1. Why VACON® Low Harmonics?

1.1 Power Quality Confidence

VACON® LHD products are engineered to maintain **THDi below 5%**, significantly reducing distortion on the supply network. This ensures stable voltage levels, reduced transformer stress, and increased reliability for sensitive equipment.

1.2 High Efficiency Through Regeneration

AFE technology allows drives to return braking energy back to the grid. This reduces heat in electrical rooms, minimizes cooling requirements, and eliminates most braking resistor systems.

1.3 Consistent Performance in Real-World Conditions

VACON® low harmonic solutions maintain low harmonics across a wide operating range, including partial-load and dynamic-load conditions. This makes them ideal for applications such as:

- HVAC supply and return systems
- High-inertia materials handling
- Pumping systems with rapid deceleration
- Test stands and process lines
- Cranes, hoists, and lifting equipment

1.4 Compliance and Safety

VACON® LHD products are designed to help meet IEEE-519 harmonic guidelines and align with modern electrical safety standards, including STO functionality on applicable models.

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2. AFE Technology Overview

VACON® low harmonic drives use an IGBT-based AFE rectifier in place of traditional diode bridges. This provides:

2.1 Bidirectional Power Flow

Energy can move both into the motor and back into the grid, enabling controlled braking without excess heat generation.

2.2 Advanced Harmonic Mitigation

The AFE actively shapes the current waveform to match a near-sinusoidal profile—significantly reducing upstream distortion and improving power factor.

2.3 DC Link Stability

Dynamic control of DC voltage provides excellent stability even during fluctuating process demands.

2.4 Adjustable Power Factor

VACON® LHD units can operate at unity PF or provide leading/lagging reactive power compensation as required by the facility.

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3. Regenerative Energy Handling

3.1 When Regeneration Occurs

- Decelerating heavy or high-inertia loads
- Overhauling or descending loads
- Rapid directional changes
- Cyclic processes with frequent speed variation

3.2 Benefits for Your Facility

- Lower operating costs due to recovered energy
- Reduced heat load inside electrical enclosures
- Smaller HVAC requirements in MCC/equipment rooms
- Eliminates or drastically reduces braking resistor systems
- Smoother, safer deceleration behavior for critical applications

3.3 Compatibility Considerations

VACON® LHD drives are compatible with most industrial power systems, but grid conditions should support returned energy. In islanded, generator-backed, or microgrid environments, regeneration may be limited based on site-specific requirements.

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4. Configuration Overview (Customer-Safe Summary)

VACON® low harmonic drives can be configured to suit a wide range of applications. Key areas include:

4.1 Grid and Input Settings

- Input voltage, frequency, and transformer grounding method
- Short-circuit capacity and grid strength
- AFE input filter compatibility (as specified by product family)

4.2 AFE Control Parameters

- Motoring and regenerative current limits
- DC link reference voltage
- Harmonic suppression functionality
- Power factor control (unity PF or adjustable)

4.3 Motor and Application Settings

- Motor nameplate data
- Autotune procedure (static or rotating, based on application)
- Ramp times, brake control, and torque limits
- Integrated PID settings when used for process control

4.4 Communication Options

VACON® LHD systems support a broad range of industrial protocols, including:
Modbus TCP/RTU, Profibus, Profinet, EtherNet/IP, CAN, DeviceNet, BACnet, and building automation protocols.

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5. Commissioning Best Practices

A strong commissioning process ensures long-term performance and reliability. The following summary reflects standard field practice for VACON® low harmonic installations.

5.1 Pre-Installation

- Confirm drive frame size, cooling requirements, and environmental ratings
- Verify correct cable sizing and grounding method
- Ensure adequate enclosure ventilation and free airflow
- Review protective device selection and coordination

5.2 Power-Up Checks

- Verify line voltage, grounding integrity, and phase rotation
- Observe normal DC link charging behavior
- Check AFE status indicators and confirm expected operating state
- Validate harmonic performance at initial loads

5.3 Functional Testing

- Run motor at low speed and verify current waveform quality
- Increase speed to full reference and review THDi performance
- Test regen behavior under deceleration or load reversal conditions
- Confirm proper interlock operation, STO (when applicable), and fault recovery
- Verify PLC or BMS communications, alarms, and run status feedback

5.4 Documentation & Handover

- Save and archive the final parameter set
- Record harmonic measurements and commissioning data
- Provide operator training on basic use, alarm reset, and operating modes
- Complete commissioning signoff and warranty start procedures

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6. Key Benefits Summary for Customers

Optimized Power Quality

- <5% THDi
- Stable voltage under dynamic loads
- Reduced transformer and feeder stress

Energy Efficiency

- Full regenerative capability
- Reduced cooling requirements
- Lower overall lifecycle cost

High Application Flexibility

- Suitable for industrial, HVAC, infrastructure, and process applications
- Wide range of communication and control options
- Scalable frame sizes across the VACON® portfolio

Long-Term Reliability

- Robust thermal design
- Proven global field performance
- Strong diagnostics and built-in protection features

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7. Conclusion

VACON® Low Harmonic solutions deliver reliable, predictable performance for facilities seeking to improve power quality, eliminate harmonics, and benefit from regenerative energy savings. Their AFE architecture provides a stable, efficient, and future-ready foundation for modern industrial and commercial operations.