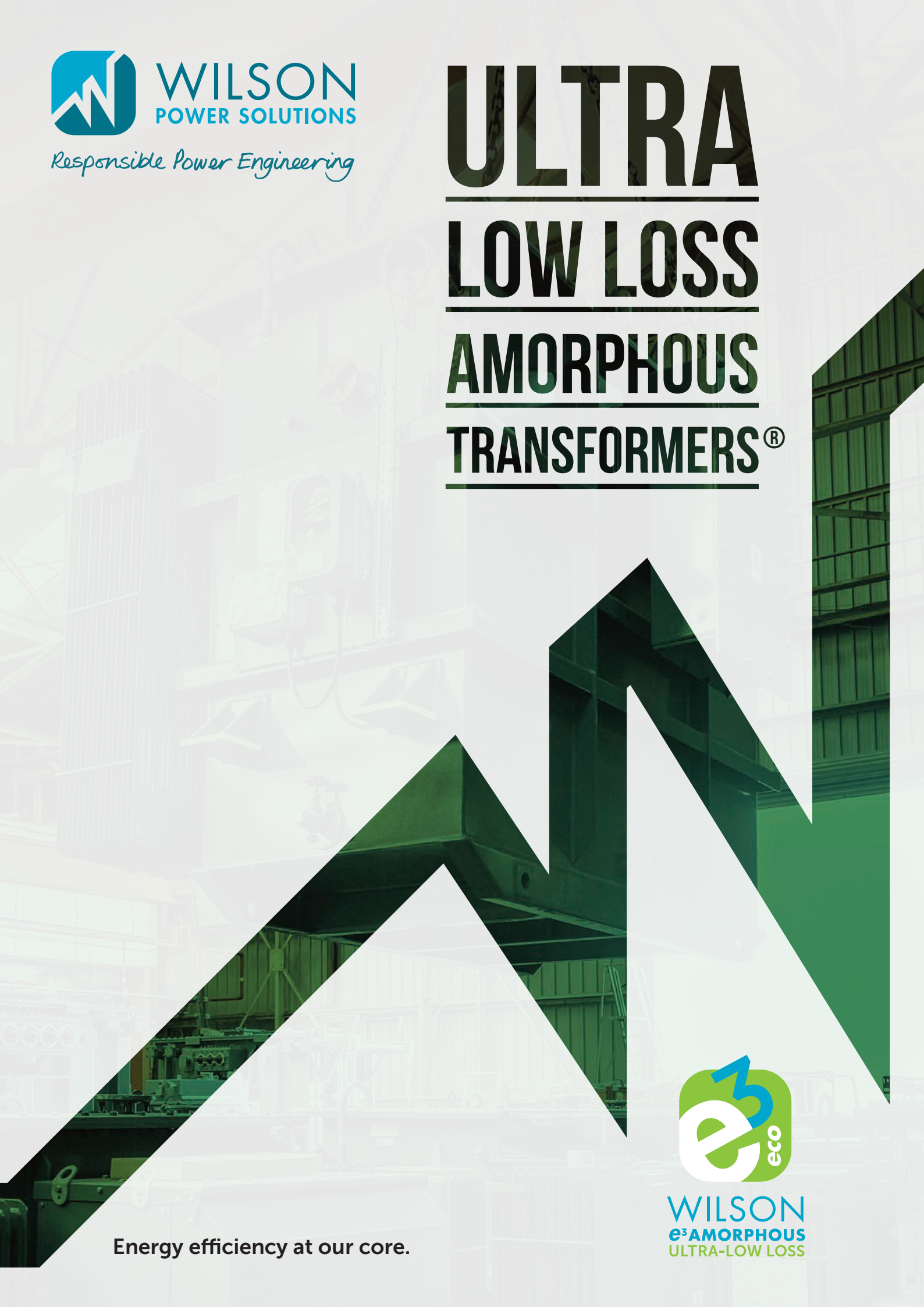
WILSON
POWER SOLUTIONS

Responsible Power Engineering

ULTRA LOW LOSS AMORPHOUS TRANSFORMERS®



e3 eco

WILSON
e³AMORPHOUS
ULTRA-LOW LOSS

Energy efficiency at our core.

ENERGY & CARBON SAVINGS THROUGH SUPPLY TRANSFORMERS

Our Wilson e3 amorphous transformer is the industry leading ultra low loss transformer product. It avoids energy wastage through transformer losses and helps organisations reduce their operating costs and their carbon emissions. With significant energy savings over the lifetime of a transformer, total cost of ownership considerations are almost always favourable with a Wilson e3.

BENEFITS OF CHOOSING A WILSON E3

- Guaranteed loss savings over lifetime
- Favourable total cost of ownership (TCO)
- Cost effective 2 in 1 Voltage Management solution
- Over 1500 amorphous installations across the UK
- Meets & exceeds Tier 2 (2021) EU Eco Design specs.
- Up to £260k lifetime savings when replacing an existing 1990's transformer
- Easy, non-invasive energy efficiency measure
- 24 month guarantee for complete peace of mind
- Award-winning amorphous technology

ADD TO YOUR BOTTOM LINE WITH ONE SIMPLE INFRASTRUCTURE DECISION

Our Wilson e3 transformer range provides superior operational efficiency alongside in-built voltage management capabilities, achieving savings in both energy costs and associated CO^2 emissions.

Two types of energy losses are inherent in the running of distribution transformers:

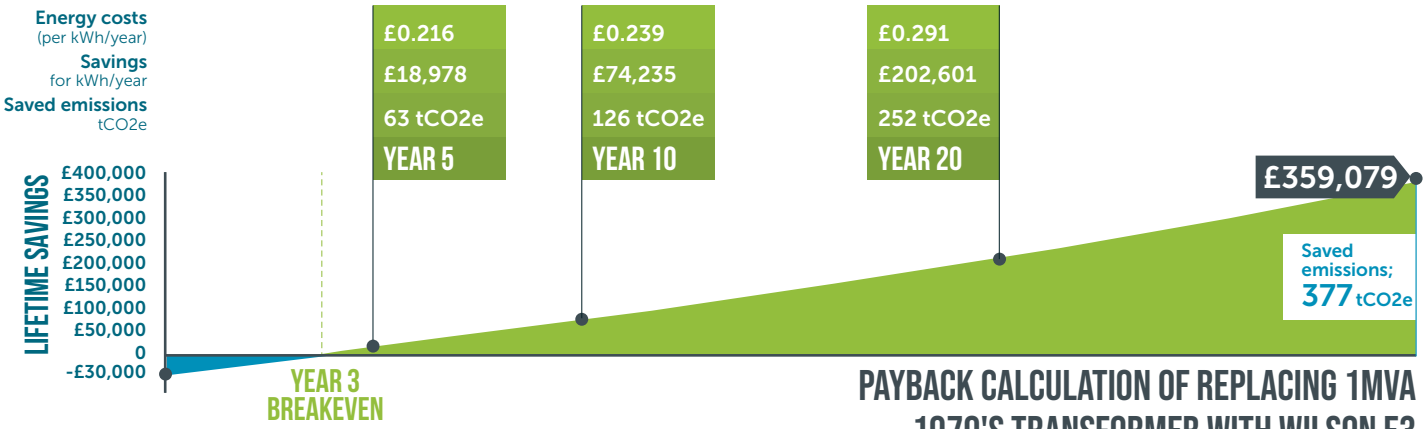
1 LOAD LOSSES THAT VARY DEPENDING ON TRANSFORMER LOADING

2 NO-LOAD LOSSES THAT OCCUR IN THE TRANSFORMER CORE

CUTTING TRANSFORMER LOSSES FURTHER: AMORPHOUS METAL CORE TECHNOLOGY

Core losses are continually present from the day the unit is energised, that is 24 hours a day, 365 days a year. Wilson e3 transformers combine amorphous metal cores with low current density conductor to create an ultra low loss transformer with significantly reduced losses.

The result? Providing you with guaranteed, easily quantifiable energy savings for your organisation.

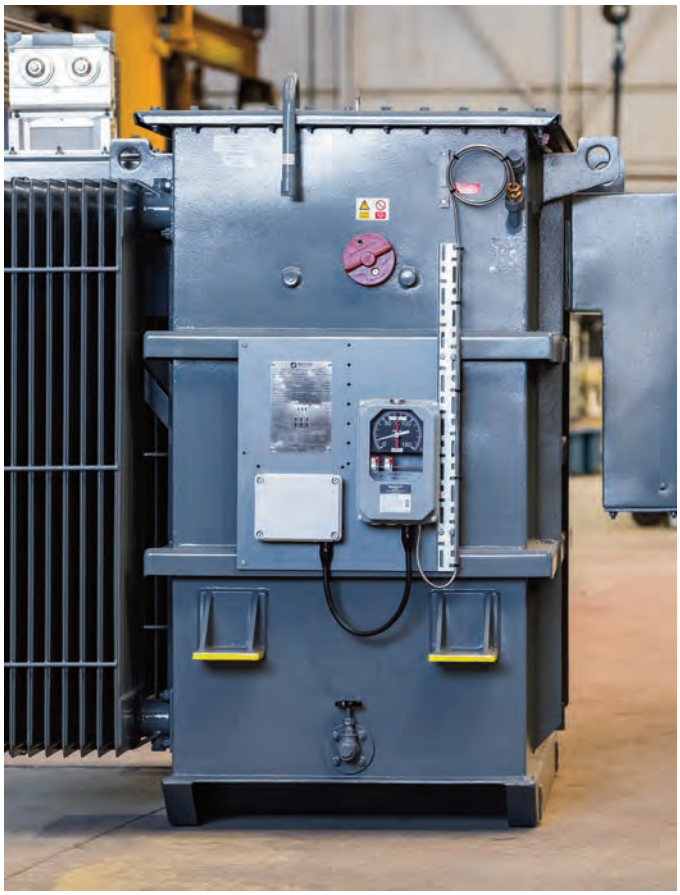


PAYBACK CALCULATION OF REPLACING 1MVA 1970'S TRANSFORMER WITH WILSON E3

AWARD WINNING AMORPHOUS TECHNOLOGY

ENERGY EFFICIENCY AT OUR CORE

The Wilson e3 transformer combines amorphous core material with low current density conductors to provide a distribution transformer with the lowest combined transformer losses. As a result, it does not only exceed Tier 2 EU Eco Design specifications that came into force in 2021 but sets ambitious new standards ahead of the curve for Tier 3. Amorphous technology transformers won 2019 IEMA Sustainability Impact Award and 2021 AEE Innovative Energy Project of the Year for the energy and carbon savings achieved in over 1500 locations across the UK.



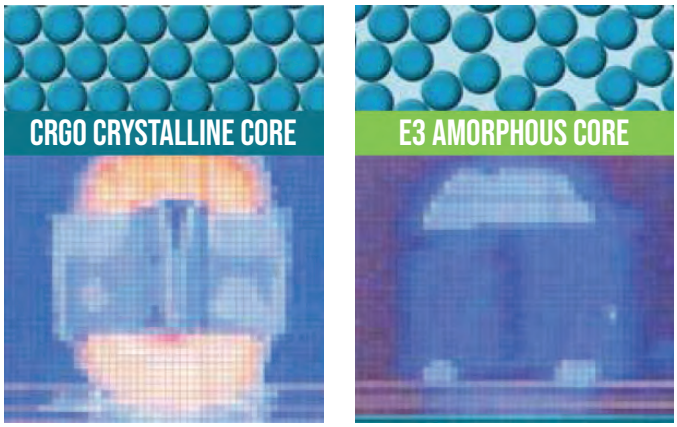
WHAT ARE AMORPHOUS CORE TRANSFORMERS (AMT'S)?

The cores of conventional transformers consist of stacks of laminations that are made from silicon steel with an almost uniform crystalline structure (CRGO). In transformers with amorphous cores, a ribbon of steel is wound to form the core.

The big benefit of amorphous transformers is that amorphous steel has lower hysteresis losses. Simply put, this means that less energy is wasted as heat during the magnetisation and de-magnetisation of the core (see IR imagery below).

WHAT ARE AMORPHOUS METALS?

Amorphous metals are made of alloys that have no atomic order. They are made by rapid cooling of molten metals that prevents crystallisation and leaves a vitrified structure in the form of thin strips. Due to the lack of systematic structure, this type of metal has also been given the name "The Metallic Glasses".



Infrared (IR) images illustrate significantly lower temperature in an amorphous metal core (right) compared with a traditional silicon steel core (left).

COMPARISON OF PROPERTIES

PROPERTIES	AMORPHOUS METAL	CRGO STEEL
Density	7.15 (g/cm3)	7.65 (g/cm3)
Specific resistance	130.00	45.00
Saturation flux density	1.56 (Tesla)	2.03 (Tesla)
Typical core loss (at 50 Hz, 1.4 Tesla)	0.205 Watt/kg	0.54 Watt/kg
Thickness	0.025 mm	0.23 mm
Space factor	0.86	0.97
Brittleness	Higher	Lower
Available form	Ribbon/foil*	Sheet/Roll
Annealing temperature	360°C	810°C
Annealing atmosphere	Inert gas	Inert gas
Special annealing requirement	Magnetic field annealing	-

*(Standard sizes -142.2mm, 170.2mm & 213.4mm)

LOWEST COMBINED TRANSFORMER LOSSES:

UPGRADE YOUR INFRASTRUCTURE TO THE UK'S MOST ENERGY EFFICIENT TRANSFORMER

Since its launch, Wilson e3 has been continually developed to achieve the highest energy efficiency levels possible. Replacing old transformers with Wilson e3 can significantly reduce your energy waste, carbon emissions and the cost that comes with it.

TRANSFORMER LOSSES COMPARISON

TRANSFORMER CONSTRUCTION	CORE LOSSES (APPROX. [W])	LOAD LOSSES (APPROX. [W])	kWh SAVINGS WILSON E3/PA	£'S SAVINGS WILSON E3/PA*
1950s Transformer (Hot rolled steel - typically pre 1965)	2870	14,000	60,002	£12,000
1970s Transformer (Early CRGO 1965 to 1985 approx)	1770	13,000	48,086	£9,617
1990s Transformer (modern standard CRGO - from approx 1985 onwards)	1350	12,500	36,394	£7,288
2015 Transformer (Tier 1 EU Eco Design compliant)	770	10,500	19,608	£3,921
2021 Transformer (Tier 2 EU Eco Design Compliant)	693	7600	6,485	£1,297

*based on electricity costs of £0.20/kWh

**All based on 1MVA rating and 70% load.

Please note that the dates detailed above are approximate and an overlap of manufacturing techniques may be evident in transformers commissioned around these milestone periods.

COMPARE TRANSFORMER LOSSES

KVA	PRE 2015 STANDARD LOSS CRGO TRANSFORMER		WILSON E1 - TIER 1 2015 ECO DESIGN COMPLIANT		WILSON T2 - TIER 2 2021 ECO DESIGN COMPLIANT		WILSON E3 - SETTING THE BAR FOR TIER 3	
	Core Losses NLL	Load Losses LL	Core Losses NLL	Load Losses LL	Core Losses NLL	Load Losses LL	Core Losses NLL	Load Losses LL
315	600	5350	360	3900	324	2800	180	2380
500	900	7400	510	5500	459	3900	270	3330
800	1150	11000	650	8400	585	6000	380	5160
1000	**1350**	**12500**	**770**	**10500**	**693**	**7600**	**428**	**6630**
1250	1575	16000	950	11000	855	9500	500	8250
1500	1700	21000	1125	13140	1015	11285	560	10156
1600	1800	21700	1200	14000	1080	12000	570	10800
2000	2300	24000	1450	18000	1305	15000	750	13500
2500	3000	28000	1750	22000	1575	18500	810	16650

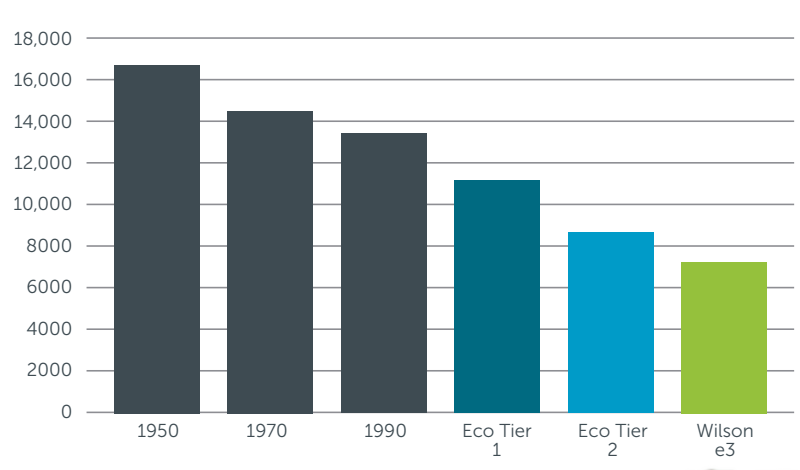
Transformer loss comparison. All values are given in Watts [W] and refer to full load. Figures correct at date of the fifth publication, August 2022.

A HISTORICAL GUIDE TO LOSSES

When calculating the gains associated with upgrading supply transformers to modern ultra low loss equivalents, the age and construction of the existing unit will make a significant difference.

As a rule of thumb, the older your transformer, the worse its performance is likely to be and the greater saving potential you will have.

How much energy (and money!) is your old transformer wasting away through losses? Find out from our rough guide on typical loss values for transformers manufactured in the last 75 years (based on a typical 1000kVA transformer).



ARE YOU STILL RUNNING

OLD INEFFICIENT ENERGY GUZZLING SUPPLY TRANSFORMERS?

VOLTAGE MANAGEMENT THROUGH MV SUPPLY

Many sites in the UK are supplied by a higher than optimal voltage that is responsible for significant energy losses in voltage dependent equipment.

WILSON
e³+AMORPHOUS
ULTRA-LOW LOSS

Voltage Management is an energy saving technique that reduces unnecessary losses by improving voltage to site.

TWO AREAS OF ENERGY SAVINGS

1. GUARANTEED SAVINGS THROUGH REDUCED TRANSFORMER LOSSES
2. SUBSTANTIAL POTENTIAL SAVINGS THROUGH VOLTAGE MANAGEMENT

Wilson e3 transformers are designed at reduced secondary voltage (415V instead of 433V) and come with one of two voltage management options. This reduces the site's footprint, avoids additional system losses and eliminates the need for additional plant maintenance.

DE-ENERGISED TAP CHANGER

This comes built-in as a standard with all transformers to allow for easy adjustment to LV site voltage without the need of costly additional equipment. The DETC switch can be turned manually to adjust the secondary voltage. In addition, the units feature an extended tapping range (+7.5%).

ON-LOAD TAP CHANGER

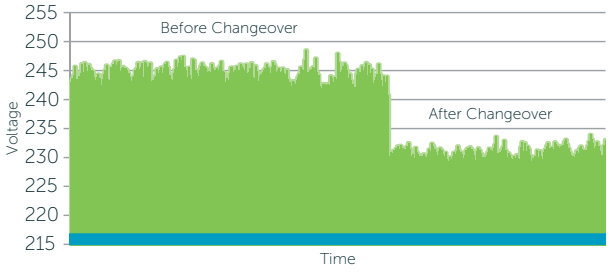
Wilson e3+ has a vacuum OLTC that changes the voltage automatically without the need to de-energise the transformer. This compact solution comes at an extra cost but has the capability of a 3 second gap between operations and can do up to 500,000 operations which allows it to outlive the transformer.

GUIDELINE VALUES FOR NO LOAD VOLTAGE

HV VOLTAGE	TAP SETTING	LV VOLTAGE
11,000V	7.5% (1)	384V
11,000V	5% (2)	394V
11,000V	2.5% (3)	405V
11,000V	0 (4)	415V
11,000V	-2.5% (5)	425V
11,000V	-5% (6)	436V

NHS CASE STUDY - VOLTAGE DATA

The following graph details the recorded RMS voltage for the supply.



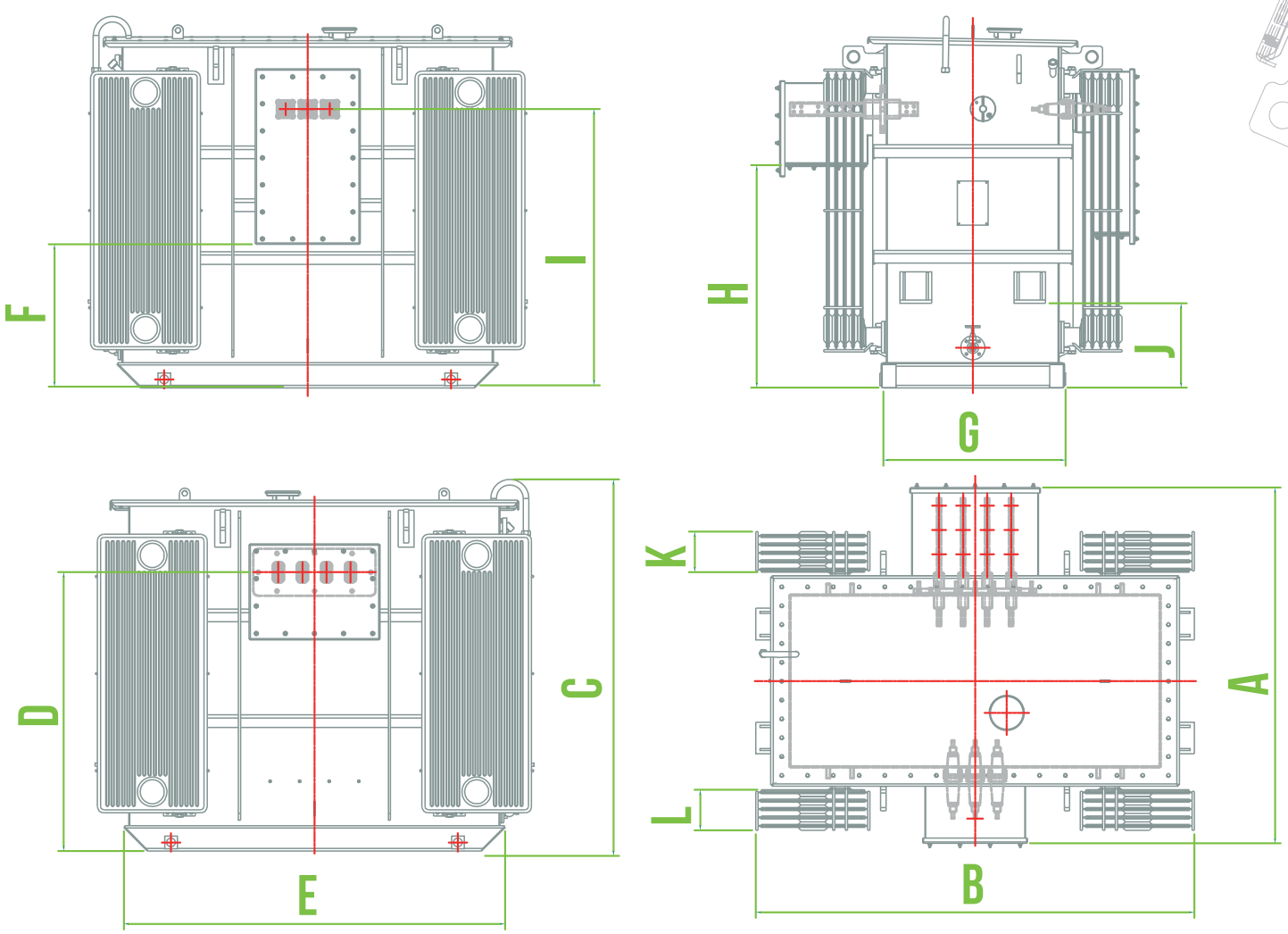
NHS

An extremely cost effective infrastructure upgrade that not only provides guaranteed energy savings through reduced transformer losses but delivers substantial additional savings through in-built voltage management capabilities.

NHS ESTATES MANAGER

GET SUBSTANTIAL ADDITIONAL SAVINGS FROM VOLTAGE MANAGEMENT

DIMENSIONS & TYPICAL ASSEMBLY

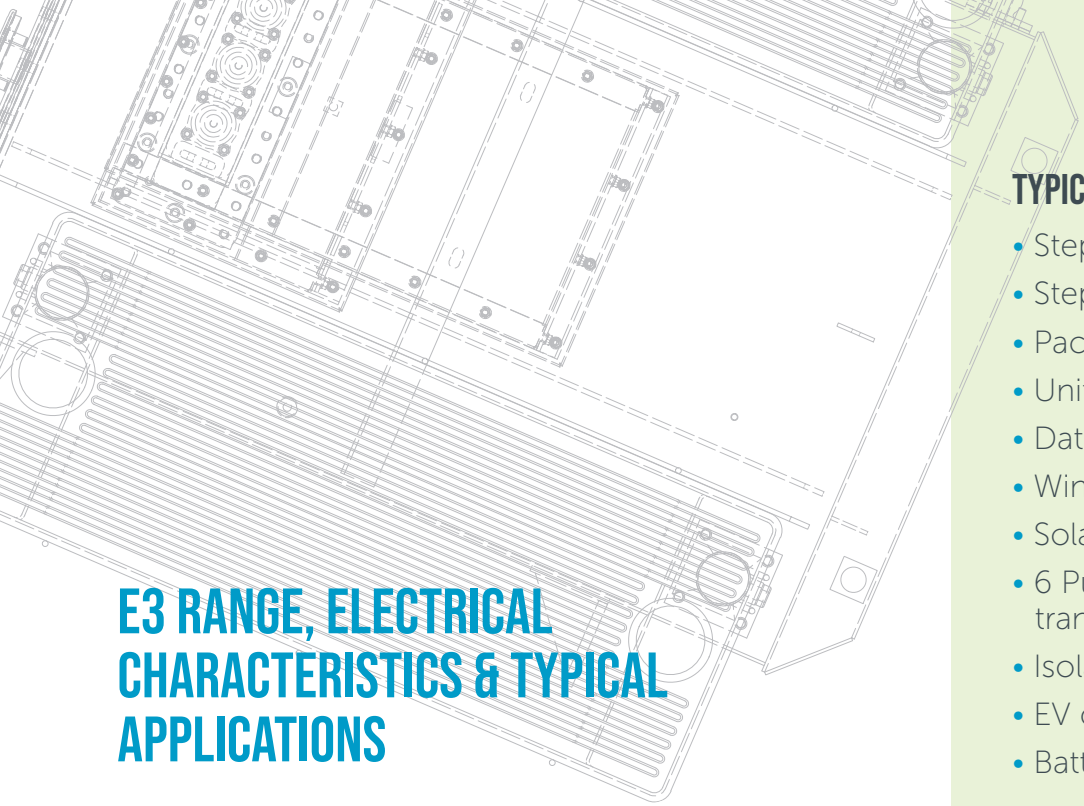


Representative assembly shown for 2000kVA Wilson e3 transformer.

DIMENSIONS (in mm)

RATING KVA	TANK TYPE	A	B	C	D	E	F	G	H	I	J	K	L
315	1	1377	1685	1750	1320	1405	720	745	1049	1320	400	-	-
500	1	1387	1835	1750	1320	1555	720	755	1049	1320	400	-	-
800	1	1585	2080	1750	1320	1800	720	840	1049	1320	400	-	-
1000	2	1585	2080	1750	1320	1800	720	840	1049	1320	400	111	-
1250	2	1730	2240	1750	1320	1960	720	870	1049	1320	400	151	-
1500	2	1730	2240	1750	1320	1960	720	870	1049	1320	400	191	-
1600	2	1730	2240	1750	1320	1960	720	870	1049	1320	400	271	-
2000	3	1985	2242	1750	1320	1960	720	1010	1049	1320	400	271	191
2500	4	2130	2437	2712	1500	2155	900	1115	1229	1500	500	311	311

Dimensions shown are subject to tolerances (10%)



E3 RANGE, ELECTRICAL CHARACTERISTICS & TYPICAL APPLICATIONS

WILSON E3 DISTRIBUTION TRANSFORMER RANGE:

- Single and three phase transformers
- 315kVA - 3000kVA
- Oil filled ONAN or synthetic ester filled KNAN with insulation class up to 36kV
- Primary voltages typically 3.3kV, 6.6kV, 11kV, 11/6.6kV dual, 33kV
- Secondary voltages typically 280V, 315V, 400V, 415V, 433V, 480V, 690V
- De-energised tap changers as standard and On-load tap changer for Wilson e3+
- Extended tapping range: -5% to +7.5%
- Corrugated or bolt on panel radiator tanks
- Cable box type or open bushings
- BS / IEC standards or custom specifications

ELECTRICAL CHARACTERISTICS

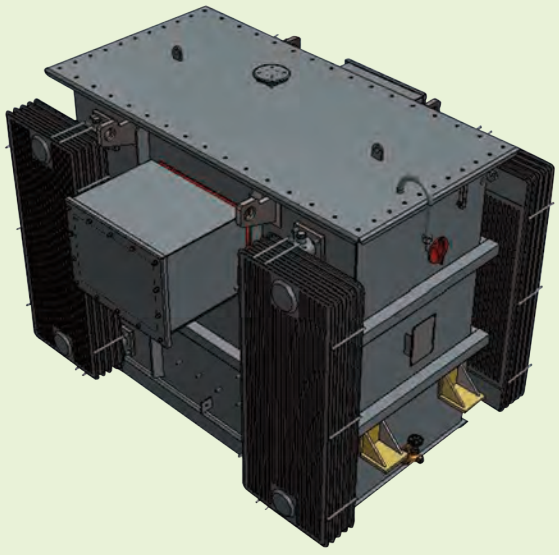
RATING KVA	KV/V	HV LI/PF	LV LI/PF	Z	PO NL	PO LL	THD%	KG
315				4.75	180	2380		2700
500				4.75	270	3330		3275
800				4.75	380	5160		4220
1000	11/415	75/28	-/3	4.75	450	6630	<5%	4540
1250				5	500	8250		5255
1500				5.5	560	10156		5720
1600				5.5	570	10800		6000
2000				6	750	13500		7180
2500				6	810	16650		9810

TYPICAL APPLICATIONS:

- Step down distribution transformers
- Step up generation transformers
- Package substations
- Unit type substations
- Data centres
- Wind farm transformers
- Solar PV farm transformers
- 6 Pulse and 12 Pulse rectifier transformers
- Isolation transformers
- EV charging stations
- Battery Storage

TYPICAL ACCESSORIES:

- Oil temperature indicator (OTI)
- Close coupled MV switchgear
- Close coupled LV cabinets /feeder pillars
- Winding temperature indicator (WTI)
- Magnetic oil level gauge (MOG)
- Forced air cooling
- Marshalling box
- Pressure relief device (PRD)
- Bi-directional rollers
- Radiator valves
- Dehydrating breather



BE PART OF THE NEW GENERATION

OVER 1500 AMORPHOUS TRANSFORMER INSTALLATIONS ACROSS THE UK

ASDA

"Results - £25,000 annual savings 285,000 annual kWh savings."

TESCO

"We're happy to recommend the Wilson e2 transformer as part of an integrated approach to energy savings."

NHS

"An extremely cost effective infrastructure upgrade that not only provides guaranteed energy savings through reduced transformer losses but delivers substantial additional savings through in-built voltage management capabilities."

NHS UNIVERSITY HOSPITAL OF SOUTH MANCHESTER

McCain

"Results - £22,500 annual savings 272,949 kWh reduction annually."

WARWICK
THE UNIVERSITY OF WARWICK

"It was in reality a 'no brainer' to select the Wilson e2 for two recently completed substation upgrade projects."

NATURAL HISTORY MUSEUM

"I found Carl and his team on site very professional. They all got on with the job, had pride in their workmanship and attention to detail. The client was certainly impressed and is looking forward to the energy savings."

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