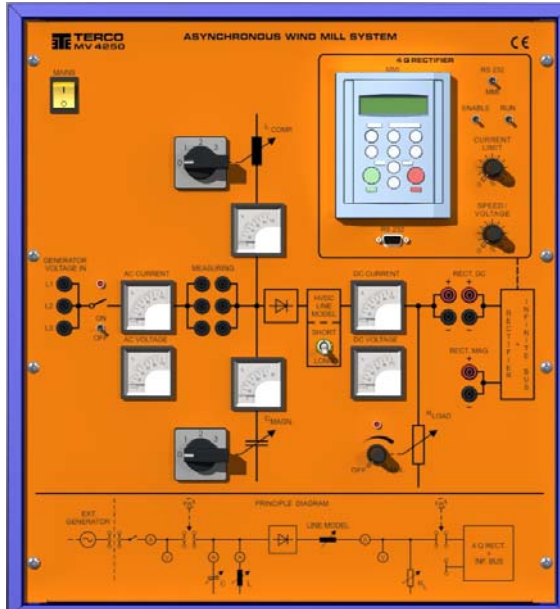


MV4250 ASYNCHRONOUS WIND MILL SYSTEM INCLUDING HVDC LIGHT LINE



The total system is integrated in one single unit:

- Controls for asynchronous machine
- Necessary instruments
- Magnetizing capacitors
- Compensating inductances
- Variable resistive load
- HVDC-light cable (two distances)
- Advanced 4Q 3-ph line inverter which is manually, MMI- or PC-operated.
- The 4Q 3-ph line inverter can also be used together with a DC-machine 1.1-2.0kW for advanced studies of DC-drives

Background

Depending on energy prices, negative influence on the environment, running on the edge of available power, transmission costs and the risk of local black-outs the need for alternative energy sources is obvious. Wind power has been existing in a smaller scale for decades but are now used as an important power producer in parallel with the classic energy sources. The former drawbacks like expensive turbines, generators, gear-boxes and conventional transmission lines together with disturbances on the environment are now overcome to a great extent.

It is now possible to use a cheap turbine with firm blades designed for floating speed with an operating range from low to higher speeds. The turbine is connected mechanically to a conventional asynchronous machine (self exciting induction motor), which is the cheapest and most sturdy machine available in the market. For bigger units synchronous generators equipped with permanent magnets are standard. In this case we will study a type of wind mill used up to some hundred kW. These windmills can be put out in the sea along the coastline and the power is transferred to the grid network by HVDC-light cables on a floating voltage level which by means of modern technology is transformed to conventional 3-ph 50 (60) Hz energy.

Description

The Wind Mill Control Unit (MV4250) is designed to be connected to an external standard type induction machine (optional) to simulate the wind turbine, which speed can be varied. By means of the MV4250 the asynchronous motor/generator will be self excited and deliver a lower or higher 3-phase voltage of different frequencies. There is a continuously controllable built-in resistive load bank to give the induction generator different working points or break-down points. By the built-in capacitor bank the excitation can be increased gradually to buffer increasing load. A group of compensating inductances will keep the voltage level within reasonable limits. A 3-phase rectifier bridge will supply the output side with a floating DC-voltage which can either be loaded by the internal resistive loads or connected to a HVDC-light line model which is feeding an advanced 3-ph 6-pulse 4Q converter. The converter is operating against the infinite bus in a floating voltage current limitation mode turning the DC-energy to 3-ph 50 (60) AC.

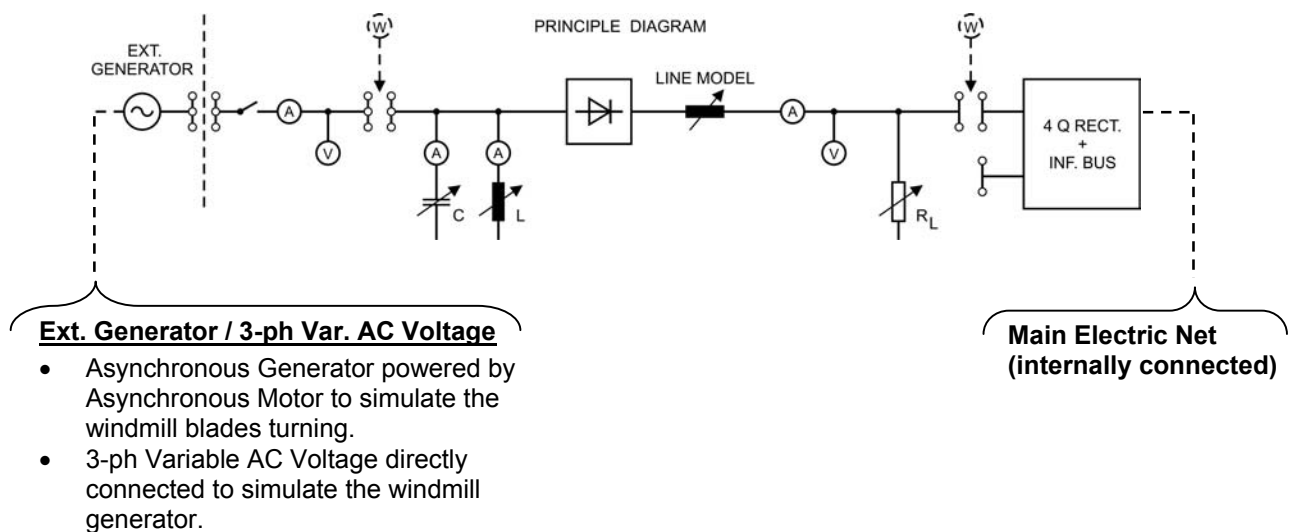
There are instruments for AC- and DC voltages and ammeters for AC-input power, inductive current and capacitive current together with a DC-ammeter on the output to give a clear view of the generator operation.

The rather complex procedure of turning floating voltage DC-energy to 3-ph 50 (60) Hz AC is studied thoroughly since most types of windmills are using this method.

Jumpers will give possibilities to connect other instruments like watt-meters (optional).

Principle diagrams are printed on the front plate (see below).

Principle Diagram





Examples of experiment setups

- Self exciting of an asynchronous motor/generator
- Working points depending on speed and capacitance
- Working characteristics depending on resistive loads
- The influence of compensating inductances
- Total efficiency depending on involved parameters
- Magnetising currents and risk for over-excitation
- Rotating currents
- Principles of floating speed and frequency
- HVDC-light cables
- Principles of DC energy transfer using a 4Q-converter operating in current limit mode at floating voltage
- Operating the main converter manually, via MMI or by PC

Technical Specifications

Minimum/maximum power by design	0,5 – 2,0 kVA input
Magnetising capacitors	by 1+3-step selector switch
Compensating inductors	by 3-step selector switch
Resistive load bank on DC-side	continuously controlled by PWM-unit
3-phase rectifier block	
V-meter for AC-input	300 V AC
V-meter for DC-output	400 V DC
A-meter for AC-input	4 A AC
A-meter for capacitive current	4 A AC
A-meter for inductive current	4 A AC
A-meter for DC-output	6 A DC
Short- and long HVDC cable model	
Suitable induction machine std (or optional)	0,75 – 1,5 kW
Advanced 4Q-converter including software	>1,5 kW
External alternative inputs from	3x230 V generator, ind. or synchr., 3x230 V power supply max 300 V DC
Power supply	3x400 V AC, 16A, 50 – 60 Hz
Dimensions	510x360x570 mm
Weight	app. 45 kgs

Terco Headoffice



Terco headoffice and factory outside Stockholm, Sweden.



<p>POWER STATION SIMULATOR (PST)</p>	<p>PROTECTION RELAYS</p>	<p>MECHATRONICS</p>
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