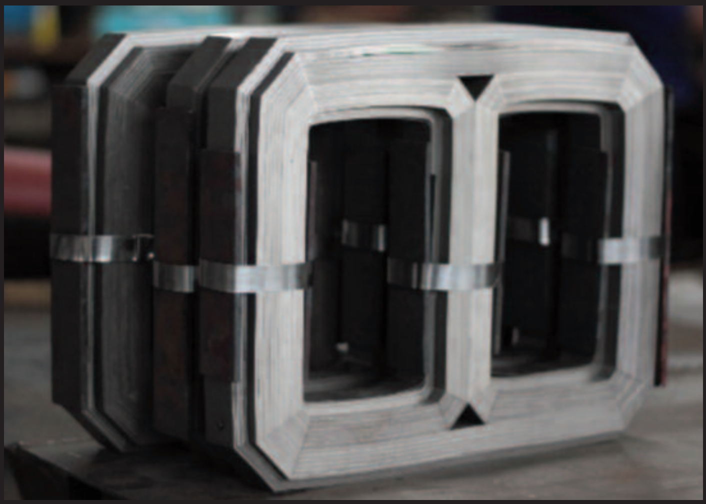
Jencores (Unicores) 3



A Revolution in Transformer Design and Manufacture

In 1997, a new concept was developed by AEM Cores (Pty) Ltd, using a mixture of the old Distributed Gap Core, C cores and stamped laminations. This new development was a radical departure from all of the traditional methods used before. This innovative concept allows complete freedom in transformer design because unrestricted core sizes are available. We have called this core a "Jencore" after the name of the founder, Mr. Jenkinson.

The Jencore (Unicore) offers advantages in technical performance that can be translated into economic benefits.

Benefits Of The Jencore (Unicores)

- Flexibility of design
- Unrestricted core size
- Smaller and lighter
- Lower watt loss
- Lower exciting current
- Better regulation
- Less winding time needed
- Quicker to assemble
- Major cost savings

Superior Performance

The performance of the Jencore (Unicore) is such that full retention of the magnetic properties of the parent material is possible.

This is because:
- the exciting field is in parallel with the strip
- the Distributed Gap Jencore (Unicore) effectively has no gaps.
- the steel suffers no more degradation after annealing.

The performance of this core allows the designer to run his transformer at peak "revs" i.e. at 1.8 Tesla. However, 1.7 Tesla is preferred for normal design with over-voltage requirements.

Typically, a Jencore (Unicore) in M5 material will have a loss of 1.24 W / kg at 1.7 Tesla 50Hz or 0.73 W / lb. at 1.7 Tesla 60Hz.

In other words, the graphs given by the steel manufacturers can be used for the results obtained by an annealed Jencore (Unicore).

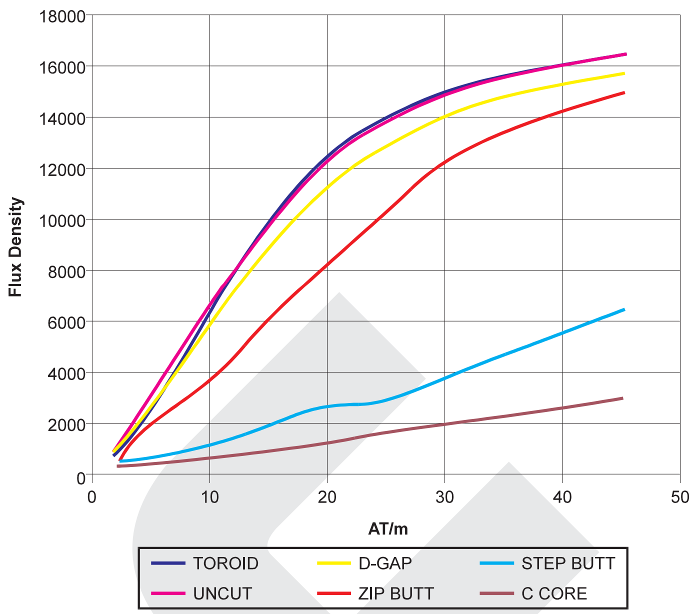
Flux Density vs Watt Loss at 50Hz

Tesla	W/kg Annealed
1.5	0.8
1.6	0.99
1.7	1.18
1.8	1.5
1.9	2.22

NOTE: Material used was an M5 grade with the test certificate reading 1.20W17/50.

In certain cases, where annealing is too costly or unobtainable, one can design without it. By adding 10% more cross-section to this Jencore (Unicore), one can achieve the same results as that of the annealed core.

Flux Density v AT/m



This graph shows the comparisons between various Jencore (Unicore) styles and conventional C Cores and Toroids. A series of cores of identical mean magnetic path length were produced under controlled conditions from the same coil.

- Uncut Jencores (Unicores) overlay conventional Toroidal cores.
- Distributed Gap Jencores (Unicores) are very close to Toroidal cores in characteristics.
- Zip Butt Jencores (Unicores) are better than Step Butt Jencores (Unicores) and conventional C Cores in characteristics.

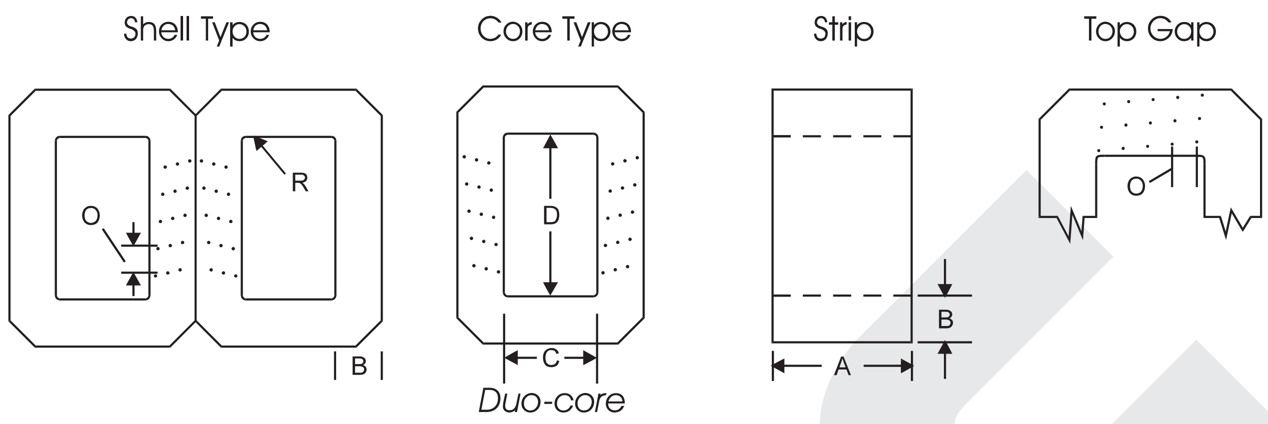
Therefore, the Jencore (Unicore) is the most efficient core available today and offers users very high-energy savings at a low price. This makes the Jencore (Unicore) ideal for Distribution Transformers, Solar Inverters and Uninterruptable Power Supplies.

Design Parameters

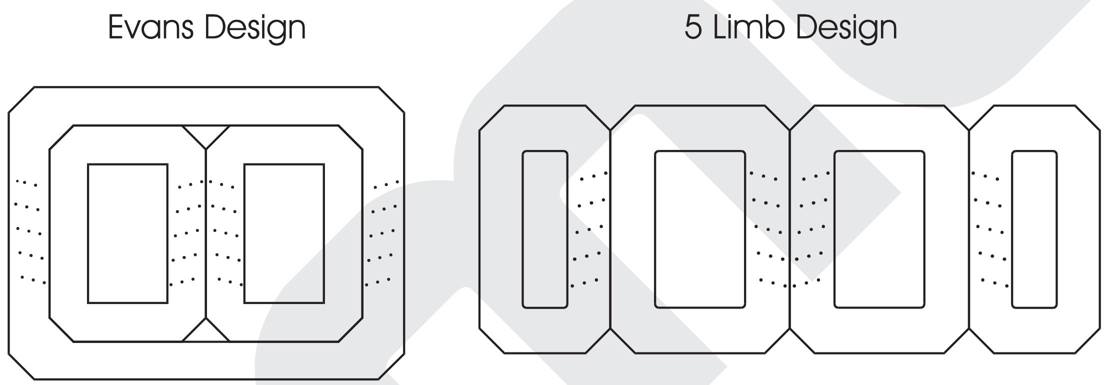
The most economical dimensions for a Jencore (Unicore) are similar to Scrapless Laminations.
Where the Scrapless Lamination has physical ratios of 3:2:1 (3 = Window Length, 2 = Tongue Width, 1 = Window Width), the Jencore (Unicore) is most economical at a 3:1:3 ratio, which is essentially the same.
To understand these ratios, it is necessary to visualise the Scrapless Lamination cut longitudinally down the centre tongue. This will give two rectangular cores similar to a C Core. The ratio would be 3:1 (3 = Window Length, 1 = Window Width and Leg Width or Build-up in a C Core). The only dimension missing is the Lamination stack (or strip width in a C Core), which is variable. If the stack is fixed to the most economical size, we get a third dimension to our ratio.
When considering the most economical strip width for producing a Jencore (Unicore), we find that it should equal the window length, hence 3:1:3. This ratio makes an economical transformer of near-cubic shape with high core mass (low loss / kg) and low copper mass (high loss / kg. The low-loss core acts as a heat sink for the heat generated in the copper and there is a large core surface exposed to the copper with short transfer paths.
Note that the Jencore (Unicore) transformer generally has more core mass than a C Core or a Mitred Core, but lower copper mass. This is typical of a good Jencore (Unicore) design where, by increasing the low-loss core mass, it is possible to reduce the high-loss copper mass. The result is a lighter, cheaper and more efficient transformer with better regulation.

Design Criteria of Single and Double (Duo) Distributed Gap Jencores (Unicores)

Single Phase Configuration



Three Phase Configuration



Standard Specifications

	Min	Max
Strip Width	20mm	280mm
Window Width	40mm	Unlimited
Window Height	40mm	Unlimited
Max Core Size	Unlimited	

Standard Terminology

Strip Width	A
Build-up	B
Window Width	C
Window Length	D
Gap Overlap	O
Radius	R

Standard Tolerances

±0.3mm on all dimensions

Jencore (Unicore) Shapes

All Jencores (Unicores) come in conventional Rectangular or Cruciform shapes. Cruciform shapes can have a maximum of three steps in their construction, either in Single or in Three Phase.

These shapes are available in 90º, 45º or 30º folds.

45º Folds

This is the preferred shape as it saves weight and is easier for the insertion of mounting screws.

Jencore (Unicore) Styles

- Single Cut Distributed Gap face
- Single Cut Diverging Distributed Gap face
- Single Cut Spiral-wound Overlapped Distributed Gap face
- Single Cut Step Butt face
- Single Cut Gapped face
- Uncut face
- Double Cut Distributed Gap face (DUO-CORE)

Please note that the above styles can be used in many permutations, for example:

- Single or Three Phase Jencores (Unicores)
- 90º, 45º or 30º folds
- Cuts along limb or yoke of Jencores (Unicores)
- Chapters can be alternated on opposite sides
- Number of chapters can be selected
- Number of laminations per overlap can be selected e.g. Duo I, II or III
- Lamination overlap distance can be selected

Jencore (Unicore) Assembly

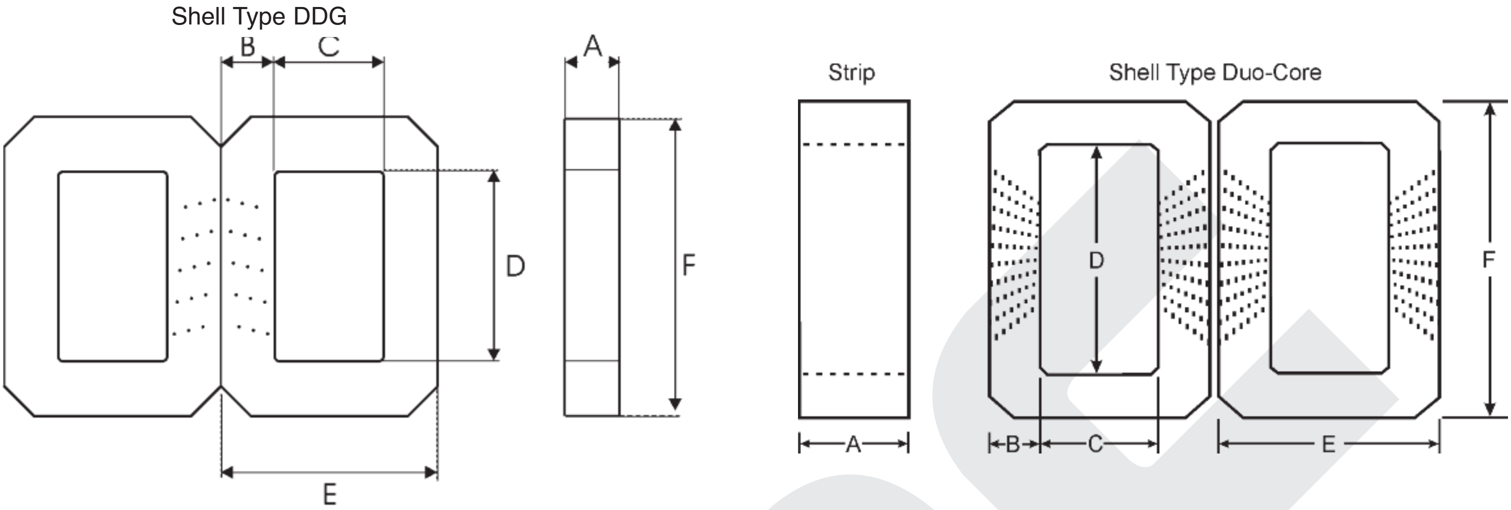
Assembly time for a Jencore (Unicore) has been greatly reduced because ten or more laminations can be assembled at once, whether it is a Step Butt, Duo or a D-Gap Jencore (Unicore). There is a special procedure for this assembly. The D-Gap Jencore (Unicore) is unwrapped chapter for chapter and then, starting from the smallest chapter, wrapped or inserted into the bobbin. The Duo-core is essentially a core in two halves inserted in the windings. Therefore, no extra space is required and this is the preferred core for the single phase Core type and three phase Evans design. Details for these procedures are available from AMC.

Jencores (Unicores) are supplied unbonded; therefore it is essential for the transformer manufacturer to impregnate the complete transformer after assembly. This has the effect of bonding the core laminations, bonding the winding and bonding the core to the winding for good heat transfer. This impregnation can be a simple hot dip into a suitable resin. Attention must be given to the correct procedure to ensure thorough resin impregnation and curing. Obviously impregnation of the transformer is not needed when it is oil cooled.

The use of normal light banding with the minimum of tension is recommended. In some cases where a special frame is used, banding is not required.

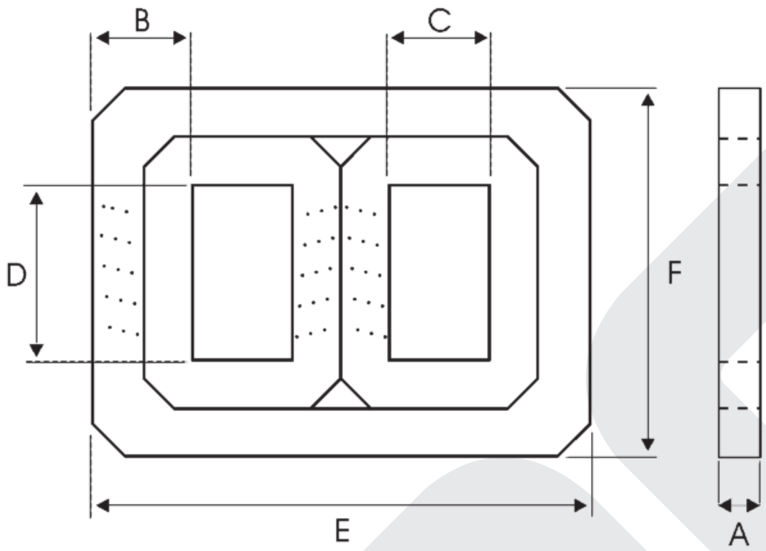
Single phase Jencores (Unicores) in GOSS

Although Jencores (Unicores) can be made in any size, we have designed a standard range of Jencores (Unicores) to suit existing E and I Lamination bobbins.



CODE or VA/Set	V/T at 1.7 Tesla	Nominal Dimensions (mm)						Nett Area/ Set (cm^2)	Nominal Weight/Set (kg)
		A	B	C	D	E	F		
JC 1000	0.717	40	25	35	90	85	140	19.00	5.09
JC 1500	0.896	50	25	35	90	85	140	23.75	6.36
JC 2000	1.076	60	25	35	90	85	140	28.50	7.63
JC 2500	1.344	75	25	35	90	85	140	35.63	9.54
JC 3000	1.742	90	27	35	90	89	144	46.17	12.64
JC 4000	2.151	100	30	35	96	95	156	57.00	16.66
JC 5000	2.151	100	30	40	105	100	165	57.00	17.88
JC 6500	2.868	100	40	45	120	125	200	76.00	28.49
JC 7500	3.227	100	45	45	120	135	210	85.50	33.36
JC 10000	3.442	120	40	45	120	125	200	91.20	34.19
JC 15000	3.585	100	50	60	180	160	280	95.00	49.42
JC 20000	5.163	120	60	60	180	180	300	136.80	75.35
JC 25000	5.163	120	60	70	210	190	330	136.80	83.72
JC 30000	5.163	120	60	80	240	200	360	136.80	92.10
JC 40000	7.027	140	70	80	240	220	380	186.20	131.04
JC 50000	7.027	140	70	90	240	230	380	186.20	133.90

Three phase Jencores (Unicores) in GOSS



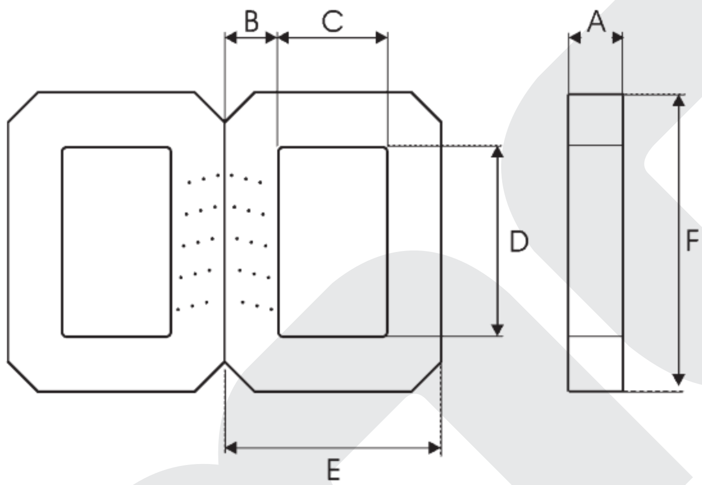
CODE or VA/Set	V/T at 1.7 Tesla	Nominal Dimensions (mm)						Nett Area/ Set (cm^2)	Nominal Weight/Set (kg)
		A	B	C	D	E	F		
JE 2000	0.645	60	30	40	95	170	155	17.10	8.18
JE 3000	0.968	90	30	40	100	170	160	25.65	12.56
JE 4000	1.076	100	30	45	100	180	160	28.50	14.39
JE 5000	1.076	100	30	50	130	190	190	28.50	16.79
JE 6500	1.255	100	35	50	140	205	210	33.25	21.11
JE 7500	1.255	100	35	50	150	205	220	33.25	21.88
JE 8000	1.613	100	45	50	150	235	240	42.75	30.09
JE 10000	1.613	100	45	60	160	255	250	42.75	32.38
JE 15000	2.044	100	57	60	180	291	294	54.15	46.48
JE 20000	2.581	120	60	60	180	300	300	68.40	59.65
JE 25000	2.581	120	60	70	210	320	330	68.40	66.45
JE 30000	2.581	120	60	80	240	340	360	68.40	73.26
JE 40000	3.514	140	70	80	240	370	380	93.10	103.98
JE 50000	3.514	140	70	110	240	430	380	93.10	112.53
JE 75000	4.034	150	75	120	320	465	470	106.88	154.53
JE 100000	4.571	150	85	140	340	535	510	121.13	193.66

NON-STANDARD JENCORES (UNICORES) TO USER SPECIFICATIONS

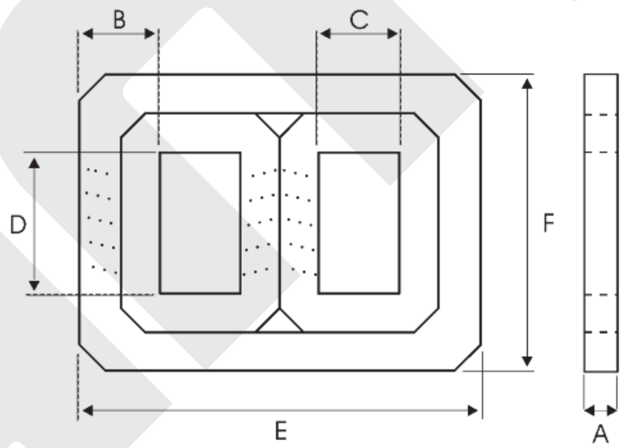
Jencores (Unicores) are specifically suited to user applications, Alloy Magnetic Cores can manufacture any size core that the design engineer wishes. We would need the following dimentions.

1. Minimum and maximum geometric dimensions (A, B, C, D, E, F)
2. Location of cut (if applicable)
3. Desired magnetic properties
4. Details of finish
5. Thickness of material (for higher frequencies if desired)

Shell Type DDG



Three Phase Evans



5 Limb Design