

"ไทยแมกซ์เวลล์ เพื่อคุณ"

"Thai Maxwell. There for you!"

Introduction to the revolutionary
3D 1TC wound core transformer
technology catalogue



a member of  MAXWELL
G R O U P

 +  +  = "เพื่อคุณ"
"There for you"



www.tme.bz

 **Aichi**
our Japanese joint venture partner

 "There for you!"
THAI MAXWELL
ELECTRIC

Introduction to the revolutionary 3D 1TC transformer technology

Technology Benefits

The 3D distribution transformer with the revolutionary delta (3D) wound core is the ideal "green" transformer:

- Increased electricity savings, lower Total Owning Cost (TOC) and reduced CO2 emissions (in **SILVER** and **GOLD** energy saving models)
- More robust and durable
- Quieter
- Promotes better stability in electrical network

Technology History

In 1880, a European engineer and inventor theorized that the optimal three-phase transformer should have a symmetrical delta-shaped (3D) core. However, his theories could not be transformed into reality because there was no manufacturing technology available at the time that could make it commercially viable.

Technology Introduction



The core:
3D wound core



The active part:
3D wound core + coil winding



The transformer:
3D energy saving
oil-immersed hermetically
sealed distribution transformer
(outdoor installation)

- The 3D transformer has been commercially available in Europe since 2004 and is billed as the "transformers of the future"
- Thai Maxwell Electric (TME) began its 3D transformer development program in 2008 and is the first manufacturer in ASEAN to introduce the 3D energy saving oil-immersed distribution transformer in 2012
- The innovative 3D wound core can only be manufactured using the latest wound core technology (TME has employed similar wound core technology since 1979)



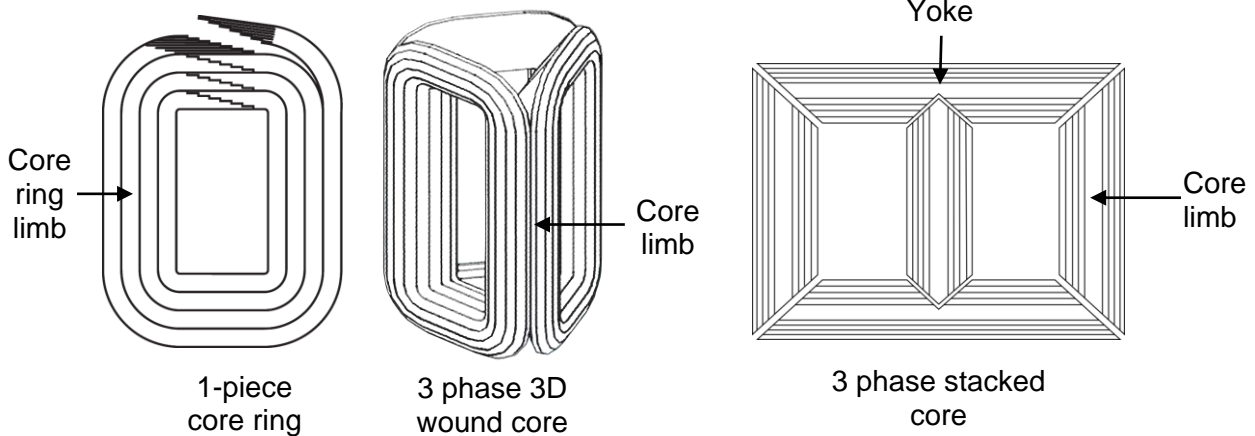
The revolutionary
3D wound core



The conventional
stacked core

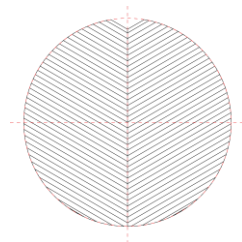
Technology Highlights

- Better core construction

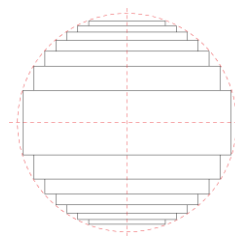


3D wound core - Single wound core ring with one-turn cut manufactured using automatic core slitting / winding / cutting machine (only 1 joint and much lower air gaps present results in low stray magnetic loss). 3 identical core rings are combined to make a 3 phase core.

Stacked core - Comprises of 3 core limbs & 2 yokes assembled together to make a complete 3 phase core (numerous number of joints and air gaps present results in higher stray magnetic loss).

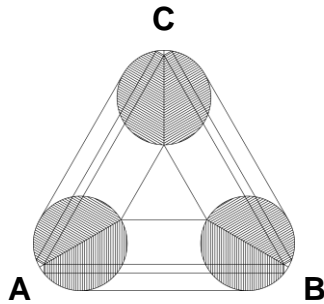


3D wound core – Each core ring limb resembles a semi-circle allowing 2 core ring limbs of equal cross section to combine to make a core limb. Cross section of core limbs takes closer shape of a circle, with a higher filling factor of approx. 98% resulting in magnetic flux being almost fully utilized.

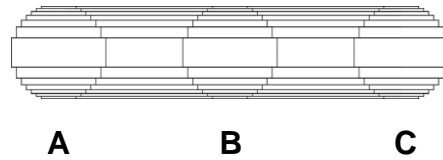


Stacked core - Cross section of core limbs are stacked type, with a lower filling factor of approx. 93% resulting in magnetic flux not being fully utilized.

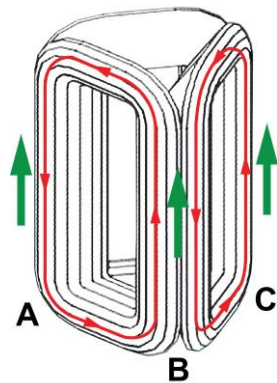
- Better core layout



3D wound core - Core limbs are in symmetrical delta shape (symmetrical 3 phase magnetic circuit) resulting in optimized magnetic flux distribution.

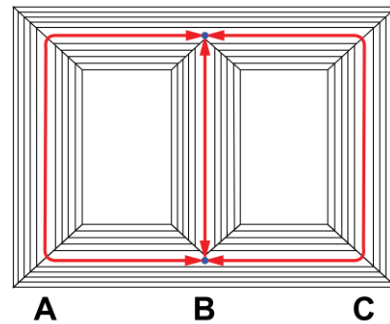


Stacked core - Core limbs are not in symmetry (non-symmetrical 3 phase magnetic circuit) resulting in under optimized magnetic flux distribution.



3D wound core - The different magnetic path directions (red arrow) of both core ring limbs that make a core limb combine to achieve zero vector sum for the magnetic flux (green arrow), resulting in magnetic flux being balanced in each phase.

Magnetic path of 3 phases are of equal distance (red arrows), resulting in 3 phases having better balanced magnetic circuits and reduced exciting currents.



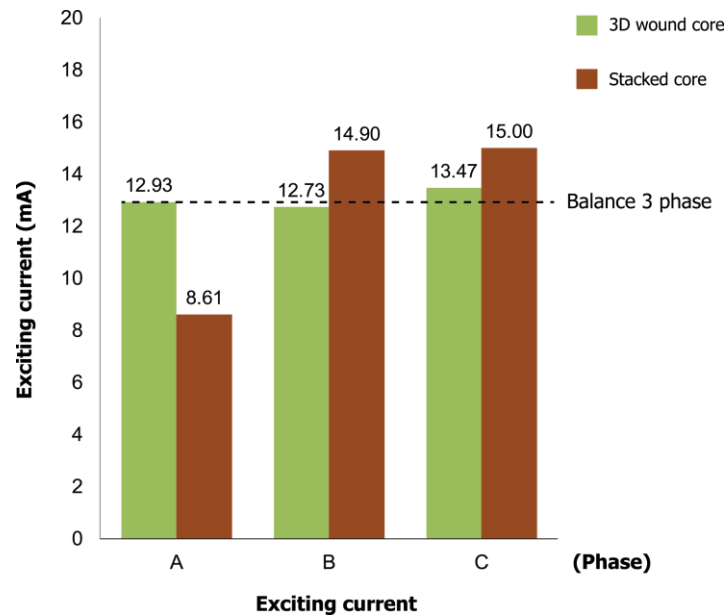
Stacked core - The stacked core design is unable to achieve zero vector sum for magnetic flux, hence magnetic flux is distorted in the direction of silicon steel resulting in magnetic flux not being fully utilized.

Magnetic path of 3 phases are of unequal distance (red arrows – magnetic path A and C are longer than magnetic path B), resulting in 3 phases having unbalanced magnetic circuits and higher exciting currents.

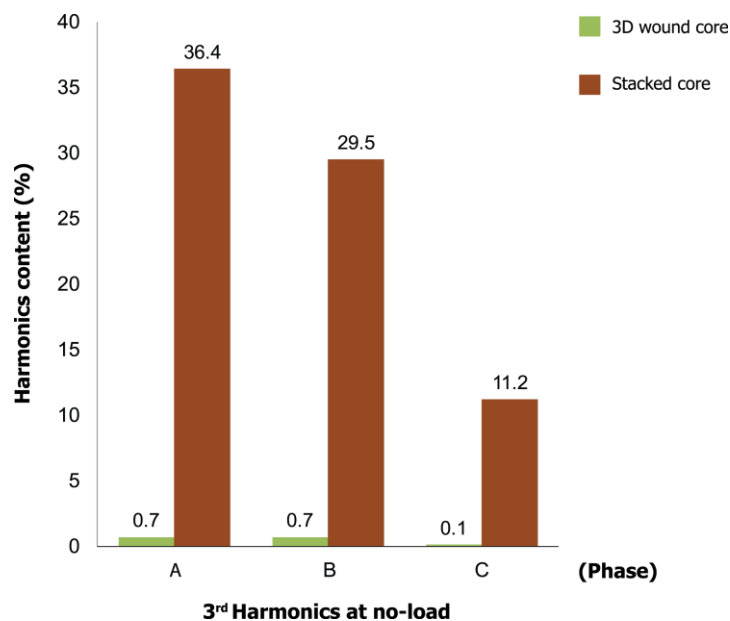
Technology Advantages

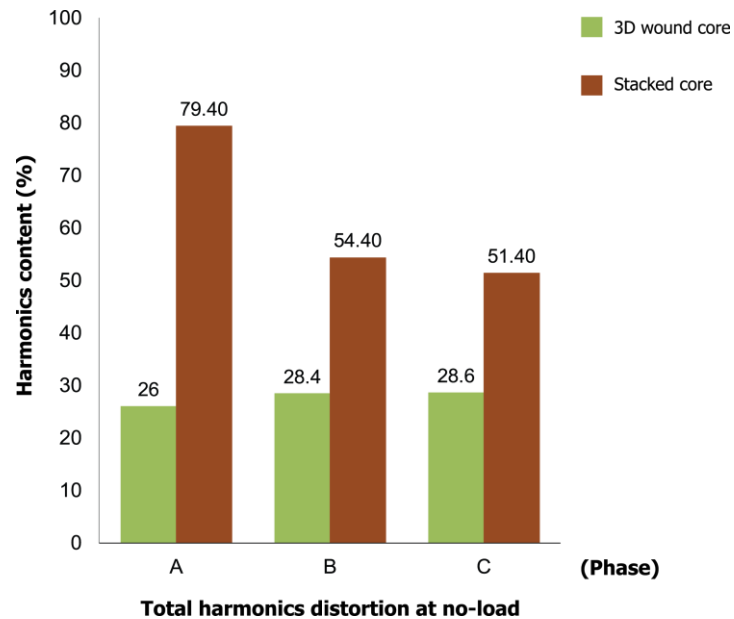
The revolutionary 3D wound core is the ideal transformer technology. It offers:

- Balanced magnetic circuits and exciting current in all 3 phases
- Lower no-load losses
- Reduced vibrations
- Reduced in-rush currents
- Better short circuit withstanding capability
- Reduced exciting (a.k.a. reactive or no-load) currents



- Reduced 3rd harmonic effects and total harmonics distortion





Remarks: All comparisons made using a 225kVA 3D wound core transformer and conventional stacked core under specific operating conditions unless otherwise stated.

Applications

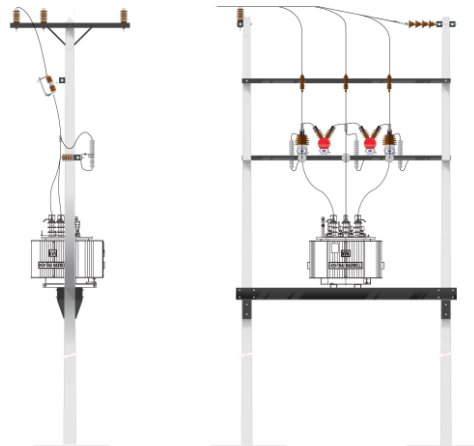
- Ideal for installation sites where low operating sound levels are required
- Ideal for installation sites with sensitive instruments/equipment (eg. data centers) where low harmonic effects are required or for use as an isolating transformer
- Ideal for reducing electricity costs in high electricity consumption installation sites (eg. cold storage warehouses that operate 24 hours a day, 365 days a year)

Installation

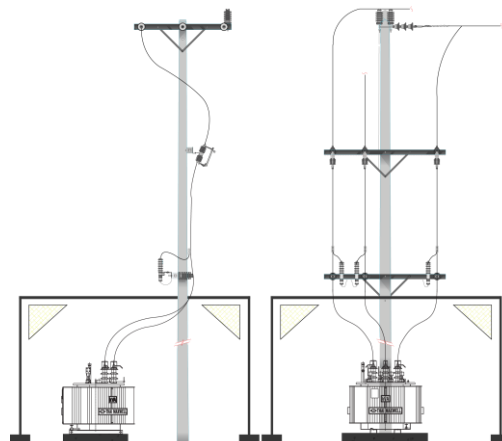
- Complies with current outdoor installation conditions and standards
- Can easily replace existing conventional stacked core standard loss transformers



3D energy saving
distribution transformer



Installation of transformer on H pole beams:
315 – 1250 kVA



Installation of transformer on ground:
315 – 2000 kVA

Installation conditions

Suitable for outdoor installation in Thailand or similar tropical environment or the following environmental conditions:

- Altitude: up to 1,000 m above sea level
- Maximum ambient temperature: 40°C
- Average ambient temperature on one (1) day: 35°C

Average maximum relative humidity in any one (1) year: 94%

Able to design and manufacture to suit other environmental conditions

Standards

Designed, manufactured and tested to conform to the following quality and engineering standards:

- Thai Industrial Standard TISI 384-2543
- International Standard IEC 60076 or any other country industrial standard
- International Quality Management System ISO 9001

Product Range



Efficiency ~ 98.69%

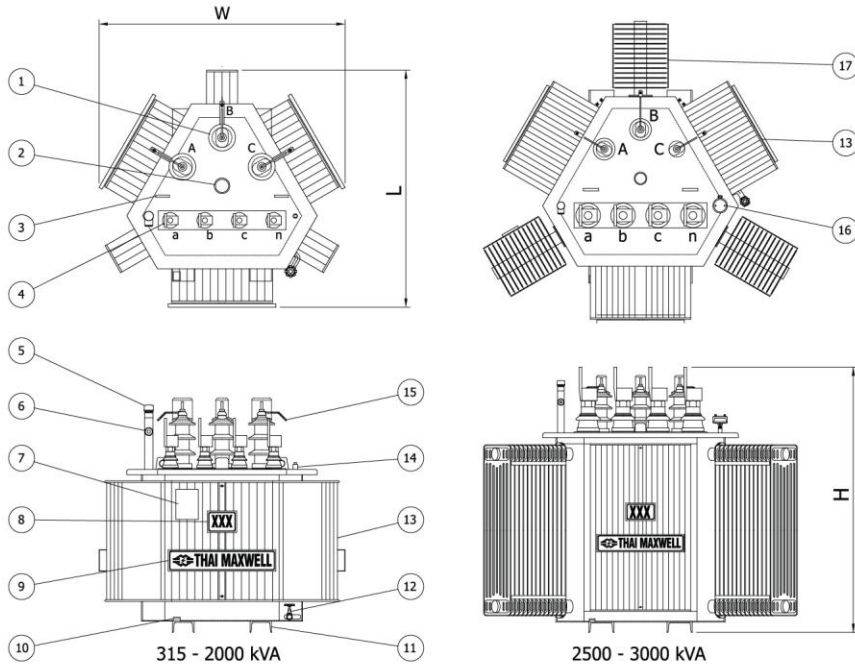


to client requirement

TECHNICAL DATA OF TRANSFORMER



3D OIL-IMMERSED HERMETICALLY SEALED THREE PHASE



NO.	DESCRIPTION
1	HV BUSHING WITH INSULATION CAP
2	OFF-LOAD TAP CHANGER
3	LIFTING EYES FOR UNTANKING/TANKING ASSEMBLY
4	LV BUSHING
5	PRESSURE RELIEF VALVE
6	OIL LEVEL GAUGE
7	NAME PLATE
8	CAPACITY PLATE
9	TRADE MARK WITH COMPANY PLATE
10	EARTH TERMINAL
11	FOUNDATION
12	OIL DRAIN VALVE WITH PLUG
13	CORRUGATED FIN
14	THERMOMETER POCKET
15	ARCING HORN
16	STICK TYPE OIL THERMOMETER WITH CONTACT
17	RADIATOR FIN

Rated primary voltage : 22kV

CAPACITY (kVA)	NO-LOAD LOSSES (Watt)	LOAD LOSSES AT 75 °C (Watt)	TOTAL LOSSES AT 75 °C (Watt)	IMPEDANCE AT 75 °C (%)	EFFICIENCY (P.F.=1)		VOLTAGE REGULATION AT FULL LOAD (P.F.=1) (%)	NOISE LEVEL dB (A) : 0.3 m	OUTLINE DIMENSION Approx.(mm.)			OIL QTY. (lt)	TOTAL WEIGHT Approx. (kg)
					½ Load (%)	Full Load (%)			W	L	H		
315	800	3900	4700	4.0	98.89	98.53	1.31	52	1215	1310	1290	280	1140
400	960	4600	5560	4.0	98.96	98.63	1.22	52	1250	1330	1325	340	1365
500	1150	5500	6650	4.0	99.00	98.69	1.17	52	1380	1440	1390	450	1680
630	1350	6500	7850	4.0	99.06	98.77	1.11	53	1385	1445	1480	455	1890
800	1400	10500	11900	6.0	99.00	98.53	1.48	54	1635	1655	1510	600	2280
1000	1600	12500	14100	6.0	99.06	98.61	1.42	55	1740	1740	1600	650	2595
1250	1850	14500	16350	6.0	99.13	98.71	1.33	57	1760	1755	1660	720	3040
1500	2050	18000	20050	6.0	99.13	98.68	1.37	57	1800	1785	1655	850	3575
1600	2350	19000	21350	6.0	99.12	98.68	1.36	58	1900	1865	1665	890	3745
2000	2650	22500	25150	6.0	99.18	98.76	1.30	58	1885	1870	1870	1090	4445
2500	3000	25500	28500	7.0	99.26	98.87	1.26	60	2125	2250	1900	1135	5225
3000	3800	33000	36800	7.0	99.20	98.79	1.34	61	2315	2510	2040	1290	6140

Rated primary voltage : 24kV

315	800	3900	4700	4.0	98.89	98.53	1.31	52	1185	1285	1300	280	1125
400	960	4600	5560	4.0	98.96	98.63	1.22	52	1250	1330	1325	335	1380
500	1150	5500	6650	4.0	99.00	98.69	1.17	52	1380	1440	1390	405	1685
630	1350	6500	7850	4.0	99.06	98.77	1.11	53	1385	1445	1480	455	1920
800	1400	10500	11900	6.0	99.00	98.53	1.48	54	1635	1655	1510	555	2285
1000	1600	12500	14100	6.0	99.06	98.61	1.42	55	1740	1740	1610	650	2680
1250	1850	14500	16350	6.0	99.13	98.71	1.33	57	1745	1745	1760	770	3135
1500	2050	18000	20050	6.0	99.13	98.68	1.37	57	1865	1845	1660	875	3740
1600	2350	19000	21350	6.0	99.12	98.68	1.36	58	1900	1865	1685	925	3935
2000	2650	22500	25150	6.0	99.18	98.76	1.30	58	1905	1880	1860	1110	4570
2500	3000	25500	28500	7.0	99.26	98.87	1.26	60	2130	2170	1910	1175	5415
3000	3800	33000	36800	7.0	99.20	98.79	1.34	61	2480	2780	1990	1380	6380

Note :



Technical data on website

- The transformer is designed to operate under the following conditions
 - Altitude : Up to 1000 m above sea level
 - Ambient air temperature : 40 °C maximum
- Limits of temperature rise
 - (top oil) : not exceeding 60 °C
 - (winding) : not exceeding 65 °C
- Insulation class : A (105 °C)
- Connection symbol : Dyn 11
- Reference standard : IEC 60076
- Special vector group and other primary voltage available upon request

The contents and data in this literature are subject to change without prior notice. It should be regarded as a guide and is intended for general information purposes only. Its contents do not constitute an offer for sale and are neither guarantees nor to be construed as expressed or implied warranties of suitability on application of any product referred to in it. We accept no liability in respect thereof. No part of this data may be reproduced without the prior approval of Thai Maxwell Electric.



บริษัท ไทยแมกซ์เวลอิเล็กทริก จำกัด Thai Maxwell Electric Co., Ltd.

32/7 หมู่ 1 ซอยวัดไทรยัด ถนนเพชรเกษม ตำบลใหม่ อ.สามพราน จ.นครปฐม 73110
32/7 Moo 1 Soi Watthiandad, Petchkasem Rd., Banmai, Sampran, Nakornpathom 73110 Thailand

T : +66 (0) 2429 0033 (Auto)
F : +66 (0) 2429 0014

Email : info@tme.bz
Website : www.tme.bz

Coordinates : N13° 42' 14.6" E100° 14' 51.5"



TME V-Card



Google Maps Location

ISO 9001 certified
ISO 14001 certified



THAILAND
TRUSTED QUALITY

