



WILSON
POWER SOLUTIONS

Responsible Power Engineering

SUPER LOW LOSS **AMORPHOUS** TRANSFORMERS

AT THE CORE OF THE UK'S MOST ENERGY EFFICIENT NETWORKS



FUTURE SAFE YOUR SITE

The e2 and e2+ are the only distribution transformers to
EXCEED TIER 2 EU ECO DESIGN SPECIFICATIONS COMING INTO FORCE 2021



WILSON
e² AMORPHOUS

THE UK'S MOST EFFICIENT DISTRIBUTION TRANSFORMER
INCORPORATING AMORPHOUS CORE TECHNOLOGY SINCE 2009

www.wilsonpowersolutions.co.uk

IMPROVE THE ENERGY EFFICIENCY AND RESILIENCE OF YOUR SITE



FUTURE SAFE YOUR SITE

The e2 and e2+ are the only distribution transformers to EXCEED TIER 2 EU ECO DESIGN SPECIFICATIONS COMING INTO FORCE 2021

TRUST THE LEADING SUPPLIER OF ENERGY EFFICIENT POWER DISTRIBUTION SOLUTIONS

Wilson e2 is specified by leading supermarket giants TESCO and ASDA

We specify the Wilson e2

ASDA

TESCO



ADD TO YOUR BOTTOM LINE WITH ONE SIMPLE INFRASTRUCTURE DECISION



**SAVE ENERGY,
ADD £££'s
TO YOUR
BOTTOM LINE**



**CUT
OPERATING
COSTS**



**EXCEEDS
TIER 2
ECO DESIGN
DIRECTIVE SPECS**

Our Wilson e2 transformer range provides superior operational efficiency alongside in-built voltage management capabilities achieving savings in both energy costs and associated CO2 emissions.

What's more, total cost of ownership considerations are almost always favourable making the e2 a clever infrastructure decision that will add significantly to your bottom line over its lifetime.

BENEFITS OF CHOOSING A WILSON E2

- ✓ Guaranteed loss savings over lifetime
- ✓ Total cost of ownership considerations always favourable
- ✓ Cost effective Voltage Management solution
- ✓ Proven & reliable technology
- ✓ Meets & exceeds Tier 2 (2021) EU Eco Design specifications
- ✓ Up to £100k lifetime savings when replacing an existing transformer
- ✓ Easy, non-invasive energy efficiency measure
- ✓ 24 month guarantee

**SAVE
UP TO
£100K**

**NEW FLEXIBLE LEASE
AND FINANCE PACKAGES
AVAILABLE NOW**



CONTACT US NOW TO SPEAK WITH YOUR DEDICATED POWER DISTRIBUTION EXPERT:
+44 (0)113 271 7588 or visit www.wilsonpowersolutions.co.uk

PROVEN TECHNOLOGY

UNSURPASSED EFFICIENCY

2 AREAS WHERE YOU GAIN SUBSTANTIAL SAVINGS

1 GUARANTEED LIFETIME LOSS SAVINGS

Our Wilson e2 transformer combines amorphous core material with low current density conductors to provide significant energy savings through reduced transformers losses and is already meeting and exceeding EU Eco design specifications planned for 2021. Depending on your installation a Wilson e2 can save up to £100,000 over its lifetime: A robust and future proof infrastructure investment!

See page 6 →

2 ADDITIONAL SAVINGS THROUGH VOLTAGE MANAGEMENT

The Wilson e2 transformer is manufactured to supply a lowered nominal voltage of 415V. In addition the e2 comes with an extended tapping range at no extra cost allowing you to adjust output voltage to suit your site. Where regulated output voltage is required the Wilson e2+ comes with automatic voltage regulators to buck & boost supply as necessary providing dynamically regulated site voltage.

See page 7 →

3 EASY STEPS TO YOUR e2 SOLUTION

1

YOUR SITE

- New build or retrofit
- Site survey
- Load profile analysis
- Existing installations
- Future expansion

2

OUR OFFER

- Proposed solution
- Detailed quote
- Savings forecast
- Payback analysis
- Buyback of redundant plant

3

YOUR SOLUTION

- Equipment manufactured
- Site monitored
- Installation confirmed
- Energy savings realised

e2 RANGE & TYPICAL APPLICATIONS



WILSON e2 DISTRIBUTION TRANSFORMER RANGE:

- Single and three phase transformers
- 100kVA – 3000kVA
- Oil filled ONAN or Midel 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
- On-load or off-load tap changers
- 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



TYPICAL APPLICATIONS:

- Step down distribution transformers
- Step up generation transformers
- Package substations
- Unit type substations
- Data centres
- Wind farm transformers
- Solar PV farm transformers
- Isolation transformers
- Voltage Management
 - Fixed ratio
 - Dynamic (OLTC)



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)
- AVR relay and control panel
- Bi-directional rollers
- Radiator valves
- Dehydrating breather

ENERGY EFFICIENCY AT OUR CORE

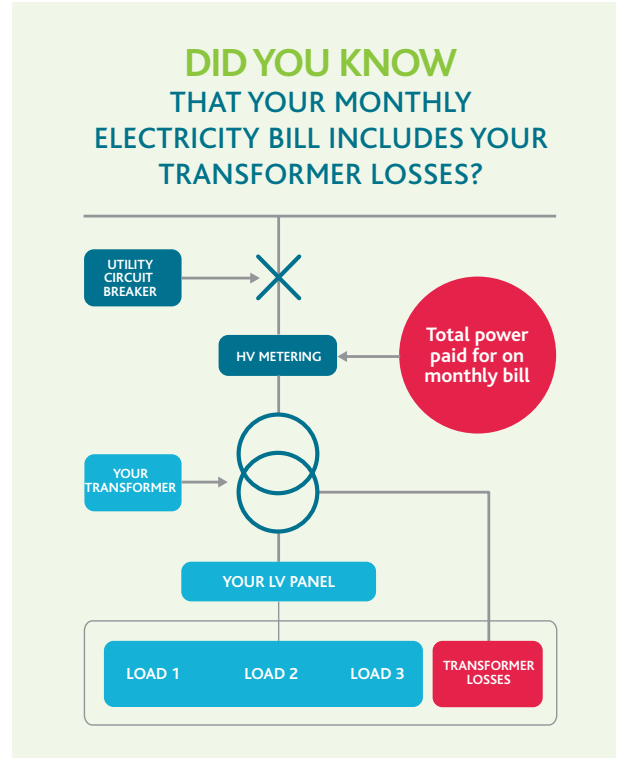
The Wilson e2 transformer reduces unnecessary losses and helps organisations save operating costs and cut CO2 emissions whilst improving site resilience and protecting against increasingly common fluctuations in grid supply voltage (Wilson e2+).

CUTTING TRANSFORMER LOSSES FURTHER: AMORPHOUS METAL CORE TECHNOLOGY

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.

Core losses are continually present from the day the unit is energised, that is 24h a day, 365 days of the year. Wilson e2 transformers combine amorphous metal cores with low current density conductors to create a super low loss transformer with significantly reduced losses. **The result? Providing you with guaranteed, easily quantifiable energy savings for your organisation.**



WHAT ARE AMORPHOUS CORE TRANSFORMERS (AMT'S)?

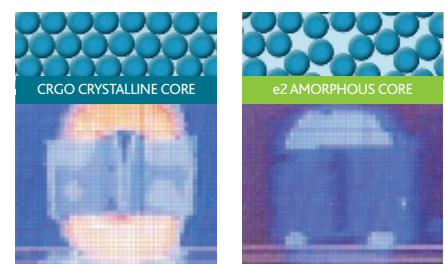
The cores of conventional transformers consist of stacks of laminations that are made from silicon steel with an almost uniform crystalline structure (CRGO). In transformers with amorphous cores, a ribbon of steel is wound forming the core.

The big benefit of amorphous transformers is that amorphous steel has lower hysteresis losses. Simply put, this means that less energy is wasted in magnetising and demagnetising during each cycle of the supply current, which results in significantly reduced core losses.

COMPARISON OF PROPERTIES			
Properties	Unit	Amorphous metal	CRGO Steel
Density	(g/cm ³)	7.15	7.65
Specific resistance		130.00	45.00
Saturation flux density	(Tesla)	1.56	2.03
Typical core loss (at 50 Hz, 1.4 Tesla)	Watt/kg	0.20	0.90
Thickness	mm	0.025	0.27
Space factor		0.86	0.97
Brittleness		Higher	Lower
Available form		Ribbon/foil (standard sizes -142.2mm, 172.2 mm & 213.4 mm)	Sheet/Roll
Annealing temperature	°C	360	810
Annealing atmosphere		Inert gas	Inert Gas
Special annealing requirement		Magnetic field annealing	-

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. The lack of systematic structure has given them the additional name metallic glasses.



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

LOWEST COMBINED TRANSFORMER LOSSES: UK'S MOST ENERGY EFFICIENT TRANSFORMER

Since its launch the Wilson e2 has been continually developed to improve energy efficiency and is the transformer product with lowest combined transformer losses available in the UK.

COMPARE TRANSFORMER LOSSES						
KVA	Pre 2015 standard loss CRGO transformer		Wilson e1 - Tier 1 2015 Eco Design compliant		Wilson e2 - Tier 2 2021 Eco Design compliant	
	Core losses NLL	Load losses LL	Core losses NLL	Load losses LL	Core losses NLL	Load losses LL
315	600	5350	360	3900	200	2800
500	900	7400	510	5500	300	3900
800	1150	11000	650	8400	425	6000
1000	1350	12500	770	10500	500	7600
1250	1575	16000	950	11000	550	9500
1500	1700	21000	1125	13140	625	11285
1600	1800	21700	1200	14000	630	12000
2000	2300	24000	1450	18000	850	15000
2500	3000	28000	1750	22000	900	18500

Figures correct at date of first publication, May 2016, All values given in Watts [W]



ARE YOU STILL RUNNING OLD, INEFFICIENT ENERGY GUZZLING SUPPLY TRANSFORMERS?

Find out how much you could save by fast-tracking your capital replacements
-Ask us for a savings forecast today!

TRANSFORMER LOSSES – A HISTORICAL GUIDE TO NO-LOAD LOSSES

When calculating the gains associated with upgrading HV/LV transformers to modern super 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.

How much is your old transformer wasting through core losses?

Find out from our rough guide on typical core loss values for transformers manufactured in the last 65 years (based on a typical 1000kVA transformer).

Transformer construction	Core losses (approx. [W])	Annual kWh consumption	kWh savings Wilson e2/pa	£'s savings Wilson e2/pa*
Hot rolled steel (typically pre 1965)	2,194	19,219	14839	2077
Early CRGO (1965 to 1985 approx)	1,688	14,787	10407	1457
Modern standard CRGO (from 1985 onwards)	1,350	11,826	7446	1042
Modern high grade low loss CRGO	1,070	9673	5293	741
Super low loss amorphous core (from 2009 onwards)	500	4380	NA	NA

*based on electricity costs of £0.14p /kWh

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.

VOLTAGE MANAGEMENT

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

Voltage Management is an energy saving technique that reduces these unnecessary losses by improving Voltage to site. The Wilson e2 transformer comes with in-built voltage management capabilities that allow for easy adjustment to LV site voltage without the need of costly additional equipment. Depending on site supply voltage and voltage dependent loads, optimising Voltage through a Wilson e2 transformer can reduce energy consumption by up to 12%; with customers typically achieving savings of 2-4% of their total energy consumption*.

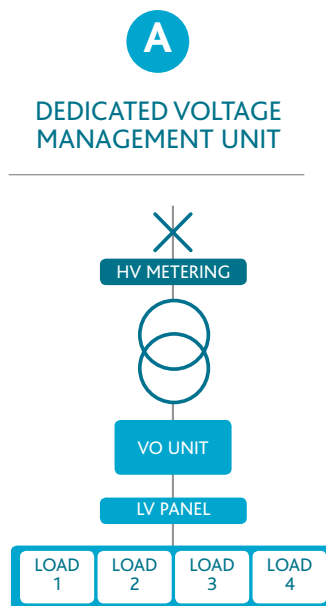
*Actual savings depend on site supply voltage and voltage dependent loads that will need to be monitored to assess a site's energy savings potential.

VOLTAGE MANAGEMENT THROUGH MV SUPPLY THE MOST COST EFFECTIVE AND LEAST INVASIVE SOLUTION

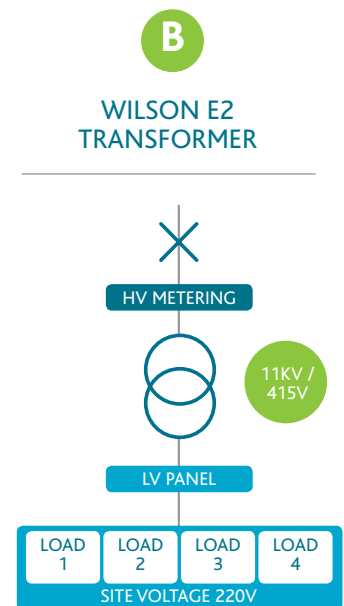
Most sites with MV supply are operating a distribution transformer that is designed to provide a nominal phase voltage of 240V. Where sites can benefit from reducing supply voltage, replacing existing transformers with a Wilson e2 super low loss amorphous unit offering a nominal voltage of 230V alongside an extended tapping range is often the most cost effective solution. Why?

Replacing the supply transformer does not require any additional equipment to be installed. This eliminates the risk of system disturbance, avoids additional transmission losses, minimises the total plant footprint and is virtually maintenance free (see diagrams opposite). Specifying a Wilson e2 super low loss amorphous unit for new developments will support a project's energy efficiency portfolio and achieve energy savings throughout its lifetime.

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



- High capital cost
- Additional system losses
- Increased plant footprint
- Additional cabling
- Additional maintenance



- Virtually maintenance free
- No additional equipment
- No added transmission losses
- No risk of system disturbance
- Cost effective 2in1 solution

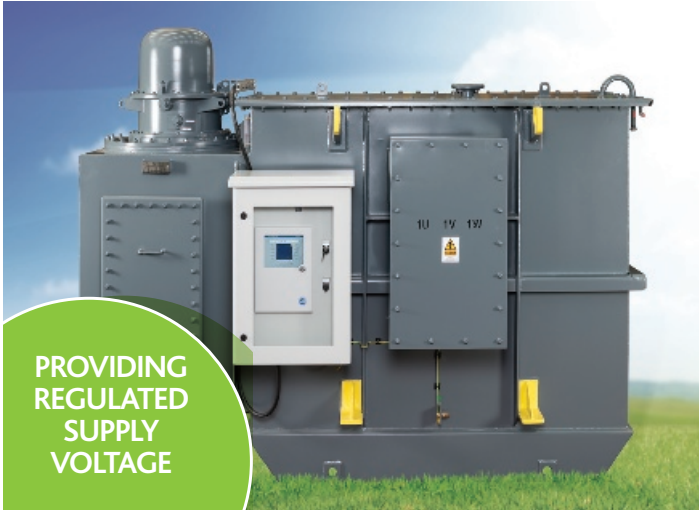
JOIN US and reduce your operating costs with the e2



BRITAIN'S 'GREENEST' HOSPITAL ACHIEVES
6% REDUCTION IN ELECTRICITY CONSUMPTION
WITH WILSON E2 TRANSFORMERS

IMPROVED SITE RESILIENCE

MAXIMISED ENERGY SAVINGS



PROVIDING
REGULATED
SUPPLY
VOLTAGE

PROTECTING YOUR SITE

Are you ready to deal with today's supply voltage challenges and make the most from associated energy saving opportunities?

Our Wilson e2+ super low loss amorphous transformer is now available with a 17 position on load tap changer that provides regulated supply voltage to site via an AVR relay.

The result: Buck and boost functionality protects your site from voltage hikes and drops whilst you maximise energy savings through reduced transformer losses and dynamic voltage management.



FUTURE SAFE YOUR SITE

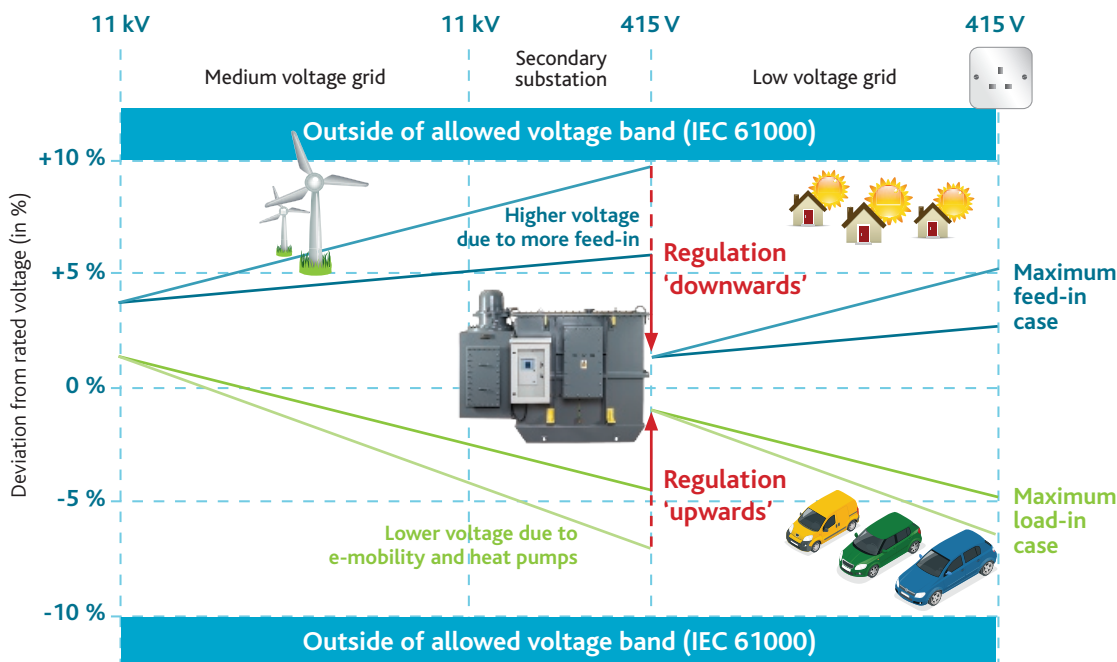
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VOLTAGE REGULATED DISTRIBUTION TRANSFORMERS

The growing importance of distributed renewables such as photovoltaics or wind power alongside a new set of loads from electric vehicles and heat pumps fundamentally changes the way our distribution networks operate: Electricity now has to flow bi-directional as opposed to the traditional one-way distribution from large power stations to industrial, commercial and household users.



On-load voltage control in modern distribution transformers is a cost effective alternative to traditional remedies for voltage band violations such as the deployment of additional cables. Due to additional benefits from reduced losses and the resulting economic attractiveness, the next generation of voltage regulated distribution transformers could therefore become a key component of our future "smart grids".

DISTRIBUTION TRANSFORMER OF THE FUTURE MEET THE WILSON E2+

The Wilson e2+ is a type of voltage regulated distribution transformer (VRDT) that uses tried and tested on-load tap changer technology.

We partnered with Maschinenfabrik Rheinhausen (MR) to develop and tailor their world renowned technology specifically for distribution transformer applications. The result is an innovative distribution transformer product that addresses today's supply voltage challenges and associated energy savings opportunities.

BENEFITS OF CHOOSING A WILSON E2+

- ✓ Buck and boost to safeguard against voltage hikes and drops
- ✓ Measure, monitor and control via remote connectivity
- ✓ Improved site resilience
- ✓ Energy savings through reduced transformers losses
- ✓ Maximised energy savings from voltage dependent loads
- ✓ Proven and robust technology
- ✓ Incorporating components from world leading manufacturer
- ✓ Equipment engineered for performance and reliability

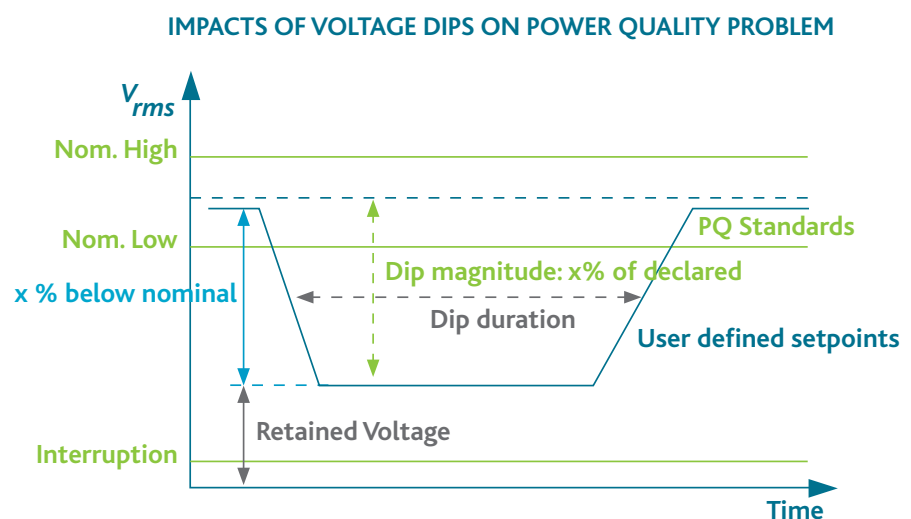
IS YOUR SITE AT RISK FROM FLUCTUATING SUPPLY VOLTAGE?

Supply voltage fluctuations are a common phenomenon across UK distribution networks.

The most frequent of these are voltage fluctuations that occur as a result of changes in local day /night load profiles. These types of voltage fluctuation are usually regular and characterised by moderate amplitudes that can be accurately forecast and controlled.

However, with increasing amounts of embedded generation in particular from renewable sources the grid supply voltage can vary substantially as a result of varying operating conditions that are a lot harder to predict and control by national grid.

The extremes of these conditions are referred to as "heavy load without distributed infeed" and "light load with maximum distributed infeed." Voltages



are considerably higher under high infeed conditions and reduced in cases of heavy loads. Another type of voltage fluctuation occurs in form of sudden hikes and surges (increases in supply voltage) and dips (decreases in site voltage).

Power surges and hikes are commonly caused by lightning, power switching on the lines or sometimes from equipment drawing excessive amounts of power on your own site or neighbouring premises. Sudden voltage dips are typically caused by overloading on the network and load switching.

ADDITIONAL FUNCTIONS AND BENEFITS

- ✓ Integrated protective functions:
 - Undervoltage blocking and overvoltage blocking
 - Overvoltage detection with high-speed return
- ✓ Digital inputs and outputs can be individually programmed on-site by the user
- ✓ Additional indicators using LEDs outside the display for freely selectable functions
- ✓ Display of all measured values such as voltage, current, active power, apparent power or reactive power, power factor ($\cos \Phi$)
- ✓ Maximised energy savings from voltage dependent loads
- ✓ Further advanced features on request



ADVANTAGES OF TRANSFORMERS WITH ON LOAD TAP CHANGER [OLTC] OVER "HYBRID" UNITS:

- One solid piece of engineering
- Proven and reliable technology
- Compact design
- Reduced plant footprint
- Less residual heat



Maximising energy savings - Increasing site resilience.

WHY CHOOSE AN ON LOAD TAP CHANGER (OLTC) OVER THYRISTOR PRODUCTS?

- No excessive heat
- Proven reliability
- Smaller plant footprint

Join us and improve the resilience of your site with the e2+ and benefit from reduced operating costs at the same time!



THE WILSON E2+ SAVES ONE ASDA STORE 285,000 KWH PER YEAR THROUGH LOSS SAVINGS AND VOLTAGE MANAGEMENT. PROVIDING A COST-EFFECTIVE AND SPACE SAVING ALTERNATIVE TO DEDICATED VOLTAGE MANAGEMENT SYSTEMS.

FREQUENTLY ASKED QUESTIONS

WHAT IS THE RESPONSE TIME OF THE WILSON E2+?

As per ENATS standard, the default out of bandwidth waiting time is 40 seconds with a second response (if required) triggered after 10 seconds (default setting). Where requested by the customer, the system can be configured to provide a shortened out of bandwidth waiting time.

WHAT IS THE LIFE EXPECTANCY OF THE OLTC?

The unit is guaranteed to provide a minimum of 50,000 mechanical operations after which time the OLTC insert and associated gear must be replaced. Over the 25 years product life of the Wilson e2+ transformer this equates to 2,000 operations per annum (5.5 operations /day).

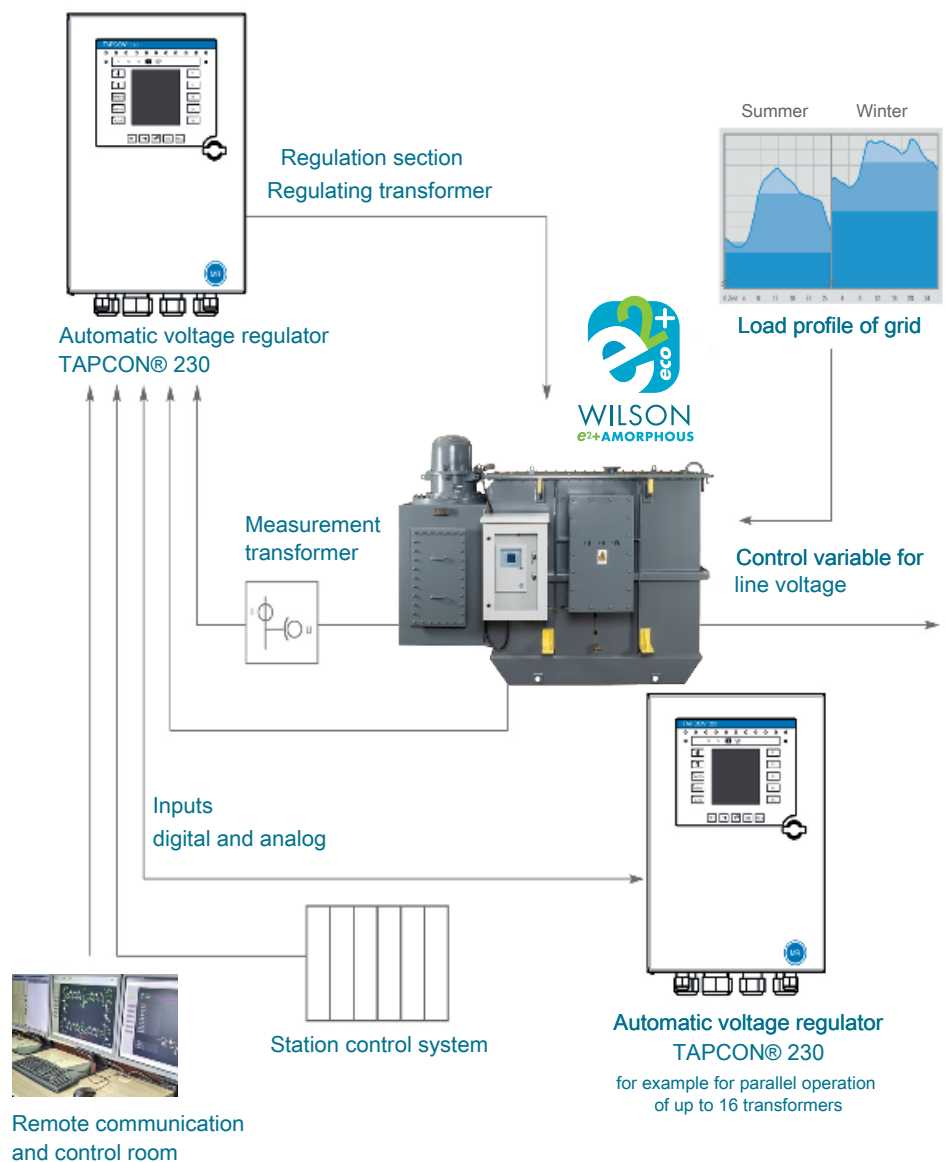
WHAT ARE THE INSPECTION/ MAINTENANCE REQUIREMENTS?

Under typical operating conditions the first inspection is due after 50,000 operations or after five years (whichever comes first). Subsequent inspections should be carried out every four years (or 25,000 operations) without oil filter unit. Filtering the on-load tap-changer oil allows the inspection intervals to be extended to every seven years or 50,000 operations whichever comes first.

HOW IS THE WILSON E2+ OUTPUT VOLTAGE REGULATED?

We have chosen the TAPCON® device by leading tap changer manufacturer Maschinenfabrik Rheinhausen (MR) to control the output voltage of the Wilson e2+ transformer.

The TAPCON® compares the transformer's measured voltage (V_{actual}) with a defined reference voltage ($V_{desired}$). The difference between V_{actual} and $V_{desired}$ is the control deviation (dV). The TAPCON® parameters can be optimally adjusted to the line voltage response to achieve a balanced control response with a small number of tapchange operations.



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SUPER LOW LOSS **AMORPHOUS** TRANSFORMERS
PROVEN. RELIABLE. BETTER.

Join the *Amorphous*
REVOLUTION

AND START SAVING
ALONGSIDE...



...WHO ALREADY BENEFIT

Choose the UK's most energy efficient distribution transformer for lowest combined transformer losses, guaranteed savings and complete peace of mind.



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