



Wilo-NL
Base-Mounted End-Suction Pumps

Engineering Specification

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish and install separately-coupled (A.K.A. long-coupled), end-suction centrifugal pumps consistent with the system's requirements. The end-suction pumps shall be suitable for the specified system function and capacity.

1.2 REGULATORY

- A. Centrifugal pumps shall be rated to a maximum working pressure of 175 psi (12 bar) and 250°F (120°C) [232 psi (16 bar) and 285°F (140°C) optional] and where applicable, bear the approval symbol of the required regulatory body.
- B. Electrical assemblies (circuitry, wiring terminals and internal connections) of the centrifugal pumps shall be certified and registered to bear the emblem of UL, CSA or ETL as required. Electrical assembly shall meet codes and standards established by national bodies.

1.3 REFERENCES

- A. ANSI/HI – American National Standards Institute/Hydraulic Institute
- B. EISA 2007 – Energy Independence and Security Act of 2007
- C. NEMA – National Electrical Manufacturers Association
- D. ISO – International Standards Organization

1.4 QUALITY ASSURANCE

- A. The pump manufacturer shall be fully certified by the International Standards Organization per ISO 9001:2008.
- B. Each pump shall be factory tested per Hydraulic Institute standards prior to shipment and shall conform to American National Standards Institute/Hydraulic Institute (ANSI/HI) 1.1-1.2, and 1.3 for recommended acceptable unfiltered field vibration limits.
- C. The pump assembly shall comply with NFPA 70, Article 100 and marked for intended use.
- D. Each pump assembly shall comply with UL 778 for motor-operated water pumps.

1.5 SUBMITTALS

- A. Provide submittals, warranty information and shop drawings in accordance with the General Requirements and as specified herein. Submit detailed product drawings including wiring schematics. Indicate critical dimensions of the end suction pumps.

- B. Submit manufacturer's technical data in the form of published Installation, Operation and Maintenance Manuals to be supplied with the end-suction pumps at time of installation.
- C. End-suction pumps shall be tested and verified for performance. Copies of "Submittals" shall be made available to the specifying engineer if requested.
- D. Submit dimensional data on for the pump in order to facilitate or allow the end-user/installer to anticipate the necessary pipe, fittings, fasteners, etc. to complete the system installation.

1.6 DELIVERY AND HANDLING

- A. End-suction pumps are shipped in boxes and are to remain in factory shipping condition until immediately prior to installation.
- B. End-suction pumps are to be stored indoors in a conditioned space, protected from exposure to the elements, and from exposure to other potential contaminants.
- C. Factory applied labels are to remain in place and unobscured. These identification tags are to display model numbers, serial numbers, and evidence of certifications/listings.

1.7 WARRANTY

- A. The Manufacturer shall warrant the circulating pumps for a period of 3 years from date of purchase, subject to the Terms and Conditions of said Warranty. A copy of the Manufacturer's Warranty shall be provided as part of the Submittals as outlined in Section 1.4 of this specification.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the specifications, the following manufacturers shall be acceptable:
 - i. WILO USA, LLC
 - ii. Pre-approved equal.

2.2 SERIES NL BASE-MOUNTED, FLEXIBLE/SEPARATELY COUPLED, END-SUCTION CENTRIFUGAL PUMPS

- A. **Product Description:**
Factory assembled and tested, centrifugal, overhung impeller, separately-coupled, end-suction pump as defined in HI 1.1- 1.2 and 1.3; designed for base mounting, with pump and motor shafts horizontal. Base-mounted, single-stage, endsuction design with an integrally-cast, foot-mounted volute which facilitates the removal of the impeller and bearing assembly for servicing without disturbing the piping connections, pump volute, or motor.

Maximum Operating Pressure:

Pump Casing	Pressure Rating
Maximum Operating Pressure	175-psig (12 Bar), 125# Flange
Standard construction	(ANSI A21.10, AWWA C110 and ANSI B16.1 Class 125)
Maximum Operating Pressure	232-psi (16 Bar), 250# Flange
Optional Construction	(ANSI B16.1 Class 250)
Maximum Suction Pressure	150-psig (10 Bar)

Operating Temperatures:

Maximum Liquid Temperatures	250 °F (120 °C) – standard construction
	285°F (140°C) – optional construction

B. Pump Construction:

- i. **Pump Casing:** Radially-split, cast iron (ASTM A48, Class 30), ¼ NPT threaded gauge tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Integral foot-mount on volute to support the casing and attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
- ii. **Impeller:** Cast bronze (ASTM B505), single-suction type, statically and/or dynamically balanced, keyed to shaft, and secured with a locking cap screw. The allowable residual unbalance in the impeller rotating assembly shall conform to ANSI Grade G6.3. Trim diameter to match specified performance.
- iii. **Pump shaft:** Shall be AISI 420 Stainless Steel
- iv. **Mechanical Seal:** Shall be an internally self-flushed mechanical seal with ceramic seat of 99.5% pure alumina oxide and hardness of 68 Rockwell C, or a tensile strength of 300,000 PSI (20,685 Bar), and carbon seal ring, suitable for continuous operation at 225 °F (107 °C).
- v. **Bearings:** Regreaseable ball bearing type with provision for purging or flushing through the bearing surface. Under continuous operation bearings shall have a minimum L10 life of 20,000 hours. The bearings will be contained in cast iron housings with grease fittings/ports.
- vi. **Shaft Coupling:** A flexible molded insert (EPDM or Hytrel® depending on torque and speed requirement of the pump unit) with interlocking teeth capable of absorbing torsional vibration shall be employed between the pump and motor. Coupler shall be drop-out type to allow for disassembly and removal without removing the pump shaft or motor.
- vii. **Coupling Guard:** A dual rated ANSI B15.1, Section 8 & OSHA 1910.219 compliant coupling guard which contains viewing windows for inspection of the coupling mounted to the pump end.
- viii. **Mounting/Base Frame:** Shall be of structural steel or

fabricated steel channel with fully enclosed sides and ends, and securely welded cross members. Grouting area shall be fully open. The combined pump and motor baseplate shall be sufficiently stiff as to limit the susceptibility of vibration. The minimum baseplate stiffness shall conform to HI 1.3 for Horizontal Baseplate Design standards.

- ix. **Motor:** Single speed, with permanently lubricated ball bearings, unless otherwise indicated; secured mounting to base frame, with adjustable alignment. Motor meets EISA 2007 requirements and NEMA specifications and shall be the size, voltage and enclosure called for on the plans.

C. Conditions:

- i. **Alignment:** Pump and motor shall be factory aligned, and shall be realigned by mechanical contractor or by an alignment service contractor to factory recommendation, prior to startup of the pump.
- ii. **Seismic Capability:** Pumps shall be capable of withstanding a horizontal load of 0.5 G, exclusive of piping and/or fasteners used to anchor the pump to mounting pads or to the floor, without adversely affecting pump operation.
- iii. **Chilled Water Applications:** Optional painted or galvanized drip pans supplied under the pump.

PART 3 – EXECUTION**3.1 PUMP INSTALLATION**

- A. The end-suction pumps must be installed and operated strictly in accordance with the terms set out in the Installation, Operation and Maintenance Manual supplied and enclosed with the attendant pumps.
- B. Comply with Hydraulic Institute (HI) 1.4.
- C. The pump and motor shall be mounted on a common base plate of heavy structural steel design and securely welded cross members and open grouting area.
- D. The pump must be installed in a way that it is not stressed by the pipework. A minimum of five pipe diameters is recommended on the inlet of the pump. Pressure gauges are recommended.
- E. Where antifreeze protection is required, the maximum concentration of heating system glycol is 50% by volume. High concentrations of glycol at lower system design temperatures may require increasing the design operating point. Use of leak sealant products or automotive antifreeze is not permitted.

3.2 ALIGNMENT

- A. Align the pump and motor shafts and piping connections after the following have been completed:

- i. Setting the pump unit on the foundation
 - ii. The grout has been set
 - iii. Foundation (anchor) bolts have been tightened
 - iv. Piping connections have been made
- B. Comply with pump and coupling manufacturer's written instructions.
 - C. Adjust pump and motor shafts for angular and offset alignment by methods specified in Hydraulic Institute (HI) 1.1-1.5,
 - D. "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation."
 - E. After alignment is correct, tighten foundation bolts evenly but not too firmly (one turn past hand-tight). Completely fill baseplate with non-shrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.
 - F. Grout pump mounting base full after piping is connected but before pump drive is aligned. After grouting, align pump drive shaft to .005 inches (.13mm), even if pump is factory aligned, and conduct vibration test.
 - G. Realignment after installation prior to start up will be performed by Owner.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions.
- C. Check piping connections for tightness.
- D. Clean strainers on suction piping.
- E. Perform the following startup checks for each pump after disconnecting/isolating motor:
 - i. Verify bearing lubrication.
 - ii. Verify that pump is free to rotate by hand or spanner wrench and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until pump turns freely.
 - iii. Verify that pump is rotating in the correct direction as indicated by the arrow cast into the volute.
- F. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
- G. Start motor.
- H. Open discharge valve slowly.

PART 4 – ISO 9001

ISO stands for the International Organization for Standardization. ISO 9000 is a series of standards that define the requirements for a quality management system. Companies are registered to these standards by an independent registration body. Registration means that an independent organization has evaluated and approved the quality system against the requirements of the appropriate ISO 9000 standard. This standard is:

→ ISO 9001:2008 Covers manufacturing, machining and assembly of centrifugal pumps and submersible mixers.

Although complying with ISO registration is voluntary, registration to these standards is recognized globally. In many cases it is a customer requirement for trade.

PART 5- FOOT MOUNTED VOLUTE

All Series NL pumps are provided as standard with an integrally cast volute foot located directly beneath the pump volute.

The integrally cast foot ensures that the alignment between the volute and motor assembly is maintained. Without solid support beneath the volute, the piping weight alone will cause distortion which can lead to premature failure of the bearings, shaft and mechanical seal. This feature is equally important on hot water applications. The Series NL volute foot provides a solid foundation and eliminates the deflections which would otherwise exist within an unsupported overhung volute during the normal thermal expansion of the system piping against the volute.

Consequently, unlike other overhung end suction pumps which require the volute and system piping to be "jacked up" for reassembly and alignment, the Series NL volute maintains its original installation alignment and reduces overall maintenance downtime.

PART 6 – TRUE BACK PULL-OUT

True back pull-out means you can access the pump impeller, bearings and coupler quickly and easily without disturbing the piping, mounts or motors. This is a critical advantage to the owner, especially now as the Energy Independence and Security Act of 2007 (EISA 2007) may require impeller trimming!

Computer Controlled, Dynamically Balanced Impeller

This modern method of computer balancing impellers provides for quiet, efficient, vibration-free performance. Diameters are computer-selected at the factory to furnish assurance that your capacity requirements will be met.

PART 7 – EISA 2007

The Energy Independence and Security Act was passed by Congress in 2007 and applies to motors manufactured after

December 19, 2010. EISA establishes efficiency standards for general purpose, 3-phase AC industrial motors from 1-250 HP.

EISA 2007 Full-Load Nominal Efficiency Requirements (%)

HP	TEFC			ODP		
	3600	1800	1200	3600	1800	1200
1	77.0	85.5	82.5	77.0	85.5	82.5
1-1/2	84.0	86.5	87.5	84.0	86.5	86.5
2	85.5	86.5	88.5	85.5	86.5	87.5
3	86.5	89.5	89.5	85.5	89.5	88.5
5	88.5	89.5	89.5	86.5	89.5	89.5
7-1/2	89.5	91.7	91.0	88.5	91.0	90.2
10	90.2	91.7	91.0	89.5	91.7	91.7
15	91.0	92.4	91.7	90.2	93.0	91.7
20	91.0	93.0	91.7	91.0	93.0	92.4
25	91.7	93.6	93.0	91.7	93.6	93.0
30	91.7	93.6	93.0	91.7	94.1	93.6
40	92.4	94.1	94.1	92.4	94.1	94.1
50	93.0	94.5	94.1	93.0	94.5	94.1
60	93.6	95.0	94.5	93.6	95.0	94.5
75	93.6	95.4	94.5	93.6	95.0	94.5
100	94.1	95.4	95.0	93.6	95.4	95.0
125	95.0	95.4	95.0	94.1	95.4	95.0
150	95.0	95.8	95.8	94.1	95.8	95.4
200	95.4	96.2	95.8	95.0	95.8	95.4
250	95.8	96.2	95.8	95.0	95.8	95.4

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