

Ultra-low harmonic drives for remote pump stations

Advantages of using ULH in remote pump stations

The power quality at remote pump stations is often questionable. It can be poor, which may be due to the physical location (end of the line) or due to using paralleled single-phase transformers to create 3-phase power. These could result in low or imbalanced voltages conditions. Lightning strikes, falling branches, or vermin can result in power disturbances affecting operations. Additionally, due to changes in a pump station, the potential exists for the standby generator to be undersized. As the name implies, the ABB ultra-low harmonic (ULH) drive provides excellent harmonic reduction. It does not create additional harmonic content associated with six-pulse drives, which requires oversizing the standby generator. The ABB ULH offers additional benefits for remote pump stations, including unity power factor and voltage boost for undervoltage conditions. ULH drives are available in the water/wastewater industry in the ACQ580 and ACS880 drive families.

When utilizing ULH technology, a total harmonic current distortion (THDi) level of 3% or less at the drive input lugs meets the most stringent specification standards for IEEE-519. The current draw from a standby generator may be critical to maintaining site power loading during utility power outages. A typical six-pulse drive with internal impedance generates 35% to 40% harmonic current, requiring the standby generator to be oversized. ABB's ULH sinusoidal current waveform results in the standby generator not being overloaded and thus does not have to be oversized due to the additional harmonic currents.

The ULH drive's ability to continuously operate through external power quality issues is also beneficial for remote pump stations beyond harmonic mitigation. Common issues can include phase imbalance, undervoltage, and other power issues associated with the line power supplied to the site. The ABB ULH drive will continue to perform without incident with up to a 10% input voltage drop and maintain the motor nameplate rated voltage.

As with any installation, long motor leads can play a significant role in performance due to voltage drop. One solution to accommodate voltage drop from long motor leads is to adjust the wire size; however, poor input power quality can reduce the voltage at the drive input, thus still resulting in lower output voltage being supplied to the motor. The voltage boost feature of the ABB ULH will maintain motor nameplate rated voltage and current with up to a full 10% voltage drop on the input of the drive.

Example

The ULH drive adjusts itself automatically to maintain the desired DC bus level and to operate at the motor nameplate voltage. For example, if the line voltage is 485 VAC early in the morning and then 472 VAC at midday and 455 VAC in the afternoon; the ULH voltage boost allows the drive to adjust the DC bus level to a fixed bus level that is required to allow the PWM output to achieve a value equal to the motor nameplate voltage.

The ABB ULH in remote pump stations offers many benefits, including unity power factor across the speed range, voltage boost for up to a 10% voltage drop, maintaining IEEE-519, sinusoidal current draw, is standby generator friendly, and generates relatively no harmonics compared to six-pulse drives.

ABB ULH drives are compact and available up to 1,900 HP as UL Type 1 or Type 12 environmental protection. Reference tables 1 and 2 for additional information on the ULH dimensions, weights, and sizes which are available as wall-mounted units.

Table 1: ULH drive information

Drive	Size	Nominal output ratings		Heat dissipation	
	Frame Size	Power (HP)	Current (A)	Heat Loss (W)	Heat Loss (BTU/hr)
ACQ580-31-07A6-4	R3	5	7.6	219	748
ACQ580-31-012A-4	R3	7.5	12	278	949
ACQ580-31-014A-4	R3	10	14	321	1,096
ACQ580-31-023A-4	R3	15	23	473	1,614
ACQ580-31-027A-4	R6	20	27	625	2,133
ACQ580-31-034A-4	R6	25	34	711	2,426
ACQ580-31-044A-4	R6	30	44	807	2,754
ACQ580-31-052A-4	R6	40	52	960	3,276
ACQ580-31-065A-4	R6	50	65	1,223	4,173
ACQ580-31-077A-4	R6	60	77	1,560	5,323
ACQ580-31-096A-4	R8	75	96	1,678	5,726
ACQ580-31-124A-4	R8	100	124	2,237	7,633
ACQ580-31-156A-4	R8	125	156	2,796	9,540
ACQ580-31-180A-4	R8	150	180	3,355	11,448
Additional sizes are available upon request.					

Table 2: ULH drive sizes

Frame Size	Dimensions			Weight
	Length (in.)	Width (in.)	Depth (in.)	Weight (lbs.)
R3	19.49	8.08	13.75	47
R6	30.36	9.93	15.44	135
R8	38	11.82	17.25	247

Additional ULH resources

- ACH580-31, ACH580-34, ACQ580-31, and ACQ580-34 drives – Product note on DC voltage boost (3AXD50000769407 REV A)
- Application Guide – Harmonics in water applications (3AXD50000625635 REV A)
- Technical Note 032 Ultra-low harmonic vs. 18-pulse differentiators (LVD-EOTKN032U-EN REV B)