyurethane overcoat
- Screened ventilation openings
- Enclosure — hinged panels
- Enclosure — knockdown
- Electrostatic Shield
- Space heaters
- Temperature monitor/fan controller
- Thermostat for space heaters
- Bus to End
- Flex Leads
- Low Noise

STANDARD FEATURES

- UL Listing, CSA, & CUL
- Vacuum Pressure Impregnated (VPI) windings
- 80°, 115°, 150°C average winding rise ratings
- 60 Hz operation
- 220°C insulation system
- Aluminum or copper windings
- ANSI ground pads
- Core ground strap
- Indoor ventilated enclosure - NEMA 1
- Paint — ANSI 61 finish
- Provisions for lifting
- Removable front and rear panels
- Vibration isolating pads
- (2) 2 1/2 % full capacity taps above and below nominal
- Conform to NEMA, ANSI, & IEE standards for Dry Type Transformers
- OSHPD Qualified

ENCLOSURE

The standard indoor enclosure is NEMA 1, Category C construction. Enclosures are suitable for lifting, jacking, rolling or skidding with provisions for lifting from the transformer base. High voltage and low voltage ANSI ground pads are provided.

The enclosure paint finish is neat, clean and highly resistant to corrosion. Metal surfaces are thoroughly cleaned of scale, oil, grease, rust and other foreign matter before painting. Unless specified otherwise, paint color shall be ANSI 61 (light gray). NEMA 3R and NEMA 4 outdoor enclosures are available for applications that prohibit indoor installation.

COILS

Generally, low voltage (LV) windings less than 2,400 volts are either multi-conductor barrel or sheet conductor types. Multi-conductor windings may be more economical and preferred in smaller kVA low voltage applications in which the current and axial short circuit forces are relatively small. High voltage (HV) windings 2,400 volts or greater may be single-section barrel, multi-section barrel or disk types. Ventilated dry-type coils may be either round, oval or rectangular through about 2,000 kVA. Transformers larger than 2,000 kVA generally are designed with round windings unless there are special considerations, such as limiting dimensions.

CORE

The transformer cores are constructed of non-aging, high grade, grain oriented silicon steel laminations with high magnetic permeability. Magnetic flux densities are kept well below the saturation point. Core laminations are free of burrs and stacked without gaps. Mitered STEPLAP construction cores may be provided when specified. The core clamping brackets are designed to provide even distribution of clamping forces to the core yokes and legs. The core is electrically isolated except for the factory-installed core ground strap, which provides a single path from the core to ground.

FORCED AIR COOLING

All units rated 750 kVA and higher can have added fans, increasing capacity in all current carrying parts for the fan-cooled rating and capability to add a thermometer relay to control fans. When specified, the transformer shall be provided with fans to give a forced air-cooled rating of 33% above the self-cooled rating. Control wiring (wire markers included), a thermal sensor and a fan controller will be supplied.

TYPE

AUDIO SOUND LEVELS

The transformer shall be designed to meet or exceed ANSI and NEMA sound levels for dry-type transformers. As an option, transformers designed at -3dB to -10dB below ANSI and NEMA standard sound levels are available.

Vent-Dry Sound Levels: (dB)

Equivalent Two Winding Base kVA	Self-Cooled dB	Fan-Cooled dB
500	60	N/A
750	64	67
1000	64	68
1500	65	69
2000	66	71
2500	68	71
3000	68	73

Product Coordination

When specified, transformers can be close-coupled to a multitude of High Voltage and Low Voltage Switchgear.

Testing

Each transformer shall receive the following standard production tests in accordance with ANSI C57.12.90

- Resistance test
- Polarity & phase relation test
- Turns ratio test at all tap positions
- No-load loss & exciting current test
- Impedance and load-loss test
- Applied potential test
- Induced potential test

Test results, when requested, are available by transformer serial number. In addition, the following special tests can be performed on each transformer in accordance with applicable ANSI standards at an additional cost.

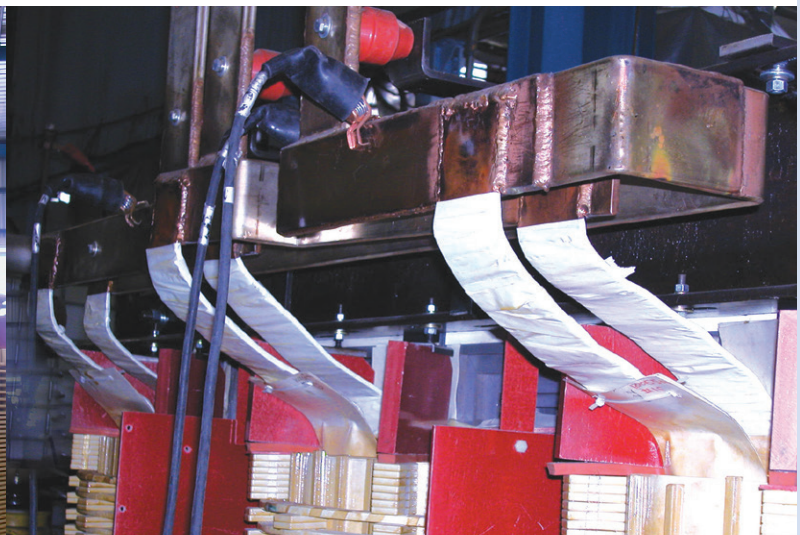
- Temperature test
- Impulse test
- Sound test
- Partial discharge test

Special Design or Application

- Low loss designs
- Rectifier transformer designs
- Special ambient designs
- High overload capacity designs
- Special/low sound level designs
- 50 Hz designs
- Series/parallel windings
- Retrofit to specific dimensions
- K-factor ratings
- Special Paint
- Auto transformers
- PCB replacement
- Grounding transformers
- Zig-zag transformers
- Scott-T transformers
- 6, 12, 18, 24 and 36-pulse transformers
- Drives isolation transformers

VENT-DRY BASIC IMPULSE RATINGS

Nominal System Voltage kV	Standard BIL kV	Option BIL kV
1.2	10	30
2.5	30	45
5.0	30	45,60
8.7	45	60,95
15.0	60	95,110
22.0	110	125

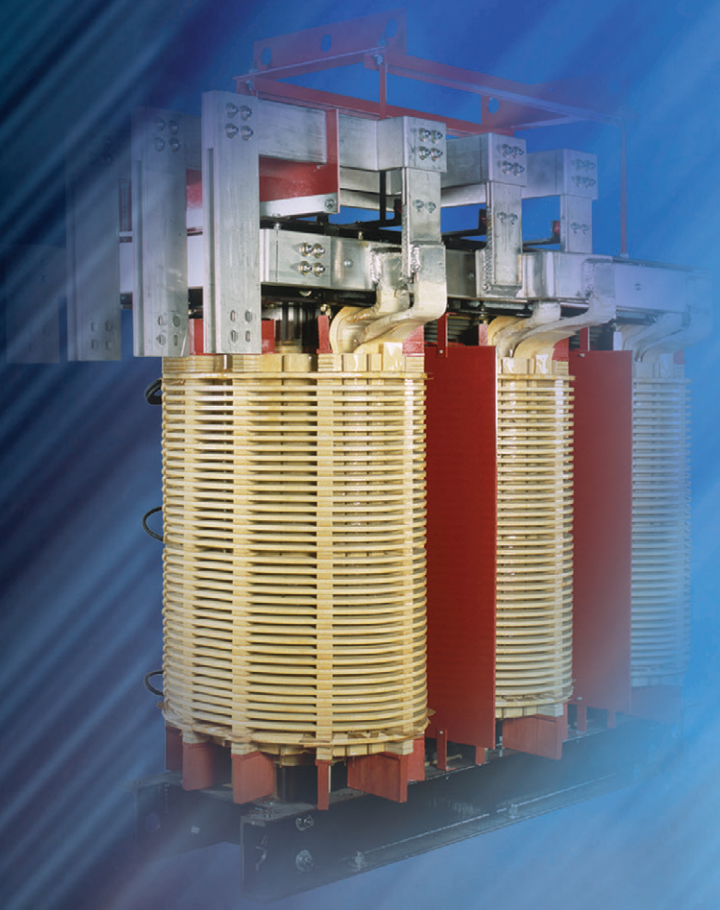


DOE 2016 Energy Efficiency

Single Phase			
kVA	BIL		
	20-45 kV	46-95 kV	>= 96 kV
	Efficiency(%)	Efficiency(%)	Efficiency(%)
15	98.10	97.86	NA
25	98.33	98.12	NA
37.5	98.49	98.30	NA
50	98.60	98.42	NA
75	98.73	98.57	98.53
100	98.82	98.67	98.63
167	98.96	98.83	98.80
250	99.07	98.95	98.91
333	99.14	99.03	98.99
500	99.22	99.12	99.09
667	99.27	99.18	99.15
833	99.31	99.23	99.20

Three Phase			
kVA	BIL		
	20-45 kV	46-95 kV	>= 96 kV
	Efficiency(%)	Efficiency(%)	Efficiency(%)
15	97.50	97.18	NA
30	97.90	97.63	NA
45	98.10	97.86	NA
75	98.33	98.13	NA
112.5	98.52	98.36	NA
150	98.65	98.51	NA
225	98.82	98.69	98.57
300	98.93	98.81	98.69
500	99.09	98.99	98.89
750	99.21	99.12	99.02
1000	99.28	99.20	99.11
1500	99.37	99.30	99.21
2000	99.43	99.36	99.28
2500	99.47	99.41	99.33

MGM Transformer Company is pleased to list a sample of our satisfied customers. For more information, please contact the factory.



Quality
you can see

Drives Industry

Rockwell Automation	Cegelec
Rockwell Reliance	Lloyd Controls
ABB	Ansaldo-Ross Hill
Toshiba	Control Techniques

Industrial & Commercial

General Electric	Motorola
Siemens	LTV Steel
Proctor & Gamble	Toyota
EATON	Hewlett-Packard
BMW	AT&T
Amazon	Logan Aluminum
eBay	Constellium
Boeing	Chrysler

Petrochemical

Amoco Oil	Shell Oil
Arco	Exxon
Chevron	Unocal
Mobil Oil	Premcor
	Aramco

Pulp & Paper

Weyerhauser	Georgia-Pacific
Eddy Paper	

Municipalities & Utilities

Southern California Edison	Pacific Bell
Commonwealth Edison	Iowa Power & Light
L.A. Department of Water & Power	Wisconsin Power & Light
	Pacific Gas & Electric
Metropolitan Water District	Edison International
Florida Power & Light	PSEG Power LLC

Architects & Contractors

ARAMCO	Fluor Daniel
Bechtel	Ralph M. Parsons Co.
Brown & Root	Black & Veatch
Jacobs	Rosendin Electric
Mustang	Cupertino Electric
Bergelectric	

Universities / Labs

UCLA	University of Michigan
UC Berkeley	University of Minnesota
UC San Diego	Lawrence Livermore Labs
Fermilab	SUNY
Argonne National Lab	

Wind-Turbine Power Generation

Palm Springs, California	Tehachapi Pass, California
Solar City	

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