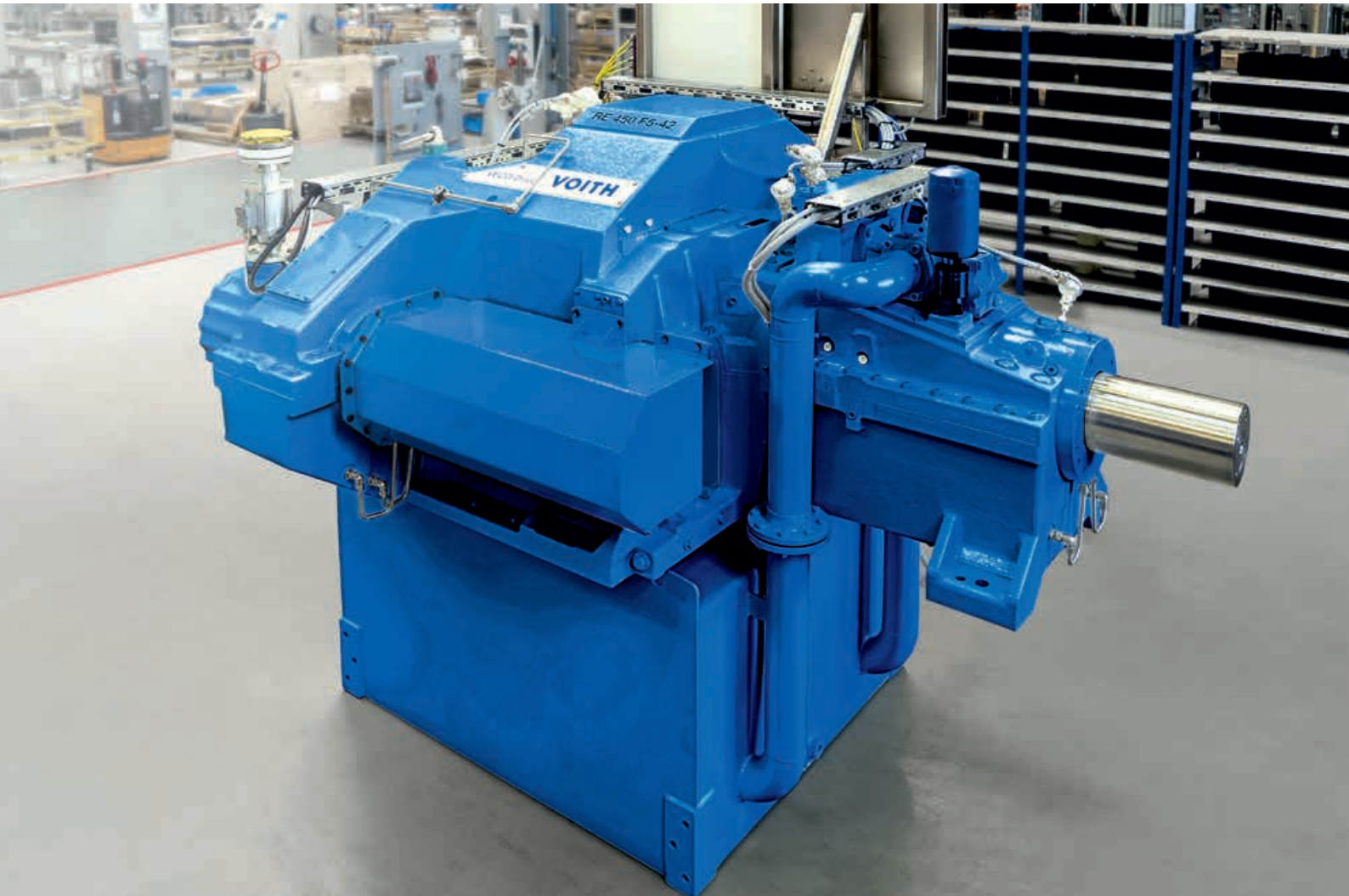


# Highest efficiency achieved in variable speed drives VECO-Drive



# Benefits that drive your business



Saving energy

97%  
↑ peak efficiency



Easy motor start



Less maintenance

Smaller footprint



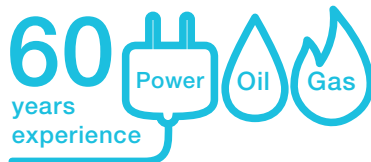
Output power

4–15  
MW





Investment  
cost savings



Reliability backed by over  
**34 000**  
successful variable speed  
installations

# Benefits explained ...

## Energy cost savings result from outstanding efficiency, over 97 % at peak

The VECO-Drive is the ideal solution for speed regulation of high speed rotating equipment, achieving a record efficiency of more than 97 %. This is attained by operating an electrical superimposing planetary gear in combination with frequency controlled servo motors that transmit a small amount of rated power. This saves energy and reduces CO<sub>2</sub> emissions. Operators are assured of the lowest possible operating cost through the increased efficiency while running rotating equipment in a power range of between 4 and 15 MW.

## Small footprint – more than 30 % reduction in footprint

The VECO-Drive requires 50 % less space and has 30 % less overall footprint, when compared to a conventional variable frequency drive. Only a small portion of rated power is needed as control power which results in less space being occupied by VFD cabinets. Where ever space and weight are important, e.g. offshore oil & gas production, the VECO-Drive is the perfect solution.

## Soft motor start & slow roll function

In order to protect the electric grid from high currents, servo motors can be used to start-up the main motor. For this purpose, a clutch is installed that locks the superimposing function temporarily. The entire train is then smoothly accelerated and the main motor synchronized, before it is connected to the grid. Additionally, the servo motors can be used in slow roll, in order to avoid bending during the cooling down phase after the operation.

## Less maintenance

A low voltage VFD is less complex, easier to install and also maintain. It is designed only for power control and therefore less spare parts need to be purchased and stored. Additionally, the amount of service work is reduced.

## Investment cost saving

Control power, is not lost, rather it is superimposed to the input of the main motor, this facilitates a reduction in the motor size by up to 20 % thus reducing capital expenditure.

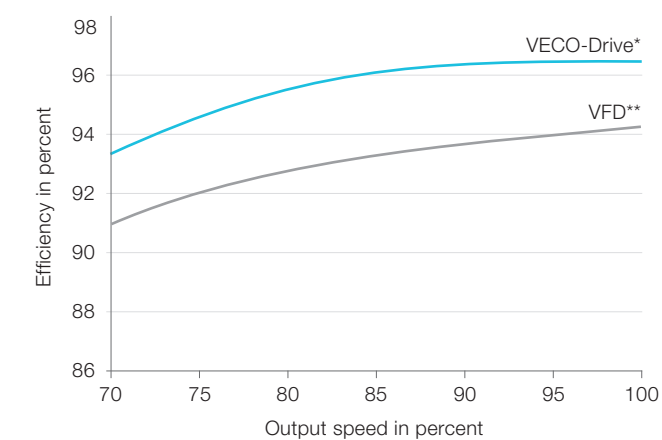
**“Raise efficiency to over 97 percent – control your compressors and pumps more efficiently than ever.”**

Dr. Martin Tilscher, Product Manager  
Geared Variable Speed Drives

# The ultimate in efficiency and control

## Overall component efficiency – parabolic load torque

Comparisons of VECO-Drive\* and full scale in-line VFD\*\*



\* including transformer, low voltage VFD, lube oil pump and forced cooling

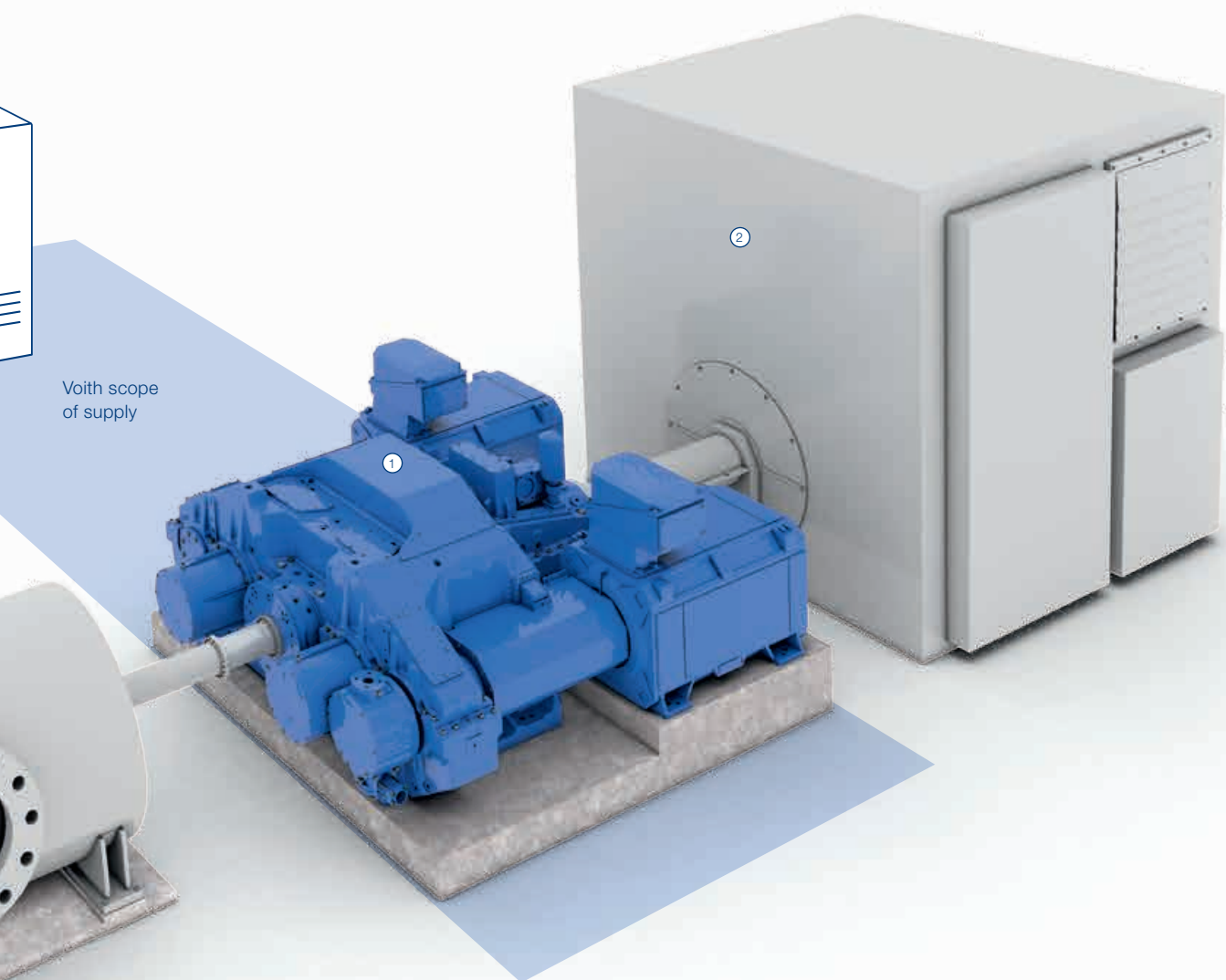
\*\* including transformer, step-up gear and lube oil pump

## Technical data

<b>Input speed</b>	1 500 rpm / 1 800 rpm
<b>Rated output power</b>	4 MW – 15 MW / 5 300 HP – 20 100 HP up to 20 MW / 26 800 HP on demand
<b>Rated output speed</b>	5 000 rpm – 15 000 rpm
<b>Component efficiency</b>	more than 97 % at peak
<b>Speed regulating range</b>	70 % – 105 % (compressors) 50 % – 100 % (pumps)
<b>Machine ambient temperature</b>	-20 °C – 40 °C (-4 °F – 104 °F) up to 55 °C for special applications
<b>Cabinet ambient temperature</b>	0 °C – 40 °C (32 ° – 104 °F)

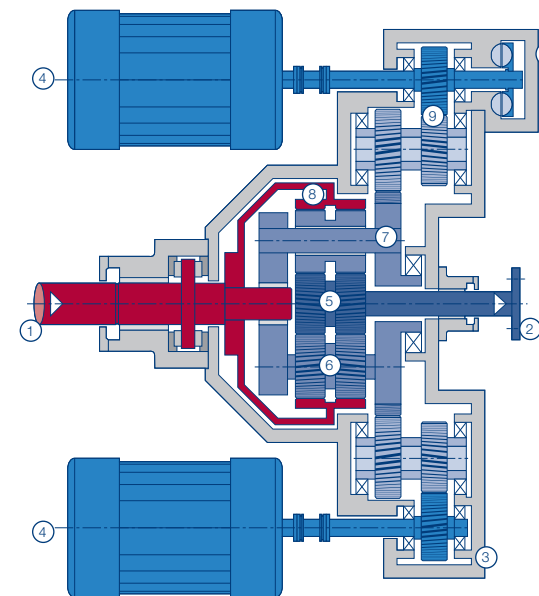
## Design of variable speed drive train





- 1 VECO-Drive
- 2 Constant speed motor
- 3 Compressor/pump
- 4 Transformer
- 5 Low voltage frequency converter

### Sectional drawing Type RE



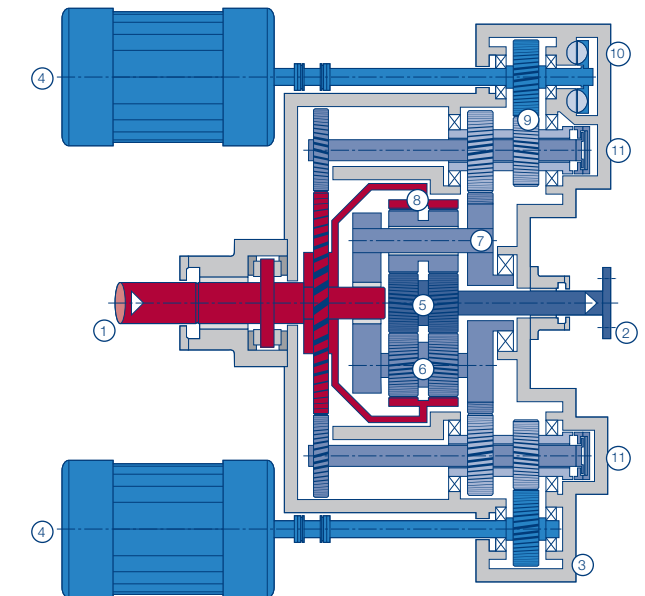
- |                |                                |
|----------------|--------------------------------|
| 1 Input shaft  | 6 Planets                      |
| 2 Output shaft | 7 Planet carrier               |
| 3 Housing      | 8 Ring gear                    |
| 4 Servo motors | 9 Helical gears                |
| 5 Sun gear     | 10 Overspeed protection device |

### Optional enhancements include

- + explosion-protected design
- + advanced functions such as an integrated PLC-based controller, user interfaces and condition monitoring
- + mechanically driven oil pump, which provides lube oil as long as the train is turning, negates the need to install an overhead tank or a battery-buffered electric pump

### Sectional drawing Type REC

For soft motor start and slow roll function



- |                |                                |
|----------------|--------------------------------|
| 1 Input shaft  | 7 Planet carrier               |
| 2 Output shaft | 8 Ring gear                    |
| 3 Housing      | 9 Helical gears                |
| 4 Servo motors | 10 Overspeed protection device |
| 5 Sun gear     | 11 Clutch                      |
| 6 Planets      |                                |

### Operating principle explained

The VECO-Drive is a respected combination of reliable and proven variable speed planetary gear and highly standardized frequency controlled servo motors. The servo motors are used to add power to the train thereby increasing the speed or alternatively can be used to recuperate energy in order to decrease the speed. A main motor drives the ring gear at fixed speed and the servo motors are coupled to the planet carrier and the sun gear hereby providing variable output speed.

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