Product information

Drum motors

TM 620A75

Van der Graaf

Power Transmission Equipment

www.vandergraafpte.nl

The TM 620's playground

TM 620A75

A wide range of applications

Van der Graaf has achieved a prominent position on both the domestic and international market with its “GV” drum motors. The “GV”drum motor has found success in a wide range of applications including the following: automotive, X-ray, construction, postal, courier, mining, aggregate, airline baggage, package flow, tyre manufacturing, fish processing, poultry processing, meat processing, agriculture, fruit and vegetable, farming, forestry, baking, dairy and many more.

What is a drum motor?

The Van der Graaf drum motor is a one component conveyor drive which houses all components internally, eliminating the need for external components like motor, gearbox, sprockets, chain, chain guard and pillow block bearings. This reduces operating and maintenance costs, improves safety conditions, and because it is completely sealed our drum motors can operate in extreme environmental conditions.

The rugged design of the Van der Graaf drum motor provides the end user with a quieter environment, space savings, efficiency and reliability with virtually no maintenance.

Solid, maintenance free design

The electric motor, gears and bearings are placed inside the drum ensuring a compact construction. High performance sealings are used to prevent oil leakage and the ingress of water and dust. Different sealing types have been developed for different situations e.g ip68 underwater sealing. With a minimum ip rating of ip66, water and dust have no chance of entering the drum motor. The oil in the drum motor is used not only to lubricate the gears but also to keep the electric motor cool.
The shell has a barrel crowned finish to aid belt tracking.

Long life span

All gears are made of high alloyed hardened steel. Low noise level and longuevity are ensured by machining the gear teeth to fine tolerances and finishing by grinding or honing.
Ball and needle bearings are well-sized.
The power is connected directly to the stator (standard insulation class F). There is no need for slip rings or brushes.

Cast iron endflanges

Many manufacturers of drum motors use aluminium parts for gear housings, endflanges and shells. They state the main reason for using aluminium is to save weight in comparison with steel or cast iron. The reason however is due to cost as the softer aluminium is easier to machine. Van der Graaf exclusively uses cast iron for their endflanges, stator housing, motor housing, gear housing and terminal box. Steel is used for the shell. Compare the weights. Can you really compare the strength of aluminium with steel or cast iron? Does it protect sufficiently against possible external ‘impact’ forces or high belt tension on a conveyor?

Removeable endflanges

Almost all drum motors, especially in the Ø 80 - 320 mm range, are designed with glued or pressed endflanges. This makes the motor cheaper to produce, but makes it hard to service or repair. Removing a glued endflange is only possible with special tools or after applying heat. If the drum motor is lagged, the lagging may get damaged when heating. This all equates to lower initial costs, but higher costs for maintenance. Not with Van der Graaf drum motors. On smaller diameters one, and on larger diameters both endflanges are fitted with bolts. Ask your maintenance engineer what he prefers.

Grounded or honed gear teeth

The quality of the external and internal gears determines how much noise is produced by a drum motor. Milling or hardmilling is not sufficient according to Van der Graaf. Grounding and honing of the gear teeth offer the highest quality. At Van der Graaf both treatments are standard procedure. You can actually predict the life span of a gearbox by the amount of noise produced. Little noise means little friction, thus less wear and increased longuevity.

Selection table

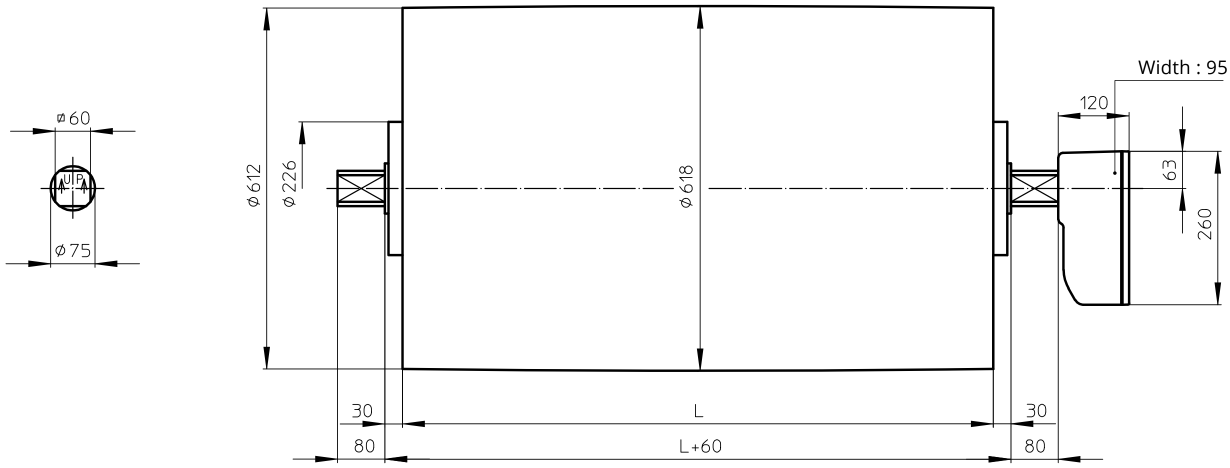
TYPE TM 620A75	Power kW	Beltspeed m/s at 50 Hz Beltpull N				Min. L mm Design A	Full load curr. 400 V - 50 Hz I = ... A	Weight kg L=850
440 ZV	**30,0**	**3,90** 7310	**3,10** 9190	**2,50** 11400		950	52,0	820 (L=950)
430 ZV	**22,0**	**3,90** 5360	**3,10** 6740	**2,50** 8360	**2,00** 10450	850	37,0	700
425 ZV	**18,5**	**3,90** 4505	**3,10** 5670	**2,50** 7030	**2,00** 8790	850	32,0	690
620 ZV	**15,0**	**2,60** 5480	**2,10** 6785	**1,60** 8905	**1,25** 11400	850	31,5	700
815 ZV	**11,0**	**2,00** 5225	**1,50** 6965	**1,25** 8360	**1,00** 10450	850	26,0	700

Available standard facewidth's: 850 - 900 - 950 - 1000 - 1050 - 1100 - 1150 - 1400 - 1600 mm
When an electro-mechanical brake is fitted, the minimum facewidth is increased by 150 mm
The total weight of a drum motor grows approx. 38,7 kg. per 100 mm
Available torque: (Beltpull N x drum diameter m) / 2 Nm

Dimensions

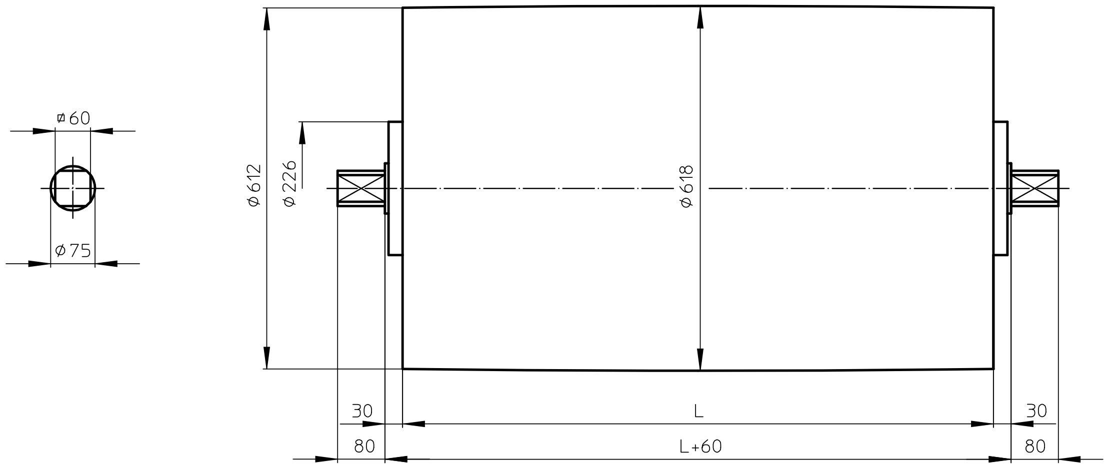
TM 620A75

TM 620A75, mildsteel drum motor with cast iron junction box



KT 620A75

KT 620A75, mildsteel tail drum



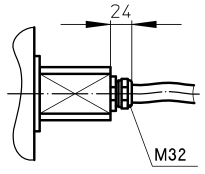
Standard design of a TM 620A75 is with a cast iron terminal box. For stainless steel design, this can be either a cast iron PU coated or stainless steel terminal box.

On request a drum motor can be fitted with a cable. In this case it is important to know the available voltage (preferably 1 voltage), the length of the cable, wether the cable is shielded or not and the type of cable exit.

The available cable exit is shown below.

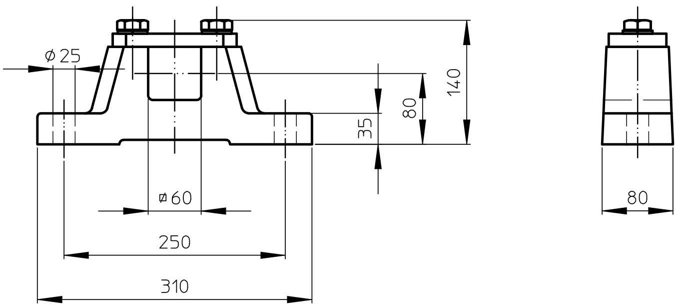
Option 1

Straight cable exit with cable gland



AB 75

AB 75, cast iron or stainless steel bracket Weight: 22 kg per pair



Scope

This is a comparative analysis concerning the energy consumption of a conventional conveyor with an electric motor, a gear reducer and a chain drive, and a conveyor driven by a Van der Graaf drum motor.

Hypothesis

There will be considered that both conveyors, the conventional conveyor and the conveyor driven by Van der Graaf drum motor:
a. have the same rated output power
b. operate in the same environmental conditions (temperature, pressure, humidity, altitude)
c. supplied power have the same parameters (phase number, line voltage, frequency)
d. loaded at the same constant output power, equal by the rated output power, for the whole period of the considered operation time.

Calculation

a. The conventional conveyor (index C from conventional) operates with a Baldor motor VM3615T, with rated output power 5 hp (or 3730 W, rated speed 1750 rpm, rated voltage 3 x 460 V, rated frequency 60 Hz), a coupling, a right angle gear reducer with a gear ratio 20, and a chain drive with ratio 1.5. The electric motor has the rated efficiency 85,5%, the coupling has the efficiency 99%, the gear reducer is a worm gear reducer with efficiency of 87% and the chain drive has the efficiency 75%.
(See Diagram A)

The total efficiency of the conventional conveyor:

η_C = 0,855 x 0,99 x 0,87 x 0,75 = 0,552, or 55,2%

The input power (index 1 for input and 2 for output) of the conventional conveyor is:

$P_{1C} = P_{2C} / \eta_C$ = 3730 / 0,552 = 6757,25 W ≈ 6,757 kW

b. The conveyor (index M from drum motor) driven by a Van der Graaf drum motor is considered. It has the same rated output power as the conventional conveyor, 5 hp or 3730 W and contains an electric motor with rated efficiency 87% and a parallel-shaft gear reducer with efficiency 96%.
(See Diagram B)

The total efficiency of the conveyor driven by Van der Graaf drum motor is:

η_M = 0,87 x 0,96 = 0,835, or 83,5%

The input power (index 1 for input and 2 for output) of the conveyor driven by Van der Graaf drum motor is:

$P_{1M} = P_{2M} / \eta_M$ = 3730 / 0,835 = 4467 W = 4,467 kW

c. An operation time of both conveyors is determined taking into consideration that both conveyors work 8 hours shift, 2 shifts per day, 5 days per week, and 52 weeks per year,

t = 8 hours/shift x 2 shift/day x 5 days/week x 52 weeks/year = 4160 hours/year

d. The electric energy consumed by the conventional conveyor, in the considered operation time, is determined by the product of the input active power and the operation time:

$E_C = P_{1C}$ x t = 6,757 kW x 4160 hours/year = 28109,12 kWh/year ≈ 28109 kWh/year

e. The electric energy consumed by the conveyor driven by Van der Graaf drum motor, in the considered operation time, is similarly determined:

$E_M = P_{1M}$ x t = 4,467 kW x 4160 hours/year = 18583 kWh/year

f. An average price of the electric energy in the Netherlands is considered:
p = 0,08 €/kWh

g. The cost of the electric energy per year of the conventional conveyor will be calculated as the product between the consumed electric energy in the considered operation time and the specific price of the electric energy:

$C_C = E_C$ x p = 28109 kWh/year x 0,08 €/kWh = 2248,72 €/year ≈ 2249 €/year

h. The cost of the electric energy per year of the conveyor driven by Van der Graaf drum motor will be similarly calculated:

$C_M = E_M$ x p = 18583 kWh/year x 0,08 €/kWh = 1486,64 €/year ≈ 1487 €/year

i. The energy saving per year of the higher efficient conveyor, respectively of the conveyor driven by Van der Graaf drum motor, is determined as a difference between the consumed energy of the conventional conveyor and the consumed energy of the conveyor driven by Van der Graaf drum motor, in the considered operation time of one year period.

$S_E = E_C - E_M$ = 28109 kWh/year - 18583 kWh/year = 9562 kWh/year

j. The cost saving per year of the higher efficient conveyor, respectively of the conveyor with Van der Graaf drum motor, is determined as a difference between the cost of the consumed energy of the conventional conveyor and the cost of the consumed energy of the conveyor drive by Van der Graaf drum motor, in the considered operation time of one year period.

$S_C = C_C - C_M$ = 2249 €/year - 1487 €/year = 762 €/year

Energy cost savings with conveyor driven by Van der Graaf drum motor is 762 €/year

NOTE: If the cost of energy of the conventional conveyor is considered 100%, than the cost of energy of the conveyor driven by Van der Graaf drum motor is 66% and the cost savings with the Van der Graaf drum motor is 34%.

Diagram A:

Conveyor driven by a conventional conveyor drive

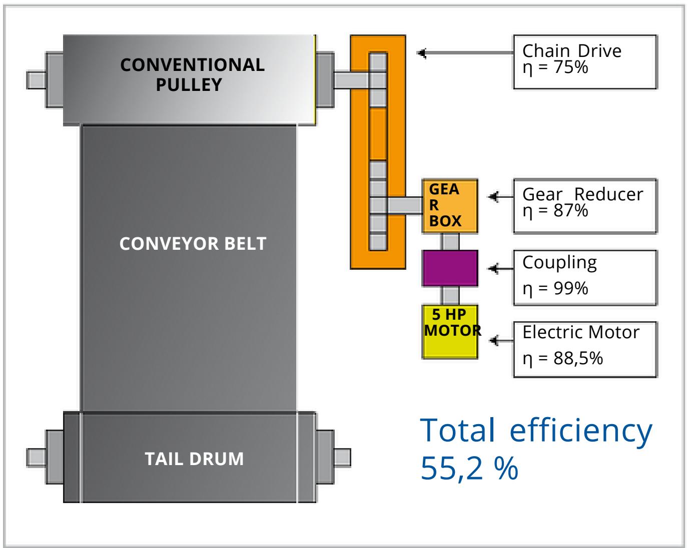
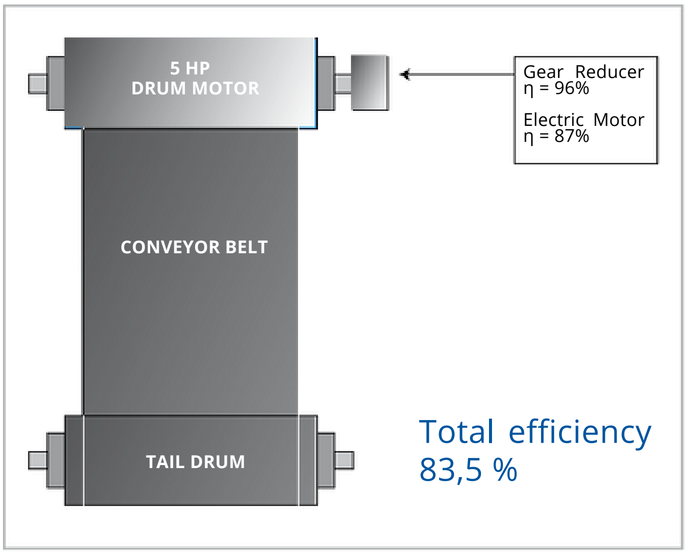


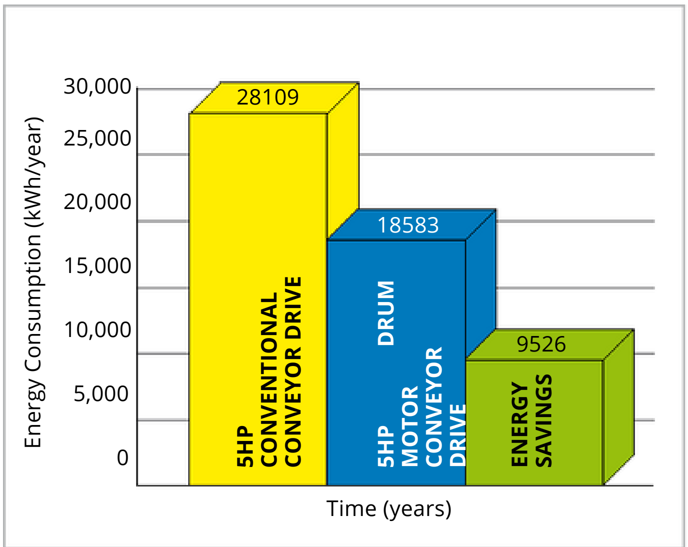
Diagram B:

Conveyor driven by a Van der Graaf drum motor



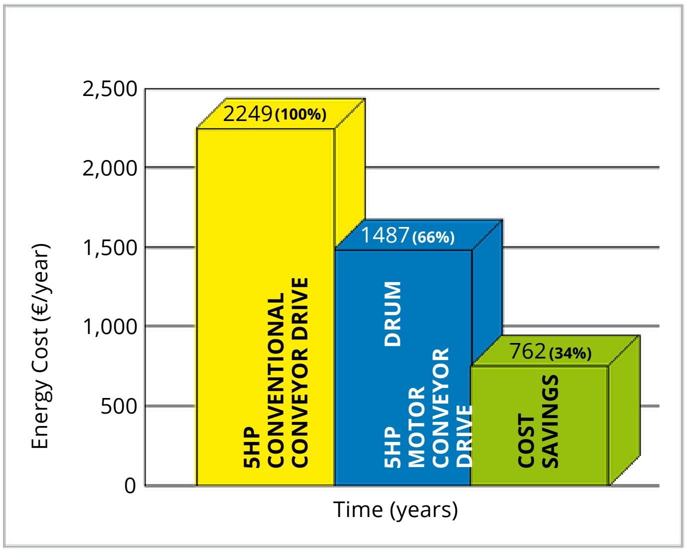
Graph 1:

Energy consumption comparison



Graph 2:

Energy cost comparison (@ 0.08 €/kWh)



Material

The external parts of the drum motor are made from mild steel and cast iron. Depending on the application it is also possible to manufacture in stainless steel (complete or part). You can choose between RVS 304 (general food industry) and RVS 316 (salt water applications).

Backstop - Brake

If an inclined belt conveyor is stopped fully loaded, it could run backwards.

To prevent this we can install a backstop. One of the bearings in the drum motor is replaced by a one way bearing. The way this bearing is installed determines the direction of rotation of the drum. TBRH indicates a cw rotation and TBLH ccw.

In situations where a drum motor needs to be able to drive in both directions it is not possible to use a backstop. In this case we use a brake. When an declined belt or a horizontal belt needs to be stopped quickly to pick or place items a brake is the best solution.

Inclined position

Sometimes a drum motor needs to be installed on an inclined or even vertical position. This is possible, but we need to make adjustments to the oil level in the drum as the oil will flow to the lower side of the drum motor causing the top bearing to run without lubrication. To prevent problems we will need to know the installation angle so we can fill the drum with extra oil and fit a double sealed bearing on the high side.

Thermal protection

A Van der Graaf drum motor can be fitted with thermal protection. This consists of either a thermistor (PTC) or bi-metal (klixon). We install these on each phase of the electric motor.

Encoder - Sensor bearing

In certain applications it is required to measure the speed or position of a conveyor belt. For this type of application we can install an encoder or sensor bearing to accurately measure rotational speed of the drum motor.

The accuracy needed will determine the type of encoder or sensor used.

Lagging

The power produced by the drum motor has to be transferred to the belt and lagging is used to give more friction between the drum motor and the conveyor belt. Van der Graaf can fit your drum motor with different kinds of lagging.

There is a difference between cold and hot vulcanised lagging. Cold vulcanised means the lagging is glued to the drum motor usually in sheet form and the join ‘welded’ together. Hot vulcanising is a process where the shell is wrapped around with thin layers of rubber. The shell with the rubber is then baked in an autoclave fusing the layers together creating a seamless finish.

It is possible to cut grooves (e.g chevron or diamond) in the lagging.

Sprockets

Do you wish to use a drum motor to drive modular belts? Van der Graaf can help you! Fitting sprockets suitable for various types of modular belts is a simple solution. The drum motor is manufactured with a cylindrical shell and machined with a patented ‘keying’ system. The sprockets are simply ‘slid’ on and locked securely into position.

Sealings for mild steel drum motors

RB sealing - IP 66

This is Van der Graaf's standard sealing. This type of sealing will work in most conditions.

RBS sealing - IP 66

This sealing is specifically designed for those applications where high water pressure is used for cleaning.

HD sealing - IP 66

This sealing is designed for abrasive applications, like sand, gravel and soil.

Sealings for stainless steel drum motors

CR sealing - IP 66

This is our standard sealing for stainless steel drum motors, a very effective, multi labyrinth sealing.

UW sealing - IP 68

This sealing is suitable for under water applications. The maximum depth is approx 2,5 m.

Options

Specification	Standard	Optional
Construction		
Shafts and bolts	Mild	Stainless steel
Endflanges	steel	Stainless steel
Shell	Cast iron	Stainless steel
Junction box	Mild steel	Cast iron PU coated or stainless steel
Cable		Shielded or non-shielded
Sealing mild steel	Cast iron RB	RBS, HD
Sealing stainless steel	CR	UW
Shell		
Crowned	•	
Cylindrical		•
Balanced		•
Lagging, cold vulcanised		•
Lagging, hot vulcanised		•
Lagging, FDA approved		•
Fitted with grooves, patterns		•
Sprockets		•
Electro motor		
Three-phase asynchronous	•	
Power supply	400/690 V - 50 Hz	Other voltages and frequencies on request
Twin drive (double power)		•
Insulation class	F	H
Thermal protection		Bi-metal or thermistor
Run by frequency inverter	•	
Other options		
Food grade oil		•
Backstop, mechanical		•
Brake, electro mechanical		•
Clutch brake, electro mechanical		•
Inclined or vertical position		•
Other facewidth’s		•
Different shaft designs		•
Encoder or sensor bearing in drum motor		•
Encoder or sensor bearing in tail drum		•
Certificates		
CE	•	
UL		•
CSA		•
ATEX zone 22, dust		•

Our products, an overview

Drum motor type	TM	TM	TM 127.25	TM 138.25	TM 160.25	TM 160.30	TM 215.30	TM 215.40	TM 215B50
Drum diameter (mm)	100B25	113B25	127	138	160	160	215	215	215
Shaft diameter (mm)	100	113	25	25	25	30	30	40	50
Power (kW)	25	25	0.10-1.1	0.10-1.1	0.10-0.75	0.10-2.2	0.10-2.2	0.37-5.5	1.5-4.0
Speed (m/s)	0.05-0.37	0.04-0.55	0.008-2.60	0.009-2.80	0.13-3.30	0.06-4.00	0.08-5.30	0.12-4.70	0.18-0.31
	0.007-3.60	0.008-4.40							

Drum motor type	TM 273.40	TM 315.40	TM 315.50	TM 400.50	TM 400.60	TM 500.60	TM 500A75	TM 620A75
Drum diameter (mm)	273	315	315	400	400	500	500	620
Shaft diameter (mm)	40	40	50	50	60	60	75	75
Power (kW)	0.37-5.5	0.37-5.5	1.1-11	1.1-11	1.5-22	1.5-22	11-30	11-30
Speed (m/s)	0.16-4.95	0.18-5.20	0.16-4.40	0.20-4.80	0.20-4.60	0.25-4.70	0.80-3.20	1.00-3.90

Design benefits

- Robust, industrial design
- Fully enclosed
- Oil filled
- Well-sized gears and bearings

Installation advantages

- Easy to install
- Compact and reliable
- Easy to clean
- Virtually maintenance free
- Low Life Cycle Costs

Notes

Notes

Notes

A family company

Van der Graaf, known internationally for its reliability and quality, is a family organization with its head office in Vollenhove, Netherlands.

Top quality and professional service have allowed Van der Graaf to maintain their world leading position in the power transmission industry. With product applications worldwide, Van der Graaf still maintains its down to earth principle:

Not just a superior product, but also superior service!

Van der Graaf
Power Transmission Equipment

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