

**Custom 600 V Class, Dry Type  
General Purpose Distribution Transformers**



**BULLETIN 5**

**Other Products**



Dry Substation  
(Bulletin 30)



Liquid Substation  
(Bulletin 40)



600V Dry Type  
(Bulletin 10)



Let MGM Transformer Company with it's 40 years of manufacturing experience design and deliver your next custom transformer! To meet the requirements of your special applications, we can develop units with any voltage combination, tap arrangements, winding options and enclosure types. Some examples of special projects are:

- ◆ Low noise level design for use in hospitals, schools and office buildings
- ◆ Marine duty application for use near shores, on docks and onboard ships and marine platforms
- ◆ Totally Enclosed Non-Ventilated (TENV) for use in adverse atmospheric environments
- ◆ Auto-transformers for machinery voltage conversions
- ◆ OSHPD seismic certified enclosures to meet regulatory standards such as hospital installations

With our two state of the art manufacturing facilities we can offer quick turnaround time with free shipping throughout the continental United States. Ask about our Bull Rush program for expediting your order.

MGM Transformer Company can manufacture your units at our 120,000 square foot plant in the U.S. and source the raw materials solely from American companies if required. By doing so we can certify your units to be compliant with all of the various "Buy U.S." statutes (either state or federal). Please make sure to specify your requirements at the time of order.





## ENCLOSURES

MGM ventilated transformers utilize a NEMA 2 rated drip proof metal enclosure with natural draft ventilation. MGM dual rated enclosures are suitable for indoor or outdoor applications and are standard on all models except the 225, 300, and 500 kVA transformers (optional Weather-shield Kits are available for these units). Our standard enclosures use cold rolled steel with standard ANSI 61 gray paint. We can also offer totally enclosed, non-ventilated (TENV) and stainless steel (304SS & 316SS) enclosures. All of our units can be ordered to comply with OSHPD seismic regulations.

## TENV - NEMA 4 & 4X

Totally enclosed non-ventilated dry type transformers are for special applications. They are used mainly in adverse atmospheric conditions where it is desirable to use a dry type non-ventilated transformer vs. the ventilated standard unit, which has openings in its enclosure to allow air to flow directly over the core and coil. In applications where the atmosphere contains conductive, corrosive, or combustible materials, which might damage a transformer, or lint and dust particles which might block the ventilation passages, the non-ventilated transformer is highly suited. It has no openings in the enclosure. Heat is dissipated by radiating from the surface area of the enclosure. Consequently, the enclosures are larger than those of the standard ventilated type. Non-ventilated transformers are suited for application in the textile, chemical, automotive, electrochemical, foundry, cement, food, paper, and other industries where the transformer is subject to spray or wash down conditions.

## K-FACTOR

K-Factor Rated Transformers include several major design improvements that address the problems caused by non-linear loads and harmonics. They are designed to withstand the effects of harmonic currents without exceeding the temperature rating of the insulation system. The K-Factor design compensates for the stresses on a transformer's winding insulation which prevents insulation breakdown and premature failure. The net result is longer transformer life.

### Core Design

A high grade, non aging, grain-oriented silicon steel with high magnetic permeability provides reduced core induction levels, preventing saturation as a result of the higher frequency harmonics and resultant peak voltages. This core also provides reduced eddy currents or induced currents in the steel caused by the high ratios of peak-to-RMS currents and voltages found in harmonic loads.

### Neutral Bus

The neutral bus is sized and configured to accommodate at least 200% of the rated current. This compensates for the increased neutral currents found in non-linear loads thus reducing heat.

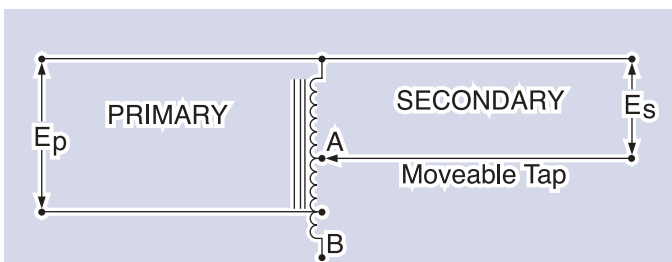
## GENERAL INFORMATION

MGM Dry type transformers are designed, manufactured and tested in accordance with all applicable NEMA, ANSI and IEEE standards and are designed with a 220°C insulation system.

MGM 600 Volt class transformers are UL and CUL listed in accordance to standards UL506 and ULI561 and are classified as isolation transformers.

## AUTOTRANSFORMERS

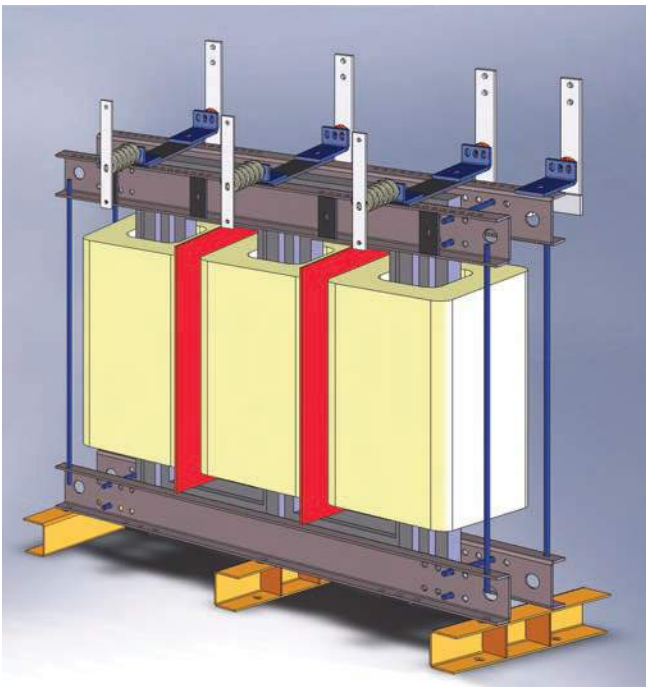
It is not necessary in a transformer for the primary and secondary to be separate and distinct windings. Figure A is a schematic diagram of what is known as an AUTOTRANSFORMER. Note that a single coil of wire is "tapped" to produce what is electrically a primary and secondary winding. The voltage across the secondary winding has the same relationship to the voltage across the primary that it would have if they were two distinct windings.





## CORE & COIL

The basic purpose of a transformer is voltage transformation as near as practically possible to the load for economy and distribution of power. Typical loads for dry type distribution transformers include lighting, heating, air conditioners, fans, and machine tools. Such loads are found in commercial, institutional, industrial, and residential structures. Open core and coil assemblies are typically used by panel builders and equipment OEM customers who incorporate the entire transformer into their structures.



## MARINE DUTY

MGM Transformer's single-phase and three-phase marine-duty transformers have been developed utilizing over 80 years of commercial and military experience in magnetic transformer design. This ABS (American Bureau of Ships) Type Approved product line has been engineered to meet the unique requirements of marine applications including commercial and pleasure ships, offshore oil rigs, tankers, near shore and other harsh marine environments.

All of MGM's facilities are ISO9001 certified and have modern testing equipment to meet all the requirements of ABS, ANSI, CSA, NEMA and UL. Below are just a few of the enhanced design features of MGM marine duty transformers.

**Core Design** – Cores are manufactured from the highest quality non-aging, cold rolled, grain oriented silicon steel laminations using stacked, step core construction and designed to minimize voltage harmonics. All cores are protected in a vacuum pressure impregnated resin.

**Steel Components** – All steel parts (frames, base channels, brackets, rods, etc.), are either coated or plated to meet UL50 salt spray requirements. All hardware (bolts, nuts, washers, etc.), are fully protected in stainless steel or equivalent finish.

**Insulation** – 220°C insulation systems are fully vacuum impregnated and protected.

## SCR & DRIVES ISOLATION

Drive isolation transformers are specifically designed for use with AC and DC adjustable speed drives. Two winding drive isolation transformers provide:

- Electrical isolation between the incoming line and the drive circuitry.
- Voltage conversion of input line to standard drive input voltages.
- Minimized line disturbances caused by SCR (silicon controlled rectifiers) firing.
- Reduced short circuit currents and voltage line transients.

Drive isolation transformers are specifically sized to the drive kVA requirements and are braced to withstand the mechanical stresses of current reversals and short circuits associated with SCR drives.

## SERIES MULTIPLE WINDINGS (RECONNECTABLE)

To make the basic single-phase transformer move versatile, both the primary and secondary windings can be made in two equal parts. The two parts can be reconnected either in a series or in parallel. This provides added versatility as the primary winding can be connected for either 480 volts or 240 volts and the secondary winding can likewise be divided into two equal parts providing either 120 or 240 volts. (Note: there will be four leads per winding brought out to the terminal compartment rather than two). Either arrangement will not affect the capacity of the transformer. Secondary windings are rated with a slant such as 120/240 and can be connected in a series for 240V or in a parallel for 120V or 240/120V (for 3-wire operation). Primary windings rated with an "X" such as 240X480 can operate in series or parallel but are not designed for 3-wire operation. A transformer rated 240X480V primary, 120/240V secondary could be operated in 6 different voltage combinations.

## ELECTROSTATIC SHIELD

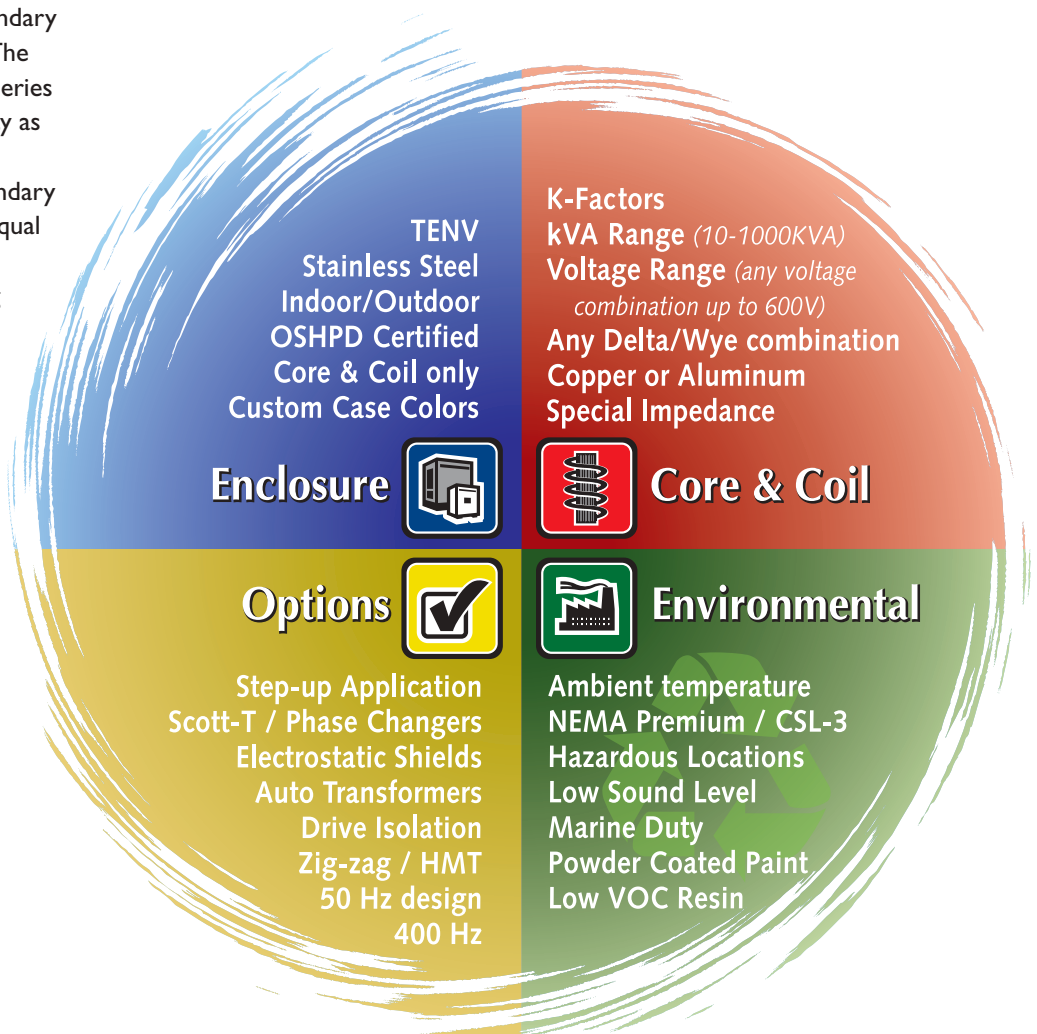
Electrostatically (faraday) shielded transformers are designed to protect sensitive electrical and electronic devices and systems from high frequency voltages (electrical noise) or transients that occur due to switching and loading on distribution lines. Electrical noise and transients are classified two ways: Normal Mode - noise which appears between the hot & neutral conductors. Common Mode - noise which appears between the ground wire and hot and neutral conductors. Common mode noise is more prevalent and should be the key criterion for any noise suppression device.

## LOW SOUND LEVEL

Low sound transformers are designed to have average sound levels 3 dB below NEMA ST-20 standards. Depending on kVA rating and KV class, we may be able to reduce sound level up to 7 dB below NEMA ST-20 standard.

Note: Sound levels are measured in a sound room, not at the installation. These quieter transformers are ideal for noise sensitive installations such as schools, hospitals, libraries, and offices. Proper installation procedures should be used to achieve maximum benefit.

- Available in single-phase ratings 10 – 500 kVA
- Available in three-phase ratings 15 – 1000 kVA



# 600V, Dry Type, General Purpose Distribution Transformer

## Catalog Numbering System

	1	2	3	4	5	6	7	8	9	10	11	12	13	
<b>Example:</b>	<b>H</b>	<b>T</b>	<b>112</b>	<b>A</b>	<b>3</b>	<b>B</b>	<b>2</b>	<b>SH</b>	<b>-</b>	<b>H</b>	<b>K1</b>	<b>060</b>	<b>LN0</b>	<b>01</b>

<b>1</b>	<b>Certifications</b> H = UL Listed, CSA
<b>2</b>	<b>Phase</b> S = Single Phase, rated max. 500 kVA      T = Three Phase, rated max. 1500 kVA
<b>3</b>	<b>kVA:</b> As called out in numerals. 9, 10, 15, 25, 30, 37½, 45, 50, 75, 100, 112½, 150, 225, 300, 500, or 1000. (Other numbers between 9 and 1000 may be used. Construction same as next larger number.)
<b>4 &amp; 6</b>	<b>Primary &amp; Secondary Voltage:</b> <b>Single Phase:</b> <b>A:</b> 480 <b>B:</b> 120/240 <b>C:</b> 240 x 480 <b>D:</b> 240 <b>E:</b> 120 <b>F:</b> 600 <b>G:</b> 208 <b>H:</b> 230/460 <b>J:</b> 460 <b>K:</b> 277 <b>P:</b> 230/115 <b>V:</b> 110/220 <b>W:</b> 230 <b>AZ:</b> 450 <b>BZ:</b> 440 <b>HZ:</b> 115  <b>Three Phase:</b> <b>A:</b> 480D <b>B:</b> 208Y/120 <b>C:</b> 240D <b>D:</b> 480Y/277 <b>E:</b> 120D <b>F:</b> 600D <b>G:</b> 208D <b>H:</b> 230D <b>J:</b> 460D <b>K:</b> 240/120 4W <b>L:</b> 240Y/139 <b>M:</b> 380D <b>N:</b> 575D <b>P:</b> 230Y/133 <b>Q:</b> 400Y/231 <b>R:</b> 380Y/220 <b>T:</b> 240Y/139 <b>U:</b> 440D <b>V:</b> 220D <b>W:</b> 500D <b>X:</b> 320Y/185 <b>AZ:</b> 450D <b>BZ:</b> 440Y/254 <b>CZ:</b> 415D <b>DZ:</b> 240 X 480 <b>EZ:</b> 220Y/127 <b>FZ:</b> 416Y/240 <b>GZ:</b> 460Y/266 <b>HZ:</b> 115D <b>JZ:</b> 550D <b>KZ:</b> 280D <b>LZ:</b> 360D <b>MZ:</b> 160Y/93 <b>NZ:</b> 130Y/75 <b>PZ:</b> 240Y X 208Y <b>RZ:</b> 208D X 230D <b>SZ:</b> 277Y/160 <b>TZ:</b> 490D
<b>5</b>	<b>Taps</b> <b>1:</b> No Taps <b>2:</b> 2 - 2½% FCAN and 2 - 2½% FCBN <b>3:</b> 2 - 2½% FCAN and 4 - 2½% FCBN <b>4:</b> 4 - 2½% FCBN <b>5:</b> 1 - 5% FCAN and 1 - 5% FCBN <b>6:</b> 2 - 5% FCBN <b>7:</b> 2 - 2½% FCAN and 1 - 2½% FCBN <b>8:</b> 1 - 5% FCAN and 2 - 5% FCBN
<b>7</b>	<b>Winding Material</b> 1 = Copper      2 = Aluminum
<b>8</b>	<b>Special Features</b> SH = Electrostatic Shield <b>None (Blank) = No Shield</b>
<b>9</b>	<b>Temperature C Rise</b> H = 150°C (Standard)      F = 115°C      B = 80°C
<b>10</b>	<b>K-Factor</b> K1: K01 (Standard)    K4 = K04                      K6 = K06                      K9 = K09                      K13 = K13 K20 = K20                      K30 = K30 <small>other numbers between K2 and K99 may be used</small>
<b>11</b>	<b>Frequency</b> 60 = 060 Hertz (Standard)      50 = 050 Hertz      400 = 400 Hertz
<b>12</b>	<b>Sound Level</b> LN0 = NEMA ST-20 (Standard)                      LNI = 1 dB Below NEMA LN3 = 3 dB Below NEMA                      LN5 = 5 dB Below NEMA LN8 = 8 dB Below NEMA
<b>13</b>	<b>Enclosure Type</b> 01 = NEMA 1 (Indoor)                      1X = NEMA (Indoor - SS) 3R = NEMA 3R (Outdoor)                      3X = NEMA 3RX (Outdoor - SS) 04 = NEMA 4 (TENV)                      4X = NEMA 4X (TENV - SS) CC = Core & Coil only

\* We can build units that fall outside of this cataloging scheme. Please contact us for details.

## SPECIAL FREQUENCIES

If the frequency applied to a transformer is increased, the inductive reactance of the windings is increased, causing a greater ac voltage drop across the windings and a lesser voltage drop across the load. However, an increase in the frequency applied to a transformer should not damage it. But, if the frequency applied to the transformer is decreased, the reactance of the windings is decreased and the current through the transformer winding is increased. If the decrease in frequency is enough, the resulting increase in current will damage the transformer. For this reason a transformer may be used at frequencies above its normal operating frequency, but not below that frequency.

## ENERGY EFFICIENCY

Energy Efficient transformers are designed with lower than normal core, conductor and total losses. Temperature rise is therefore lower resulting in greatly improved life expectancies and substantial increases in overload capabilities. Transformers with winding temperature rise of 80°C and 115°C rise can help cut operating expenses for systems requiring unit loading at 80 to 100%; of the nameplate rating, 24 hours a day, or where load growth is expected. A 115°C rise transformer can carry a continuous 15% overload, and the 80°C rise a 30% overload, without exceeding the insulation rating or seriously reducing the life expectancy of the transformer. However, when operating in an overload condition, the internal temperature increases as a result of the higher conductor losses. Efficiency decreases under this condition. Since transformers operate beyond nameplate capacities usually during peak load periods, the benefits remain.

# ENERGY EFFICIENT NEMA Premium/CSL-3

MGM Transformer Company offers ultra efficient CSL-3 three phase dry-type transformers with higher efficiency ratings than NEMA TP-1. CSL-3 transformers are efficient up to 99% compared to NEMA TP-1 efficiency requirement which is 98.0%. The benefits of CSL-3 transformers are reduced electrical & heat losses, lower total cost of ownership (TCO), greater energy savings and green/LEED design. These features are beneficial for data centers, healthcare installations, schools & colleges, green applications, LEED buildings and government projects.

The table summarizes the CSL-3 efficiency percentages at 35% load:

kVA	CSL-3 Efficiency at 35% load
15 kVA	97.9%
30 kVA	98.3%
45 kVA	98.4%
75 kVA	98.6%
112.5 kVA	98.7%
150 kVA	98.8%
225 kVA	99.0%
300 kVA	99.0%
500 kVA	99.1%

## Transformer Total Cost of Ownership (TCO)

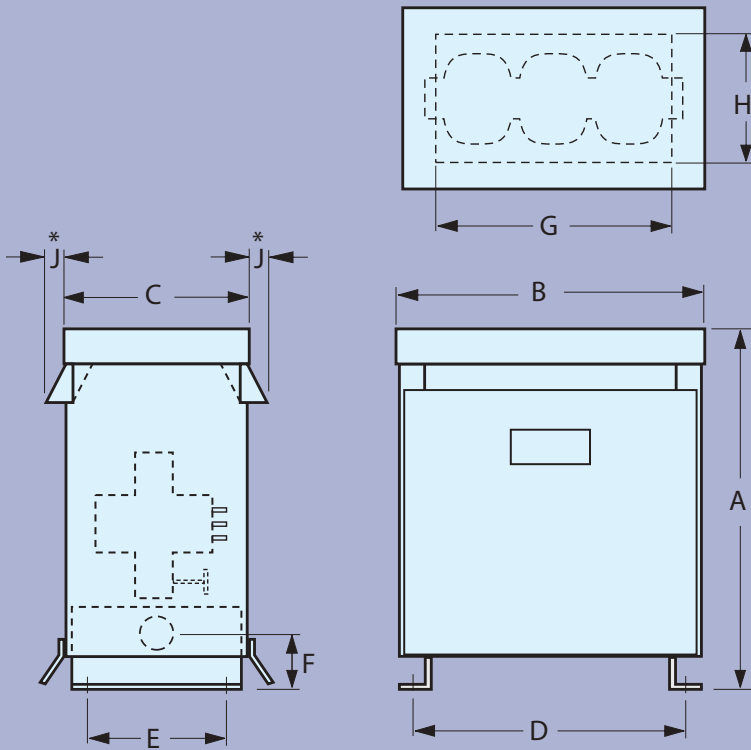
The initial purchase price of the transformer plus its operating costs determines the total cost of ownership. The wasted power and energy is the primary cost of transformers because they do not require much maintenance to operate.

Transformers typically operate for close to forty years since they have no moving parts. This will yield in a higher operating cost compared to the initial purchase price over the years. As indicated by the diagram on the right, CSL-3 transformers have the lowest operating costs due to their low losses. In the long term, the savings due to lower losses more than offsets the slightly higher initial purchase price.

These beneficial features provide both direct and indirect savings. Lower electrical losses yield direct savings and indirect savings are a result of reduction of heat losses emanating from the transformer. Conventional, low efficient transformers have a much higher heat dissipation compared to CSL-3 designed units.

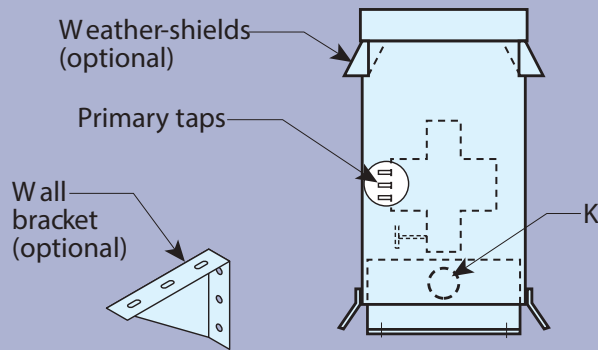


**BOTTOM  
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kVA	DIMENSIONS (Inches)										Wall Bracket	Weather Shield	Enclosure
	A	B	C	D	E	F	G	H	J	K			
9 - 15	28	21	14	18.5	11.5	-	17	10	-	-	WB	-	GPA
30 - 45	32	26.5	17	23	14	-	22	13	-	-	WB	-	GPB
75	38.5	28.5	20	28.5	17.5	-	26	16.5	-	-	WB	-	GPB+
112.5	40.5	31.5	21 3/4	28.5	19	-	26	16.5	-	-	WB	-	GPC
150	40.5	36.5	21 3/4	33.5	19	-	31	16.5	-	-	-	-	GPC+
* 225 - 300	51.5	40.5	26 1/2	37	21	10.5	35	19	4.63	5"	-	RH5	GPD
* 500	66	50.5	32	47.5	24	11.75	44	24	4.63	2-5"	-	RH6	GPE

GPA, GPB, GPB+, GPC, & GPC+ - Dual Rated Indoor/Outdoor design.  
 \*Weather-shield kits are available for GPD and GPE enclosures only.

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