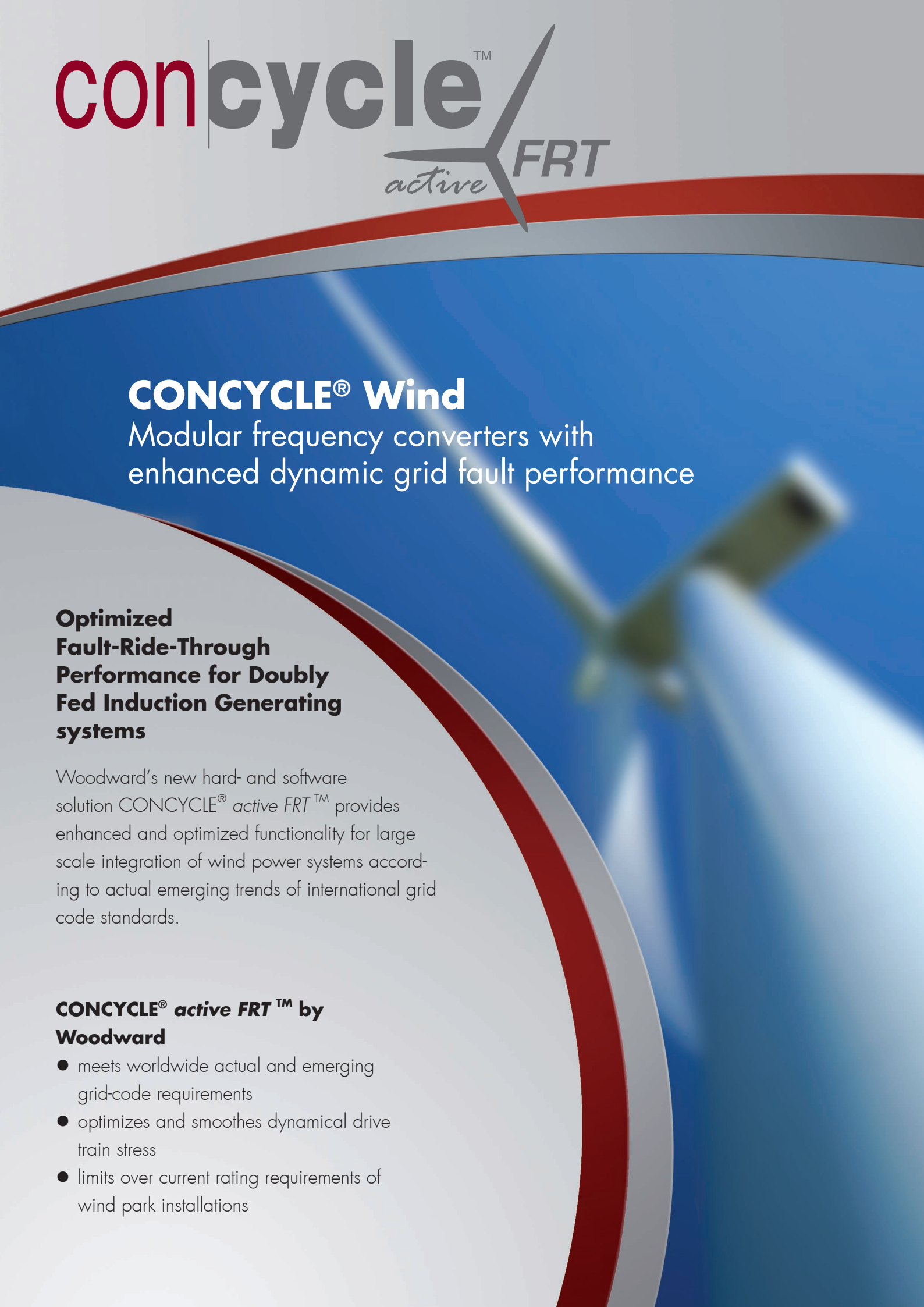
concycle™ active FRT

CONCYCLE® Wind

Modular frequency converters with enhanced dynamic grid fault performance



Optimized Fault-Ride-Through Performance for Doubly Fed Induction Generating systems

Woodward's new hard- and software solution CONCYCLE® *active FRT* ™ provides enhanced and optimized functionality for large scale integration of wind power systems according to actual emerging trends of international grid code standards.

CONCYCLE® *active FRT* ™ by Woodward

- meets worldwide actual and emerging grid-code requirements
- optimizes and smoothes dynamical drive train stress
- limits over current rating requirements of wind park installations

concycle™ active FRT

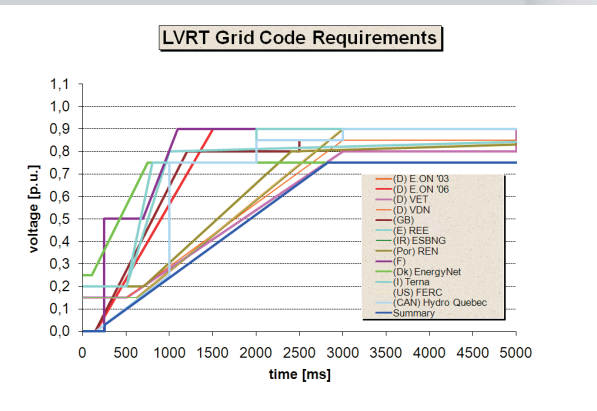
Worldwide grid code requirements

Large scale integration of wind power requires technology that supports active dynamic regulation behaviour of wind generation systems comparable to conventional power plants. This applies even more to extensive wind turbine plants connected to weak grids at remote locations. The main deliverable features to the generation equipment during grid disturbances are:

- Low voltage ride through (LVRT)
- High voltage ride through (HVRT)
- Dynamic voltage stabilization by feeding reactive current

In the worldwide market of speed variable MW-class wind turbines the converter-DFIG system is established as the leading technology due to multiple reasons. During dynamic grid disturbances this technology always has to take into account adverse effects like Crow Bar usage, additional dynamical mechanical stress to the drive train and extended over-current layout requirements to the wind park installation.

Woodward developed the optimized solution - CONCYCLE® *active FRT* ™



CONCYCLE® *active FRT* ™ - main FRT characteristics

- supports full reactive and active current during FRT for voltage and frequency stabilization (pre-setting according to on-site requirements)
- avoids any Crow Bar activity during FRT operation
- stays connected to the grid during HVRT and LVRT with zero-voltage ride through capability
- ensures continuous power & torque control during FRT operation
- provides dynamic overload capability (typ. 120% .. 140%)
- optionally reduces grid short-circuit current
- avoids additional losses in normal operation

CONCYCLE® *active FRT* ™ - active drive train care

- reduces peak torque during FRT operation
- recovers torque smoothly after voltage return with adjustable PT1 control
- compensates oscillating torques during unsymmetrical faults
- provides dynamic over-speed capability during FRT operation

CONCYCLE® *active FRT* ™ is based on active DC voltage management combined with new innovative software control algorithms. CONCYCLE® *active FRT* ™ has clear advantages compared to other converter-DFIG solutions using for example static stator switches.

CONCYCLE® *active FRT* ™ enhances the approved high dynamic performance and reliability of speed variable converter-DFIG technology with optimized full compliance to future grid code and dynamic drive train requirements.

CONCYCLE® *active FRT* ™
the trendsetting solution for the new generation of Multi-Megawatt Wind Turbines

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