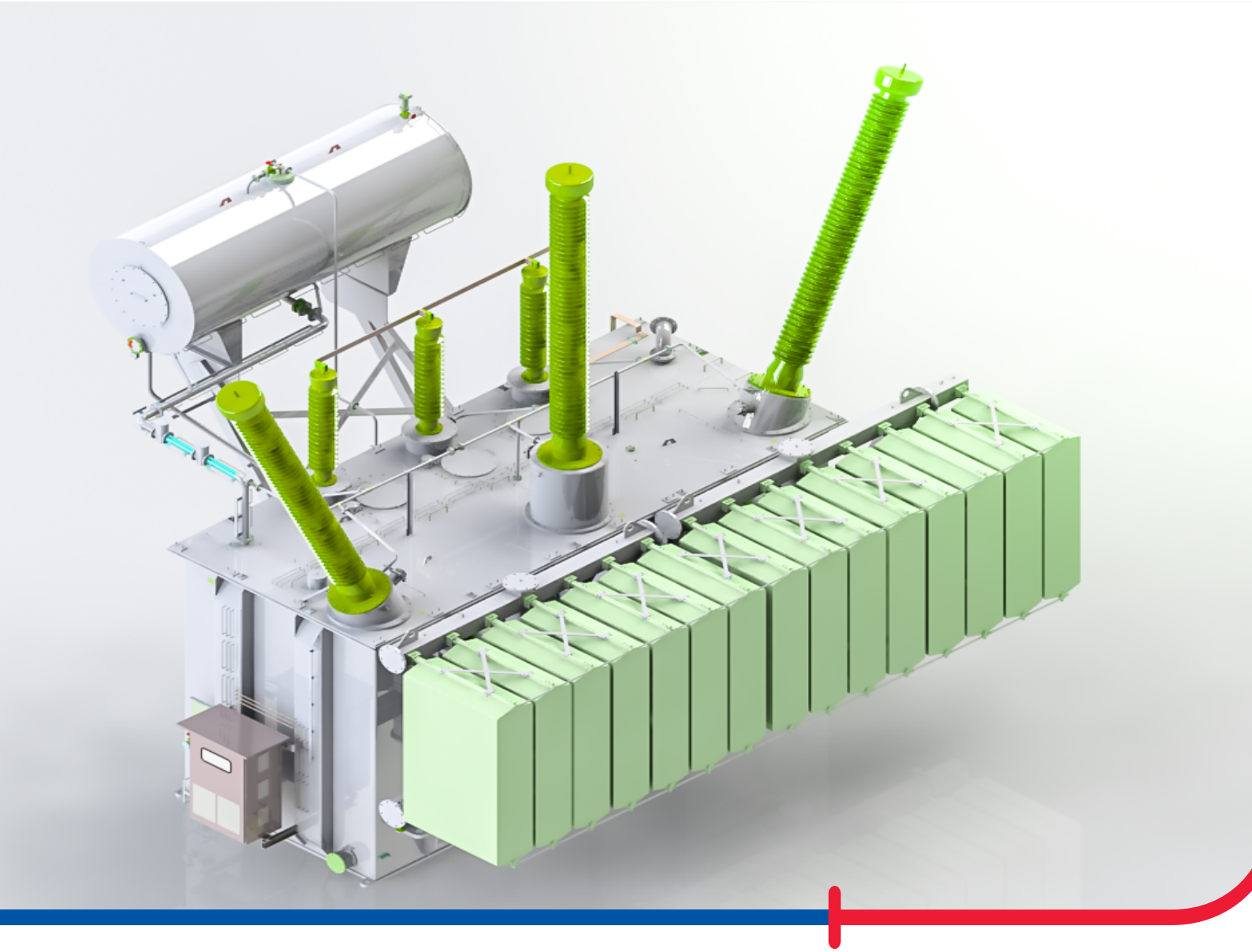
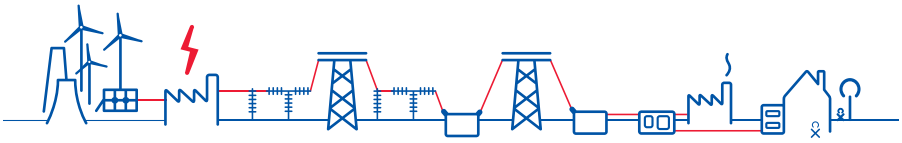
SGB-SMIT POWER MATLA

Your dedicated partner
of the SGB-SMIT Group

REACTORS





SGB-SMIT AT A GLANCE

Combined, more than

450

YEARS OF EXPERIENCE

Basis for know-how and for know-why

More than

3,500

EMPLOYEES

take care of your project

In more than

80

COUNTRIES

satisfied customers

READY FOR YOUR MARKET

The SGB-SMIT Group manufactures transformers for applications worldwide. Sales and service centers on all continents ensure optimum processes.

Our products meet the requirements in accordance with the applicable national standards.

PRODUCTS

- large power transformers
- medium power transformers
- large liquid-cooled distribution transformers
- liquid-cooled distribution transformers
- cast resin transformers
- shunt reactors
- series reactors
- phase shifters
- Lahmeyer-Compactstationen®

Transformers from 50 kVA up to incl. 1,200 MVA in the voltage range up to 765 kV.

QUALITY MANAGEMENT

The SGB-SMIT Group is certified in accordance with:

- DIN ISO 9001
- DIN ISO 14001
- DIN ISO 50001
- OHSAS 18001

TECHNOLOGIES

Technologies for conventional and renewable energy.

Status: December 2019

SGB SMIT POWER MATLA
A MEMBER OF THE SGB-SMIT GROUP

SGB-SMIT POWER MATLA has over 70 years experience in successful design, manufacturing, testing, installation and commissioning of a full range of power and distribution transformers which include large power transformers of voltages up to 800MVA.

SGB-SMIT POWER MATLA

SGB-SMIT POWER MATLA (Pty) Ltd is owned by SGB-SMIT (GmbH) and Power Matla.

SGB-SMIT, is the largest independent and pure-play transformer manufacturer in the world, with headquarters in Regensburg, Germany. They are represented on 5 continents in 8 countries with plants in Germany, the Netherlands, USA, Romania, Malaysia, India, China and the Czech Republic. With transformer expertise since 1913 they produce transformers ranging from 50 kVA up to 1,200 MVA.

Power Matla (Pty) Ltd is a locally owned black empowered company with investments in various portfolios within the renewable energy, ICT, mining and power utilities markets providing good shareholder value and solid returns.

The company consists of Large Power Transformers manufacturing plant in Pretoria and Distribution Transformers plant in Cape Town and supplies a full range of transformers, from generator step-up to transmission and distribution transformers. The range includes three-phase and single-phase units, auto-transformers, arc-furnace, locomotive and traction transformers, miniature sub-stations, NECRT's as well as shunt reactors.

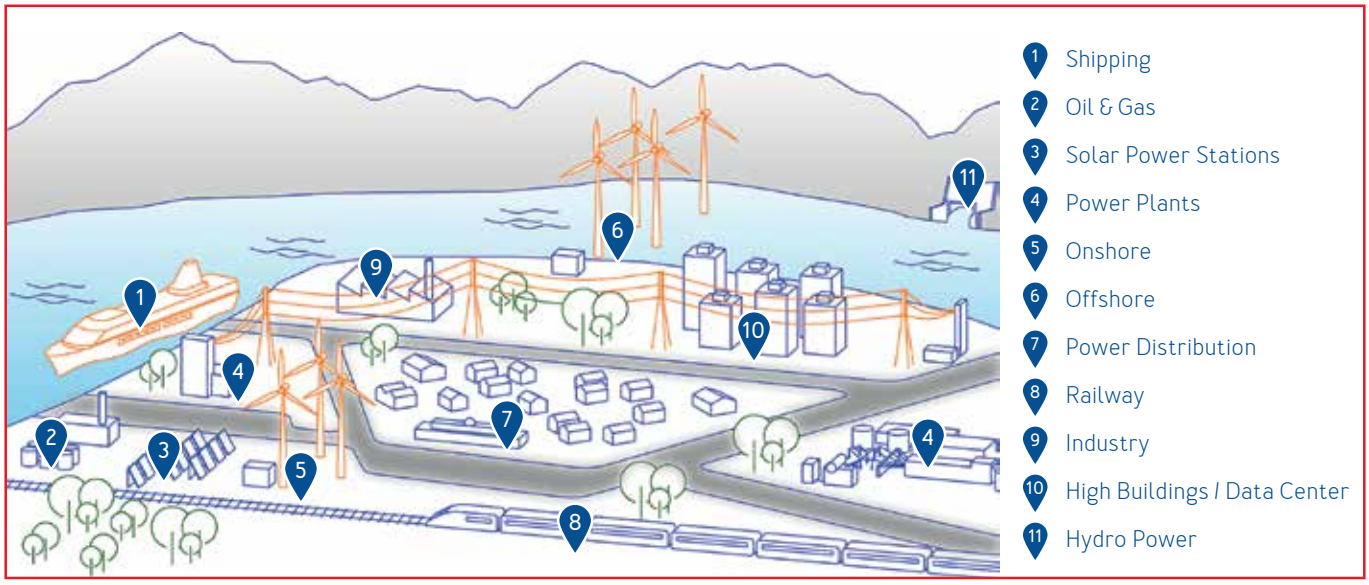
"CUSTOM DESIGNED"

Every SGB-SMIT POWER MATLA unit is custom-made from standardised design elements and using uniform manufacturing operations. This flexible, but well co-ordinated approach ensures the highest quality of design and construction for all our transformers and makes the best possible use of the valuable knowledge and experience gained over the years and best practices developed in our factory.

The Large Power Transformer factory in Pretoria is a well-equipped factory and is amongst the biggest and most sophisticated transformer manufacturing plants within the Southern Hemisphere and one of two large transformer manufacturers within sub-Saharan Africa.

The Distribution Transformers factory in Cape Town has been manufacturing distribution transformers and miniature substations for more than 60 years.

SMALL, MEDIUM AND LARGE POWER TRANSFORMERS ALL OVER THE WORLD



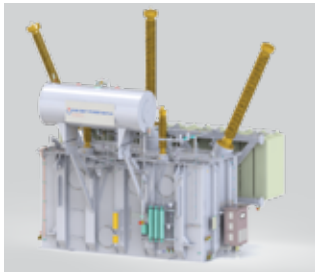
OVERVIEW

The need for large shunt reactors appeared when long power transmission lines for system voltages 220kV and higher were designed and put into service.

Shunt reactors may be connected to the power system at junctures where several lines meet or onto tertiary windings of power transformers.

The shunt reactor is a cost effective piece of equipment which compensates the capacitive charging of high voltage AC lines and cables.

Shunt reactors consist of the same components as power transformers namely windings; core; tank; bushings and insulating oil and may be manufactured in existing power transformer factories. When comparing a power transformer and a shunt reactor, the main difference is the reactor core limbs which have non-magnetic gaps inserted between packets of core steel.



APPLICATIONS

Apart from resistance real electrical circuits have a inductive and/or capacitive component, which causes a phase shift between voltage and current and reactive power (unit: VAr) will flow in the circuit.

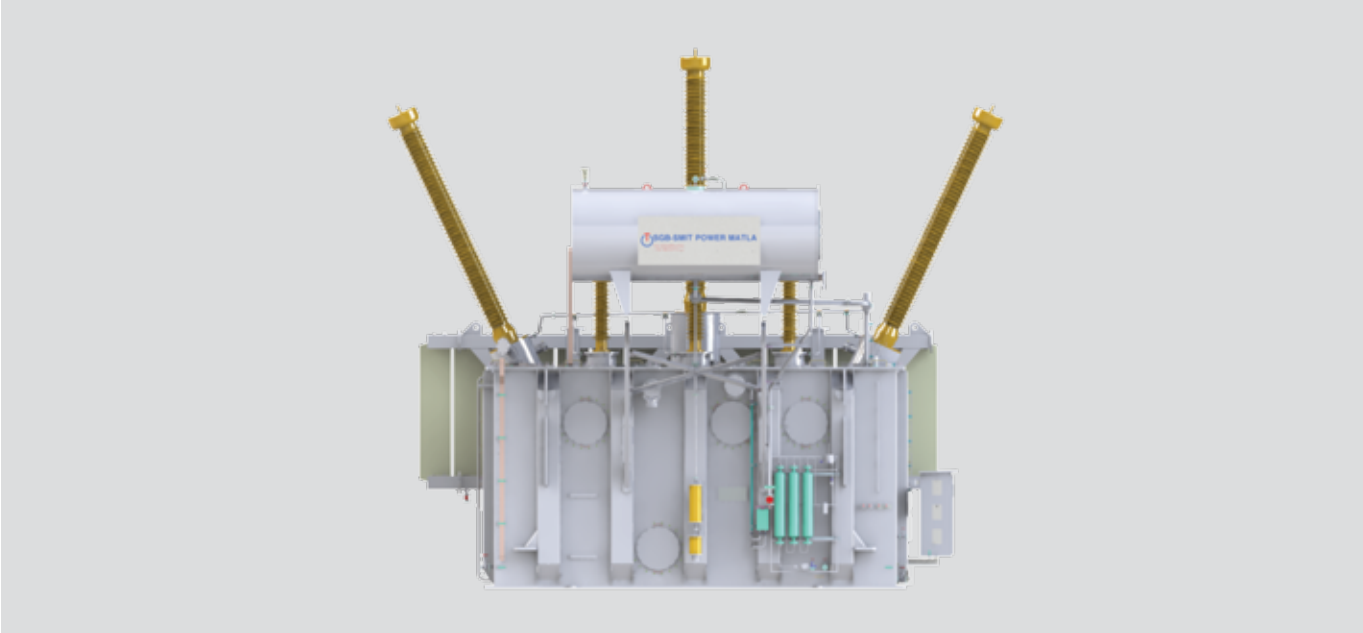
In the case of long overhead lines, the consequence of lagging currents is well known (low power factor), as well as the way to increase power factor (installation capacitor banks).

This situation is also harmful for power transformers and for generator step-up transformers.

Power transformers may also be subjected to ferroresonance, an over-voltage phenomenon that can damage the transformers and/or the surge arresters .In weak networks, functioning as an island and not integrated in a large and complex electrical network, generators are requested to supply the excessive capacitive power, a situation that will cause overheating and malfunctioning of generators, which will decrease the useful life of the equipment.

That excessive reactive power must be compensated, using shunt reactors, equipments that shall be in accordance with IEC Standard 60076-7, Applications are therefore for:

- Transmission voltage and reactive power control
- Voltage stabiliser



MAIN DIFFERENCES BETWEEN REACTORS AND TRANSFORMERS

- Shunt reactors have only single winding whilst power transformers have three windings.
- Shunt reactors provide lagging VArs (or they may consume and absorb reactive power) to increase the system efficiency whilst power transformers are meant to be operated to transform voltage (i.e. step up or step down)
- In shunt reactors, the primary AT (Ampere Turns) are equal to secondary AT due to the absence of other windings whilst in the case of power transformers the primary AT is the sum of exciting AT and Secondary AT.
- Shunt reactors may be designed without air or iron core to prevent the hysteresis loss as there are large amount of magnetizing current as compared to power transformers.
- Shunt reactors are rated in MVAr whilst power transformers are rated in kVA and MVA..
- Shunt reactors are used in high voltage systems and cable networks to improve the system efficiency whilst power transformers are used to transfer the level of voltage..

TYPES OF SHUNT REACTORS

Common shunt reactors have a fixed rating (i.e. MVAr) and they may be permanently connected to the network, or switched in and out, depending on the load and of the capacitance of the underground cables in service. This functioning and the switching in and out are similar to what is done with capacitor banks.

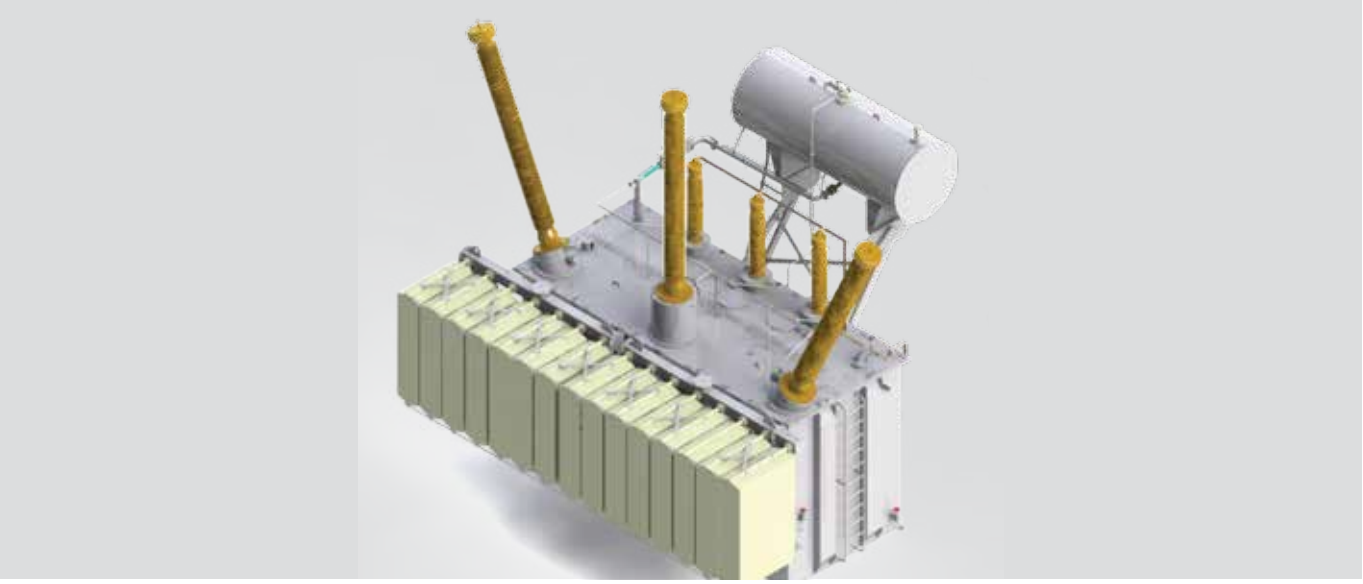
The more recent technology calls, depending on the characteristics of the network and the variability of the load, for the use of variable shunt reactors (VSR), which rating can be changed by steps. Common shunt reactors are mainly used in medium voltage networks (up to 36 kV).

VSR are mainly used in extra high and high voltage networks (rated voltage of the network ≥ 60 kV).

Maximum rated voltage of shunt reactors is nowadays 800 kV and rated power goes up to 300 MVAr.

Shunt reactors are designed similarily as per oil-immersed power transformers.

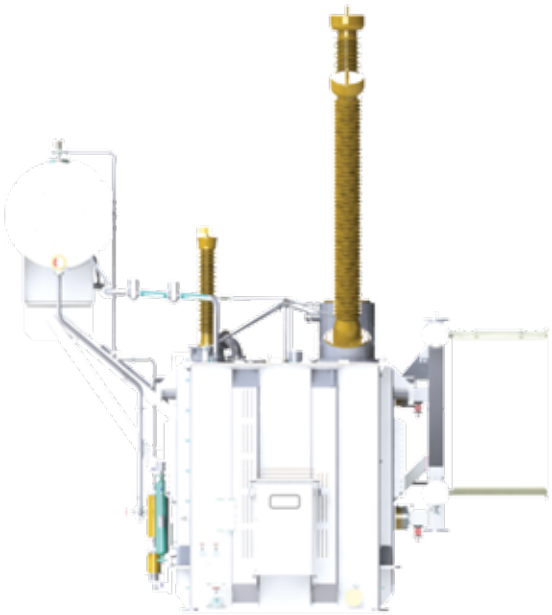
SHUNT REACTORS DESIGNS



DESIGN CONCEPTS

SGB-SMIT POWER MATLA's reactors for larger sizes and voltages are based on a gapped core type concept.

This concept focuses on low environmental impact in terms of load losses, sound and vibrations.



EXTERNAL DESIGN AND COOLING ARRANGEMENTS

Reactor tanks are built as normal transformer tanks. Special care is taken to avoid resonance with twice the power frequency.

Reactors are generally designed for natural cooling with the radiators mounted directly on the tank or free standing with bellow joints on the headers.

The high voltage bushings are normally located on the cover.

The official standards referred to in specifications are IEEE C57.21 (1990) and International Electrotechnical Commission (IEC) 60076-6.

EXAMPLES OF DESIGNS

MVAr	100	7
Voltage kV	400	132
Vector Group	Yn	Yn
Tappings	N/A	N/A
Termination	Rip/Open Air	Open Air Bushings
Cooling	ONAN	ONAN
Length	10391	3814
Width	7958	3621
Height	8809	4080
Mass	168 675	23 900
Standards	IEC 60076	IEC 60076
Fitting (Mechanical)	Oil Level Indicator, Gas Operated Relay, Leak Detector, Breather, Pressure Relief Valves PRV's), Isolating Valves, Radiator Valve, Sudden Flow Valve, Rapid Press Relay	Oil Level Indicator, Gas Operated Relay, Breather, Pressure Relief Valves (PRV's), Radiator Valve, Isolating Valve

SHUNT REACTORS REFERENCE LIST

YEAR	MVA	RATIO kV/kV	QTY	BIL (kV)	CUSTOMER	SUBSTATION	TYPE
1988 - 1995	100	400	18	1425	ESKOM	VARIOUS	3-PHASE
1996 - 1997	100	400	3	1425	ESKOM	VARIOUS	3-PHASE
1997 - 1998	100	400	7	1425	NAMPOWER	KOKERBOOM AND AUAS	3-PHASE
1998	100	400	2	1425	MOTRACO	MAPUTO	3-PHASE
1998	100	400	1	1425	ESKOM	MATLA STORES	3-PHASE
2002	100	400	2	1425	NAMPOWER	VARIOUS	3-PHASE
1995 - 2002	7	132	5	550	ABB NAMIBIA	WINDHOEK	3-PHASE
2004	100	400	1	1425	ESKOM	MATIMBA	3-PHASE
2007	100	400	1	1425	ESKOM TRANSMISSION	PERSEUS	3-PHASE
2009	100	400	1	1425	ESKOM CED	MTHATA	3-PHASE
2010	100	400	1	1425	ESKOM	VUYANI	3-PHASE
2012	100	400	1	1425	ESKOM	MOOKODI	3-PHASE
2013	30	132	1	550	ESKOM TRANSMISSION	NEPTUNE	3-PHASE
2013	30	22	1	150	ESKOM TRANSMISSION	AGGENEIS	3-PHASE
2013	40	22	1	150	ESKOM TRANSMISSION	FERRUM	3-PHASE
2015	100	400	1	1425	ESKOM TRANSMISSION	FERRUM	3-PHASE
2015	100	400	1	1425	ESKOM TRANSMISSION	STERREKUS	3-PHASE

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Subject to technical changes.

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