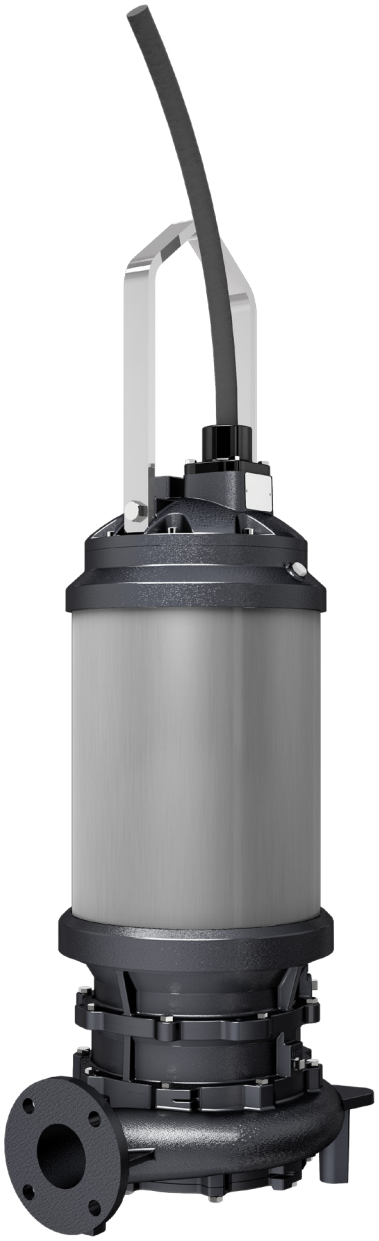
Submersible Wastewater Pump with Anti-Clog Technology



Model DKEU
Model DKEXU

Technical Specification

EBARA

EBARA Pumps Americas Corporation

Specification

Model DKEU/DKEXU

50DKE(X)U461.5
80DKE(X)U461.5
80DKE(X)U462.2
80DKE(X)U463.7
80DKE(X)U465.5
80DKE(X)U467.5
80DKE(X)U4611
100DKE(X)U462.2
100DKE(X)U463.7
100DKE(X)U465.5
100DKEB(X)U465.5
100DKE(X)U467.5
100DKEB(X)U467.5
100DKE(X)U4611
100DKEB(X)U4611
100DKE(X)U4615
100DKEB(X)U4615
100DKE(X)U4618
100DKEB(X)U4618
100DKE(X)U4622
100DKEB(X)U4622
150DKE(X)U467.5
150DKE(X)U4611
150DKE(X)U4615
150DKE(X)U4618
150DKE(X)U4622
200DKE(X)U4611
200DKE(X)U4615
200DKE(X)U4618
200DKE(X)U4622
250DKE(X)U4618
250DKE(X)U4622

Specification

Model Designation

DISCHARGE - mm

50: 2”(50mm)
80: 3”(80mm)
100:4”(100mm)
150:6”(150mm)
200:8”(200mm)
250:10”(250mm)

MODEL TYPE

DKE/DKEB: Submersible sewage pump

EXPLOSION-PROOF

X: FM/FMc Explosion proof designation
None: Non Explosion proof designation

GEOGRAPHIC DESIGNATION

U: U.S.A Market

SPEED

4: 4 POLE

HERTZ

6: 60

MOTOR POWER

1.5: 2HP(1.5kW)
2.2: 3HP(2.2kW)
3.7: 5HP(3.7kW)
5.5: 7.5HP(5.5kW)
7.5: 10HP(7.5kW)
11:15HP(11kW)
15: 20HP(15kW)
18: 25HP(18.5kW)
22: 30HP(22kW)

VOLTAGE

2: 208/230V
4: 460V
5: 575V

OPTION(S)

1000: Non-ICS
1001: ICS

Specification

Overview

	Standard	Optional
Size	2, 3, 4, 6, 8, 10inch (50, 80, 100, 150, 200, 250mm)	
Range of HP	2 to 30hp	
Range of Performance	Capacity 20 to 2800 GPM	
	Head 7 to 185 Feet	
Limitation		
Maximum Water Temp.	104°F (40°C)	
Synchronous Speed	1800 RPM	
Materials		
Casing	Cast Iron	
Impeller	Cast Iron	
Shaft	403 Stainless Steel	
Motor Frame	Cast Iron	
Fastener	304 Stainless Steel	
ICS Jacket	304 Stainless Steel & Cast Iron	
Mechanical Seal		
Type	Double Mechanical Seal	
Material – Upper Side	Carbon/Ceramic	
Material – Lower Side	Silicon Carbide/Silicon Carbide	
Impeller Type	Semi-Open	
Bearing	Pre-lubricated Ball Bearing	
Motor		
Type	NEMA MG-1 Design B	
Efficiency	Premium (Equiv. to IEC 60034-30, IE3)	
Start Method	Direct-on-Line (DOL) or VFD (30-60Hz)	
Insulation	Class H	
Service Factor	1.15	
Starts per Hour	20	
Operational Time	Without ICS: Continuous in water; up to 30mins in air	ICS for 2 to 5hp
	With ICS: Continuous in air	
Bearing Life	Minimum 50,000hrs	
Voltage/Frequency Tolerance	Maximum ±10/5% respectively	
Junction Chamber	Terminal board sealed from motor stator	
Protection	Thermal Detector – Klixons	
	Mech. Seal Leakage Detector – Float Style	

Specification

	Standard	Optional
Submersible Cable	Multi-Conductor (Single 8-Core Cable)	
Type	RHW-2 / RW90	
Rating	90°C / 600V	
Listing	UL/CSA	
Submergence Approval	NEC & CEC	
Specifications	ASTM B3, ASTM B172, ASTM B173 ASTM B174, UL44, CSA C22.2 No. 38	
AWG	#14/8, #10/4+#14/4, #6/4+#14/4, #3/4+#14/4	
Length	50 Feet	75 Feet
Accessories		QDC System Discharge Elbow

Specification-DKEU

A. General:

Provide submersible sewage pump(s) suitable for continuous duty operation underwater without loss of watertight integrity to a depth of 65 feet. Pump system design shall include a guide rail system so that the pump will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pump shall be easily removable for inspection or service, requiring no bolts, nuts, or other fasteners to be disconnected, or the need for personnel to enter the wet well. The motor and pump shall be designed, manufactured, and assembled but the same manufacturer.

B. Manufacturer:

Ebara Pumps Americas Corporation

C. Pump Characteristics:

Pumps shall conform to the following requirements:

Number of units	
Design Flow (gpm)	
Design TDH (ft)	
Minimum shut off head (ft)	
Synchronous RPM	1800
Maximum HP	
Voltage/HZ	208/230V, 460V, 575V / 60Hz
Phase	3

D. Pump Construction:

All major parts of the pumping unit(s) including casing, impeller, suction cover, motor frame, and discharge elbow shall be manufactured from gray cast iron, ASTM A-48 Class 35. Castings shall have smooth surfaces devoid of blow holes or other casting irregularities. The casing design shall be centerline discharge with the large radius on the cut water to prevent clogging. Units shall be furnished with a discharge elbow and a 125 Lb. flat face ANSI flange. All exposed bolts and nuts shall be 304 stainless steel. All mating surfaces of major components shall be machined and fitted with NBR O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression of O-rings in two planes and O-ring contact is made on four surfaces. Internal and external surfaces are prepared to SPPC-VISI-SP-3-63 then coated with a Zinc-Rich primer. The external surfaces are then coated with a Ni-Build TNEMEC series 46H-413 Coal Tar paint.

1. Impellers:

a. The impeller shall be single or multi-vane, semi-open back swept design. It shall be dynamically balanced and shall be designed for solids handling with a long thru let without acute turns. The inlet edge of the impeller vanes shall be angled toward the impeller periphery so as to facilitate the release of objects that might other wise clog the pump. The design shall also include back pump out vanes to reduce the pressure and entry of foreign materials into the mechanical seal area. In addition, a lip seal shall be located behind the impeller hub to further reduce the entry of foreign materials into the seal area. Impellers shall be directly connected to the motor shaft with a slip fit, key driven and secured with an impeller bolt. The design shall include a replaceable cast iron suction cover. The impeller and suction cover shall be designed such that it may be adjusted to maintain working clearances and hydraulic efficiencies. The combination of a guide pin at the suction cover and the slot on the surface of suction cover lead foreign material out to the discharge side of casing to avoid clogging.

2. Mechanical Seals

a. Double mechanical seals shall be provided on all units. They operate bathed in Oil (2 to 5hp STD.) or Propylene Glycol (2 to 5hp OPT. / 7.5 to 60hp STD.).

b. The oil or Propylene Glycol (PG) filled seal chamber shall be designed to prevent over-filling and include an anti-vortexing vane to ensure proper lubrication of both seal faces. Lower face materials shall be silicon carbide, upper faces carbon on ceramic, NBR elastomers, and 304SS hardware. The seal system shall not rely on pumping medium for lubrication.

E. Motor Construction:

a. The pump motor shall be an air-filled induction type with a squirrel-cage rotor, shell type design, ,built to NEMA MG-1, Design B specification. The motor shall be inverter duty rated for VFD operation. Stator windings shall be copper, insulated with moisture resistant Class H insulation, rated for 356° F (180° C). The stator shall be dipped and baked in Class H varnish and heat shrunk fitted into the stator housing. Rotor bars and short circuit rings shall be manufactured of cast aluminum. Motor shaft shall be one-piece AISI 403 SS material, rotating on two permanently lubricated ball bearaings designed for a minimum life of 50,000 hours.

b. The Premium Efficient motor shall meet the efficiency standard in accordance with IEC 60034-30, level IE3. Motor ratings tests shall be conducted in accordance with IEC 60034-2-1.

c. The motor service factor shall be 1.15 capable of up to 20 starts per hour. The motor shall be designed for continuous duty pumping at a maximum sump temperature of 104° F. The motor shall be non-overloading over the entire specified range of operation and be able to operate at full load for up to 30 minutes while unsubmerged without damage to the unit.

d. ICS (Internal Cooling System) allows the motor to be cooled down by Propylene Glycol (PG), which circulates inside the ICS jacket so that the motor may be operated at full load continuously while unsubmerged without damage to the unit. ICS is applied as standard for 7.5hp to 60hp and optionally available for 2 to 5hp.

e. The junction chamber shall be sealed off from the stator housing with O-rings and packing and contain a terminal board mounted on a DIN rail for simple connection of the cable conductors to the motor stator and sensor leads. The use of wire nuts or crimp-type connectors is not acceptable.

f. Voltage and frequency tolerances shall be a maximum ±10/ 5% respectively. Motor over temperature protection shall be provided by three miniature thermal protectors (one per phase) embedded in the windings. Mechanical seal failure protection shall be provided by a mechanical float switch located in a chamber above the seal. This switch shall be comprised of a magnetic float that actuates a dry reed switch encapsulated within the stem. Should the mechanical seal fail, liquid shall be directed into the float chamber, in which the rising liquid activates the switch opening the normally closed circuit. The float body and float shall be a polypropylene material with a 316SS stopper.

g. Motor shall have oversized AISI 304 SS Lifting hanger to easily install and remove pump and motor.

h. Motor cable shall be a single eight core cable containing both power and sensor conductors. The cable jacket shall be manufactured of an oil resistant chlorinated polyethylene (CPE) rubber material, designed for submerged applications. Cable shall be Type RHW-2 / RHW90, 90°C, 600V, UL/CSA Listed, & NEC/CEC approved for wet locations. Cable shall be watertight to a depth of at least 65'. The cable entry system shall comprise of primary, secondary, and tertiary sealing methods. The primary seal shall be achieved by a NBR tapered elastomeric grommet compressed between the cable gland, cable housing, and a set of 304SS washers. Secondary sealing is accomplished with a compressed O-ring made of NBR material. Compression and subsequent sealing shall preclude specific torques requirements. The system shall also include tertiary sealing to prevent leakage into the motor housing due to capillary action through the insulation if the cable is damaged or cut. The cable wires shall be cut, stripped, re-connected with a copper butt end connector, and embedded in epoxy within the cable gland. This provides a dead end for leakage through the cable insulation into the motor junction area.

F. Guide Rail system:

a. Design shall include two (2) 304SS schedule 40 guide rails sized to mount directly to the quick discharge connector, QDC, at the floor of the wet well and to a guide rail bracket at the top of the wetwell below the hatch opening, (refer to project drawings). Intermediate guide brackets are recommended for guide rail length greater than 15 feet.

b. Guide rails are not part of the pump package and shall be supplied by others.

c. The QDC shall be manufactured of gray cast iron, ASTM A48 Class 30. It shall be designed to adequately support the guide rails, discharge piping, and pumping until under both static and dynamic loading conditions with support legs that are suitable for anchoring it to the wet well floor. The face of the inlet QDC flange shall be perpendicular to the floor of the wet well. The discharge flange of the QDC shall conform to ANSI B16.1 Class 125.

d. The pump design shall include an integral self-aligning sliding bracket. Sealing of the pumping unit to the QDC shall be accomplished byt the single linear downward motion of the pump. The entire weight of the pump unit shall be guided to and wedged tightly against the inlet flange of the QDC, making metal to metal contact with the pump discharge forming a seal without the use of bolts, gaskets, or O-rings.

e. A stainless-steel lifting chain of adequate length and rating for removing and installing the pump unit is recommended. The chain shall have a rounnd link with a 2-1/4” inside diameter every two feet. This link will allow for sliding a pinch bar through the link to pick up the chain, more than once if necessary, at multiple intervals during pump removal and installation.

Specification – DKEXU(FM/FMc certified motor)

A. General:

Provide FM/FMc explosion proof submersible sewage pump(s) suitable for continuous duty operation underwater without loss of watertight integrity to a depth of 65 feet. Pump system design shall include a guide rail system so that the pump will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pump shall be easily removable for inspection or service, requiring no bolts, nuts, or other fasteners to be disconnected, or the need for personnel to enter the wet well. The motor and pump are designed, manufactured, and assembled by the same manufacturer.

B. Manufacturer:

Ebara Pumps Americas Corporation

C. Pump Characteristics:

Pumps shall conform to the following requirements:

Number of units	
Design flow (gpm)	
Design TDH (ft)	
Minimum shut off head (ft)	
Synchronous RPM	1800
Maximum HP	
Voltage/HZ	208/230V, 460V, 575V / 60Hz
Phase	3

D. Pump Construction:

All major parts of the pumping unit(s) including casing, impeller, suction cover, motor frame and discharge elbow shall be manufactured from gray cast iron, ASTM A-48 Class 35. Castings shall have smooth surfaces devoid of blow holes or other casting irregularities. The casing design shall be centerline discharge with a large radius on the cut water to prevent clogging. Units shall be furnished with a discharge elbow and a 125 Lb. flat face ANSI flange. All exposed bolts and nuts shall be 304 stainless steel. All mating surfaces of major components shall be machined and fitted with NBR O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression of O-rings in two planes and O-ring contact is made on four surfaces. Internal and external surfaces are prepared to SPPC-VISI-SP-3-63 then coated with a Zinc-Rich primer. The external surfaces are then coated with a Ni-Build TNEMEC series 46H-413 Coal Tar paint.

1. Impellers:

a. The impeller shall be single or multi-vane, semi-open back-swept design. It shall be dynamically balanced and shall be designed for solids handling with a long thru let without acute turns. The inlet edge of the impeller vanes shall be angled toward the impeller periphery so as to facilitate the release of objects that might otherwise clog the pump. The design shall also include back pump out vanes to reduce the pressure and entry of foreign materials into the mechanical seal area. In addition, a lip seal shall be located behind the impeller hub to further reduce the entry of foreign materials into the seal area. In addition, a lip seal shall be located behind the impeller hub to further reduce the entry of foreign materials into the seal area. Impellers shall be directly connected to the motor shaft with a slip fit, key driven and secured with an impeller bolt. The design shall include a replaceable cast iron suction cover. The impeller and suction cover shall be designed such that it may be adjusted to maintain working clearances and hydraulic efficiencies. The combination of a guide pin at the suction cover and the slot on the surface of the suction cover lead foreign material out to the discharge side of the casing to avoid clogging.

2. Mechanical Seals

a. Double mechanical seals shall be provided on all units. They operate bathed in Oil (2 to 5hp STD.) or Propylene Glycol (2 to 5hp Opt. / 7.5 to 60hp STD)

b. The oil or Propylene Glycol (PG) filled seal chamber shall be designed to prevent over-filling and include an anti-vortexing vane to ensure proper lubrication of both seal faces. Lower face materials shall be silicon carbide, upper faces carbon on ceramic, NBR elastomers, and 304SS hardware. The seal system shall not rely on a pumping medium for lubrication.

E. Motor Construction:

a. The pump motor shall be FM/FMc Explosion Proof, Class 1,Division 1, Group C, D. The design shall be an air-filled induction type with a squirrel-cage rotor, shell type design, built to NEMA MG-1, Design B specification. The motor shall be inverter duty rated for VFD operation. Stator windings shall be copper, insulated with moisture resistant Class H insulation, rated for 356° F (180° C). The stator shall be dipped and baked in Class H varnish and heat shrunk fitted into the stator housing. Rotor bars and short circuit rings shall be manufactured of cast aluminum. The motor shaft shall be one-piece AISI 403 SS material, rotating on two permanently lubricated ball bearings designed for a minimum life of 50,000 hours.

b. The Premium Efficient motor shall meet the efficiency standard in accordance with IEC 60034-30, level IE3. Motor rating tests shall be conducted in accordance with IEC 60034-2-1.

c. The motor service factor shall be 1.15 and capable of up to 20 starts per hour. The motor shall be designed for continuous duty pumping at a maximum sump temperature of 104° F. The motor shall be non-over loading over the entire specified range of operation and be able to operate at full load for up to 30 minutes while unsubmerged without damage to the unit.

d. ICS (Internal Cooling System) allows the motor to be cooled down by Propylene Glycol (PG), which circulates inside the ICS jacket so that the motor may be operated at full load continuously while unsubmerged without damage to the unit. ICS is applied as standard for 7.5hp to 60hp and optionally available for 2 to 5hp.

e. The junction chamber shall be sealed off from the stator housing with O-rings and packing and contain a terminal board mounted on a DIN rail for simple connection of the cable conductors to the motor stator and sensor leads. The use of wire nuts or crimp-type connectors is not acceptable.

f. Voltage and frequency tolerances shall be a maximum ±10 / 5% respectively. Motor over temperature protection shall be provided by three miniature thermal protectors (one per phase) embedded in the windings. Mechanical seal failure protection shall be provided by a mechanical float switch located in a chamber above the seal. This switch shall be comprised of a magnetic float that actuates a dry reed switch encapsulated within the stem. Should the mechanical seal fail, liquid shall be directed into the float chamber, in which the rising liquid activates the switch opening the normally closed circuit. The float body and float shall be a polypropylene material with a 316SS stopper.

g. Motor shall have oversized AISI 304 SS lifting hanger to easily install and remove pump and motor.

h. Motor cable shall be a single eight core cable containing both power and sensor conductors. The cable jacket shall be manufactured of an oil resistant chlorinated polyethylene (CPE) rubber material, designed for submerged applications. Cable shall be Type RHW-2 / RW90, 90°C, 600V, UL/CSA Listed, & NEC/CEC approved for wet locations. Cable shall be watertight to a depth of at least 65'. The cable entry system shall comprise of primary, secondary, and tertiary sealing methods. The primary seal shall be achieved by an NBR tapered elastomeric grommet compressed between the cable gland, cable housing, and 304SS washers. Secondary sealing is accomplished with a compressed O-ring made of NBR material. Compression and subsequent sealing shall preclude specific torque requirements. The system shall also include tertiary sealing to prevent leakage into the motor housing due to capillary action through the insulation if the cable is damaged or cut. The cable wires shall be cut, stripped, re-connected with a copper butt end connector, and embedded in epoxy within the cable gland. This provides a dead end for leakage through the cable insulation into the motor junction area.

F. Guide Rail system:

a. Design shall include two (2) 304SS schedule 40 guide rails sized to mount directly to the quick discharge connector, QDC, at the floor of the wet well and to a guide rail bracket at the top of the wet well below the hatch opening, (refer to project drawings). Intermediate guide brackets are recommended for guide rail lengths greater than 15 feet.

b. Guide rails are not part of the pump package and shall be supplied by others.

c. The QDC shall be manufactured of gray cast iron, ASTM A48 Class 30. It shall be designed to adequately support the guide rails, discharge piping, and pumping unit under both static and dynamic loading conditions with support legs that are suitable for anchoring it to the wet well floor. The face of the inlet QDC flange shall be perpendicular to the floor of the wet well. The discharge flange of the QDC shall conform to ANSI B16.1 Class 125. All the metal touch part shall be covered with Non-Sparking material such as Bronze to avoid generating sparks during the installation and operation.

d. The pump design shall include an integral self-aligning sliding bracket. Sealing of the pumping unit to the QDC shall be accomplished by the single linear downward motion of the pump. The entire weight of the pump unit shall be guided to and wedged tightly against the inlet flange of the QDC, making metal to metal contact with the pump discharge forming a seal without the use of bolts, gaskets or O-rings.

e. A stainless-steel lifting chain of adequate length and rating for removing and installing the pump unit is recommended. The chain shall have a round link with a 2-1/4” inside diameter every two feet. This link will allow for sliding a pinch bar through the link to pick up the chain, more than once if necessary, at multiple intervals during pump removal and installation.