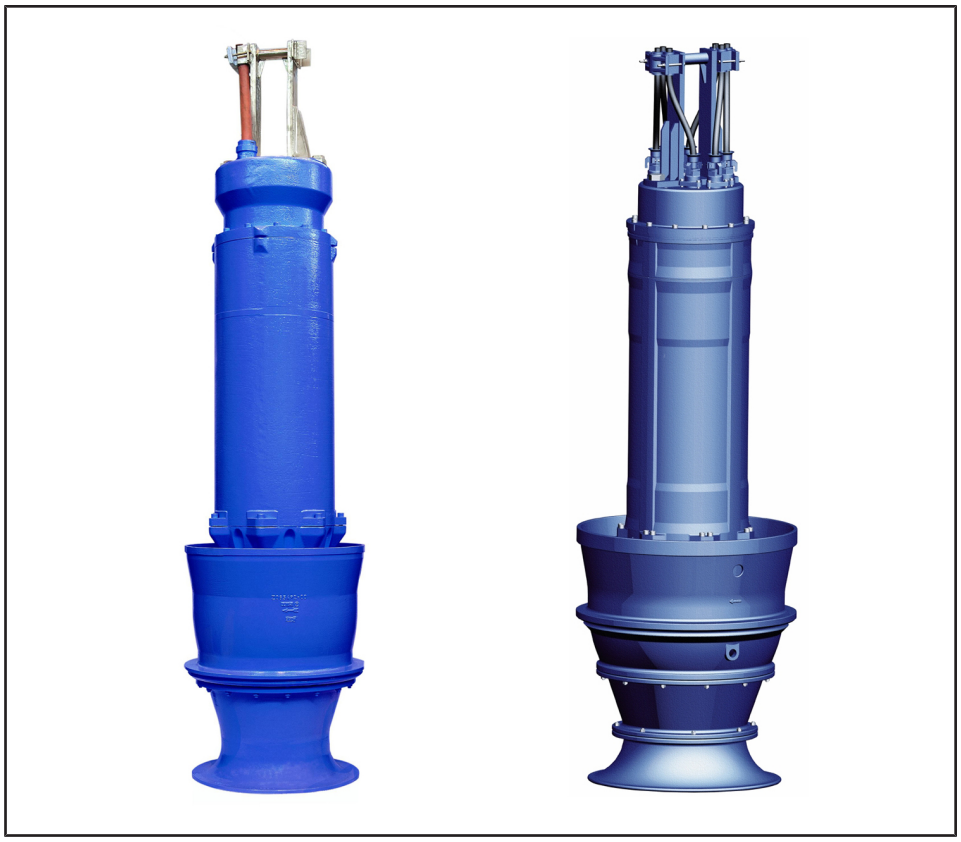
Submersible Pump in Discharge Tube

Amacan S

60 Hz

Type Series Booklet



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Type Series Booklet Amacan S

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Water Applications: Water Transport

Submersible Pump in Discharge Tube

Amacan S

Main applications

- Irrigation and drainage pumping stations
- Stormwater pumping stations
- Raw and clean water pumps in water works
- Cooling water pumps in power stations and in industry
- Industrial water supply
- Water pollution and flood control
- Dock and sluice pumps
- Aquaculture

Fluids handled

- Waste water
- River water
- Stormwater
- Activated sludge
- Seawater
- Brackish water

Operating data

Characteristic		Value
Flow rate	Q	Up to 50,000 US gpm [3000 l/s]
Head	H	Up to 98 ft [30 m]
Motor rating	P_2	Up to 500 hp [370 kW]
Temperature of fluid pumped[1)]	t	Up to 104 °F [40 °C]

Designation

Example: Amacan S 1000-655 / 250 10 UT G2

Key to the designation

Code	Description	
Amacan	Type series	
S	Impeller type, e.g. S = mixed flow impeller	
1000	Nominal diameter of the discharge tube [mm]	
655	Nominal impeller diameter [mm]	
250	Motor size	
10	**Number of motor poles**	
	6	6-pole
	8	8-pole
	10	10-pole
	12	12-pole
UT	**Motor version** (⇨ Page 7)	
	UA	Without explosion protection, standard (sizes 650-364 ... 800-505)
	UT	Without explosion protection, standard (sizes 800-535 ... 1300-820)
G2	**Material variant** (⇨ Page 9)	
	G2	Gray cast iron, standard material variant
	G3	Gray cast iron with Zn anodes, shaft made of A 276 type 431 stainless steel

Design details

Design

- Fully floodable submersible pump in discharge tube (submersible motor pump)
- Not self-priming
- Close-coupled design
- Single-stage
- Vertical installation

Drive

- Three-phase asynchronous squirrel-cage motor

Shaft seal

- Two bi-directional mechanical seals in tandem arrangement, with liquid reservoir
- Leakage chamber

Impeller type

- Open or closed mixed flow impeller

Bearings

- Grease-packed rolling element bearings

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1) Higher temperatures on request

Materials

Description	Material
Pump casing	Gray cast iron A48 Class 40 B
Motor housing	Gray cast iron A48 Class 40 B
Shaft	Stainless steel
Impeller	Duplex stainless steel
Casing wear ring	Stainless steel
Screws, bolts, nuts	Stainless steel

Coating/preservation

Surface treatment, primer and top coat

- **Surface treatment:** SA 2 1/2 (SIS 055900) AN 1865
- **Primer:** primer coat on unfinished casting 0.98 mil [0.025 mm] to 1.38 mil [0.035 mm]
- **Top coat:** environmentally friendly KSB standard coating (RAL 5002)

Special coating

- Available on request (extra charge and a longer delivery period apply).

Product features / customer benefits

- Efficient use of power thanks to three-phase motor and optimum motor cooling by fluid handled.
- Easy to install as pump's own weight ensures self-centering seating in the discharge tube, and an O-ring seals it. Quick to install or remove without any additional anchoring or anti-rotation elements.
- Slim motor minimizes discharge tube flow losses.
- High reliability provided by bearing temperature monitoring, vibration sensor, thermal motor protection, leakage sensors in the motor and connection space, and leakage monitoring of the mechanical seal system.
- Low-vibration hydraulic system; inlet ribs and optimized bellmouth for vortex-free inflow.
- Absolutely water-tight resin-sealed cable entries prevent any water from entering the motor – even in the event of a damaged cable.

Acceptance tests / warranties

Functional test

- Every pump undergoes functional testing to KSB standard ZN 56535.
- Operating data is guaranteed to DIN EN ISO 9906/2/2B or Hydraulic Institute Level B.

Acceptance tests

- Acceptance tests to ISO/DIN or a comparable standard are available against a surcharge.

Warranties

- Quality is assured by means of an audited and certified quality assurance system to DIN EN ISO 9001.

Design and selection information

Information for pump selection

The guaranteed point of submersible pumps in discharge tubes is measured at a head of 1.65 ft [0.5 m] above the motor (DIN 1184). The documented characteristic curves refer to this data. This must be taken into account when calculating system losses. The indicated heads and performance data apply to pumped fluids with a density of ρ = 7.48 lbs/ft³ [1 kg/dm³] and a kinematic viscosity v of up to 20 mm²/s.

The pump input power must be matched to the density of the fluid handled:
$P_{2req.} = \rho_{fluid}$ [kg/dm³] x P_{2docu}

The operating point with the largest pump input power is decisive for the operating range of the motor. To compensate the unavoidable tolerances of the characteristic curves of system, pump and motor we recommend selecting a motor size which provides sufficient power reserves.

Recommended minimum reserves[2)]

Required pump input power		Motor power reserve	
[hp]	[kW]	Mains operation	With frequency inverter
< 40	< 30	10 %	15 %
> 40	> 30	5 %	10 %

Intake chamber

Determine the minimum water level t_{1min} (diagram in general arrangement drawing):
The minimum water level t_{1min} is the water level required in the pump's suction chamber to ensure the following:

- The hydraulic system (propeller) is sufficiently submerged (shown in diagram depending on pump size).
- The pump does not draw in air-entraining vortices (shown in diagram depending on flow rate).
- The hydraulic system is free from cavitation (check against the $NPSH_{required}$ value in the technical literature. The following conditions must be met:
  - $NPSH_{available} > NPSH_{required}$ + safety allowance
  - $NPSH_{available} = 10.0 + (t_1 - t_3 - h_7/2)$
  - Safety allowance:
    up to $Q_{opt} \Rightarrow$ 1.65 ft [0.5 m]
    larger than $Q_{opt} \Rightarrow$ 3.3 ft [1.0 m]

Head (H)

The total pump head is composed as follows:
$H = H_{geo} + \Delta H_V$

H_{geo} (static head)

- Without discharge elbow – Difference between suction-side water level and overflow edge
- With discharge elbow – Difference between suction-side and discharge-side water level

ΔH_V (losses in the system)

- Starting 1.65 ft [0.5 m] downstream of the pump: e.g. pipe friction, elbow, swing check valve, etc.

2) If larger reserves are stipulated by local regulations or are required to compensate for uncertain factors in system calculations, these larger reserves must be provided.

Losses by inlet, riser and elbow

Losses are caused by the inlet, riser and elbow (or free discharge).

- Losses in the riser up to the indicated reference level (1.65 ft [0.5 m] above the motor) are taken into account in the documented characteristic curves.
- Inlet and elbow losses are system losses and must be taken into account for selection.
- For information on structural requirements, pump installation and pump sump design please refer to the KSB know-how brochure "Planning Information: Amacan Submersible Pumps in Discharge Tubes" 0118.55.

Overview of product features / selection tables

Table of fluids handled

The table below for your guidance is based on KSB's long-standing experience. The data are standard values and are not to be considered as generally binding recommendations. More detailed advice is available from our specialist department in Halle. Make use of our laboratory's expertise when selecting materials.

Information and recommendations regarding fluids

Fluid handled[3] (fluids not containing stringy substances)	Information, recommendations
Waste water (without long fibers and large solid particles)	Pre-screen with fine screen.
Surface water (stormwater, river water)	Pre-screen.
Activated sludge	Max. dry substance 2 %
Seawater and brackish water[4]	Material variant G3 up to t = 77 °F [25 °C][5]

Opening size of screen bars

Size	Coarse screen		Fine screen[6]	
	[inch]	[mm]	[inch]	[mm]
650-364 / -365	1 1/2	40	1/2	15
650-404 / -405	1 1/2	40	1/2	15
800-505	1 1/2	40	1/2	15
800-535	1 1/2	40	1/2	15
850-550	1 1/2	40	1/2	15
900-600	2	50	1	25
900-615	2	50	1	25
900-620	1 1/2	40	1/2	15
1000-655	2 1/2	60	1	25
1300-820	2 1/2	60	1	25

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3) Fluids to be pumped which are not listed in this table usually require higher-grade materials. Contact KSB.
4) Use of anodes required (efficiency reduced by 2 % to 3 %); anode to be checked every 6 to 12 months
5) For t > 25 °C contact KSB (stainless steel variant).
6) Fine screens must be used for high pollution loads.

Overview of product features

Overview of product features: material variants G2, G3

Feature	Motor version				
	UAG		UTG		
6-pole	26 6 ... 120 6	–	–	–	–
8-pole	–	75 8 ... 120 8	85 8 ... 160 8	205 8 ... 290 8	–
10-pole	–	–	60 10 ... 120 10	200 10 ... 250 10	310 10
12-pole	–	–	–	190 12	250 12 ... 370 12
Explosion protection					
Version U...	Not explosion-proof				
Motor					
Starting method	DOL, soft starter, frequency inverter		DOL, soft starter, frequency inverter or star-delta		
Voltage	460 V[7]				
Cooling	Cooled by surrounding fluid				
Power cable					
Type	See table "Overview of power cables"				
Length	33 ft [10 m][8]				
Cable entry	Absolutely watertight				
Sealing elements					
Elastomer seals	Nitrile butadiene rubber NBR [9]				
Shaft seal	Bellows-type mechanical seal				
Monitoring equipment					
Winding temperature of the motor	PTC thermistor				
Bearing temperature	PT100 on pump end PT100 on motor end		PT100 on pump end[10]		
Leakage inside the motor	Electrode monitoring the winding space for leakage		Electrode monitoring the winding and connection space for leakage		
Mechanical seal leakage	Float switch in leakage area				
Vibration sensor	-		-[11]		
Coating	Environmentally friendly KSB standard coating, color RAL 5002[12]				
Installation	(⇨ Page 32)				
Maximum temperature of fluid handled					
Material variant G2	104 °F [40 °C]				
Material variant G3	77 °F [25 °C]				
Tests/inspections					
Hydraulic system	KSB Standard (ZN 56525)[13]				
General	KSB Standard (ZN 56525)				

Overview of power cables

Feature	S1BN8-F rubber-sheathed cable	S07RC4N8-F rubber-sheathed cable
Type	Standard	Optional
Rated voltage	1000 V	750 V
EMC screening	-	✓
Insulation material	EPR[14]	EPR[14]
Max. continuous temperature of insulation	194 °F [90 °C]	194 °F [90 °C]
For permanent immersion in waste water to DIN VDE 0282-16/HD22.16	✓	✓

Related documents

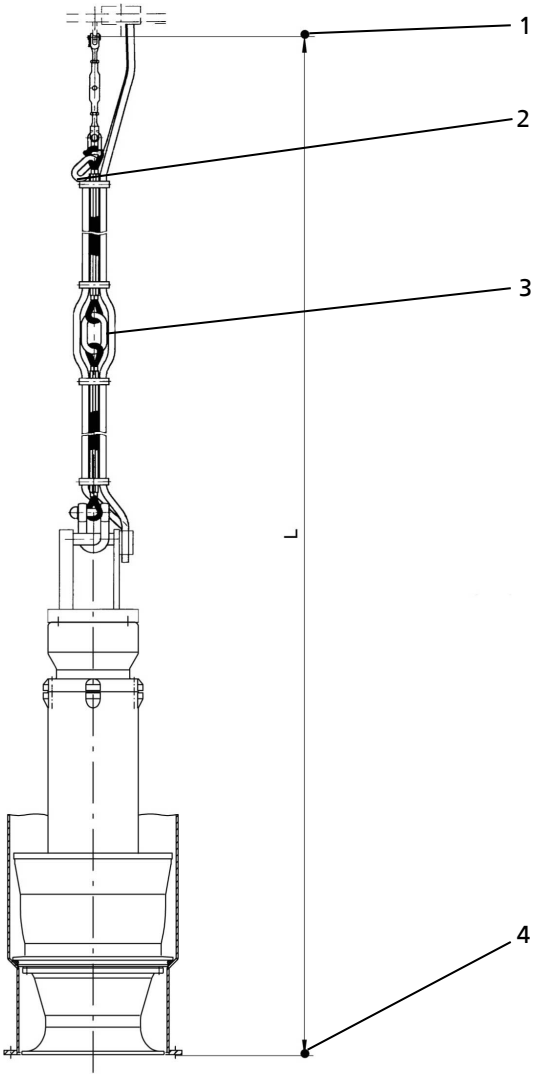
- General Arrangement Drawings 1589.396
- Motor Data Booklet 1589.566
- Planning Information 0118.55

7) Optional: 380 V, 575 V
8) Optional: up to 165 ft [50 m]
9) Optional: Viton = fluorocarbon rubber FPM
10) Optional: PT100 on motor end
11) Optional: internal vibration sensor
12) Optional: 0.0098 inch [250 µm]
13) Optional: Hydraulic Institute, Level A and Level B
14) EPR = ethylene propylene rubber

Data to be indicated in the purchase order

- Designation of the pump (see section Designation)
- Flow rate Q, head H_{total}
- Type and temperature of fluid handled
- Voltage, frequency, starting method, cable length
- Required accessories
  - For discharge tubes indicate all required elevations and the type of installation.
  - For flow-straightening vanes indicate the type of installation and whether the design is with or without suction umbrella.
  - For a support rope indicate dimension "L", the number of additional lifting rings (depending on the lifting height of the lifting equipment) as well as the elevations and type of installation.
- Quantity and language of operating manuals

Always define dimension "L" when ordering a support rope to allow the correct length to be determined. The lifting height of the crane must be taken into account when ordering a support rope. This determines the number of lifting rings required for installing the pump in or removing it from the discharge tube.



1	Suspension arrangement attached to cover (or cross beam for BU/BG)
2	Lifting ring (standard, included in the scope of supply)
3	Optional (intermediate) lifting ring(s)
4	Lower edge of discharge tube = lower edge of pump

The support rope is an accessory and can be supplied with additional lifting rings and a support spacer (⇨ Page 36) as an option. The standard design is supplied without intermediate lifting ring(s).

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15) Pump set with cathodic protection (anodes to be checked every 6 to 12 months) and top coat of 0.0098 inch [250 µm]
16) Size 900-620
17) Nitrile butadiene rubber (Perbunan)
18) FPM fluorocarbon rubber variant available as an option against a surcharge
19) A 535: 60-40-18 for motors 858 ... 1608.TG, 6010 ... 12010.TG; A 284 B for all other motors

Material combinations

Overview of materials per material variant

Part No.	Description	G2	G3[15] (seawater variant)
101	Pump casing	A 48 Class 40 B	
138	Bellmouth	A 48 Class 30 B	
233	Open counter-clockwise impeller	A 890 CD 4 MCu	
	Closed counter-clockwise impeller[16]	A 890 CD 4 MCu	
350/330	Bearing housing / bearing bracket	A 48 Class 40 B	
360	Bearing cover	A 48 Class 30 B	
412	O-ring	NBR[17] (FKM[18])	
433	Mechanical seal (pump end)	SiC/SiC (bellows NBR[17], Viton FPM[18])	
	Mechanical seal (drive end)	Carbon/SiC (bellows NBR[17], Viton FPM[18])	
502	Casing wear ring	Stainless steel (A 276 Type 316)	
571	Bail	A 536: 60-40-18/A 284 B[19]	
811	Motor housing	A 48 Class 40 B	
812	Motor housing cover	A 48 Class 40 B	
818	Shaft (rotor)	A 276 Type 420	A 276 Type 431
82-5	Adapter	A 48 Class 40 B	
834	Cable gland	–	
	Cable gland housing	A 48 Class 40 B	
Various	Screws/bolts	Stainless steel	
99-16	Anode	–	Zn
Other materials on request			

Comparison of materials

EN	ASTM
EN-GJL-200 (JL 1030)	A 48 Class 30 B
EN-GJL-250 (JL 1040)	A 48 Class 40 B
1.4517	A 890 CD 4 MCu
1.4021	A 276 Type 420

EN	ASTM
1.4057	A 276 Type 431
NBR	NBR
FPM	FKM
EN-GJS-400-15 (JS 1030)	A 536: 60–40–18
S235JR	A 284 B

Description of materials

Duplex stainless steel (1.4517 or technically equivalent material)
This type of cast steel is resistant to cavitation, has excellent strength values and is used for high circumferential speeds. An excellent resistance to pitting corrosion makes ferritic-austenitic stainless steel a popular choice for pumping acidic waste water with a high chloride content as well as seawater and brackish water. Thanks to its good chemical resistance, e.g. also against waste water containing phosphorous and sulphuric acid, this material is used in a wide range of applications in the chemical industry and process engineering. Pumps made of duplex stainless steel have a very long service life, even when handling brines, chemical waste water (pH 1–12), gray water and landfill leachate.

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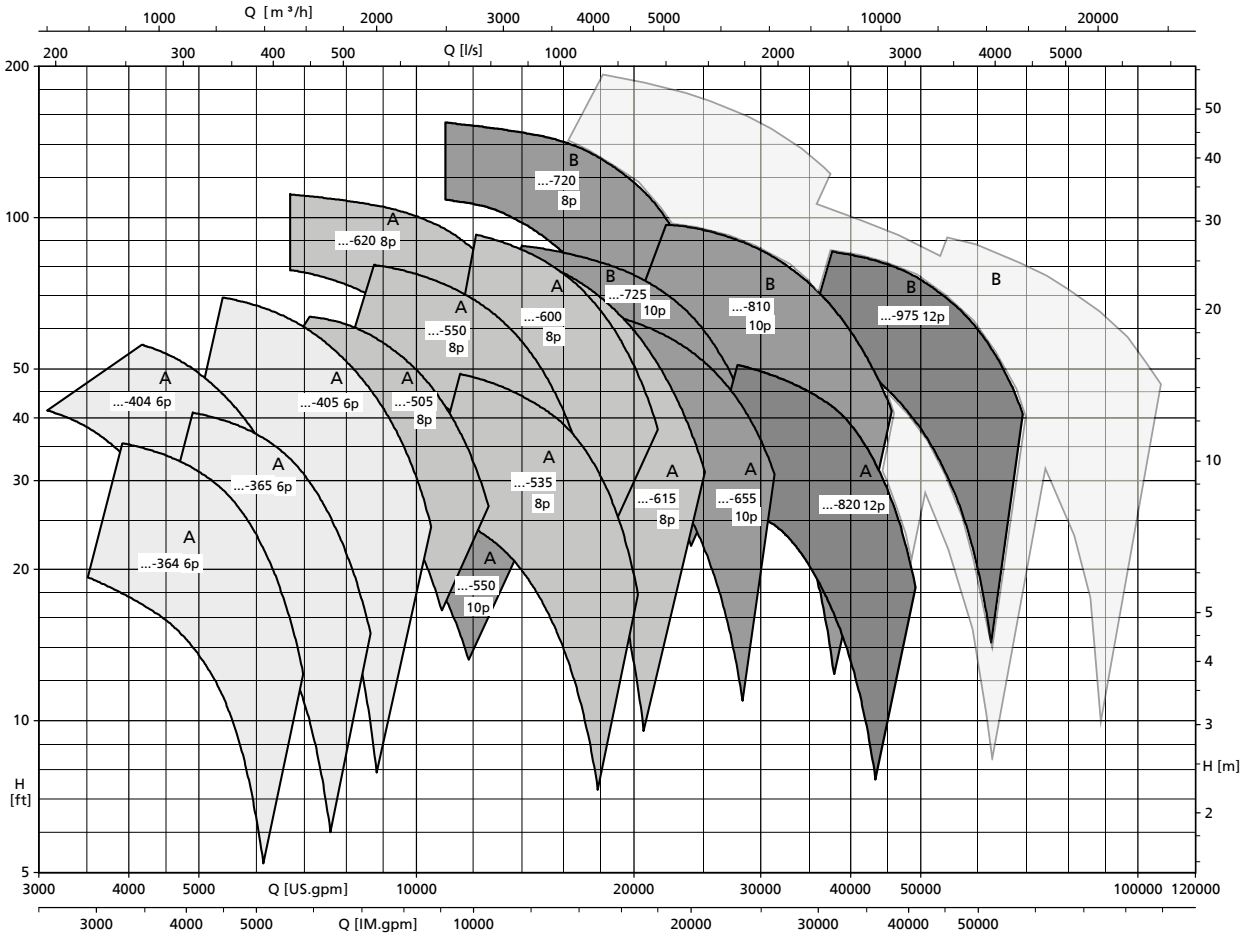
Selection chart

Amacan S, n = 1180 / 880 / 710 / 590 rpm



A Standard range

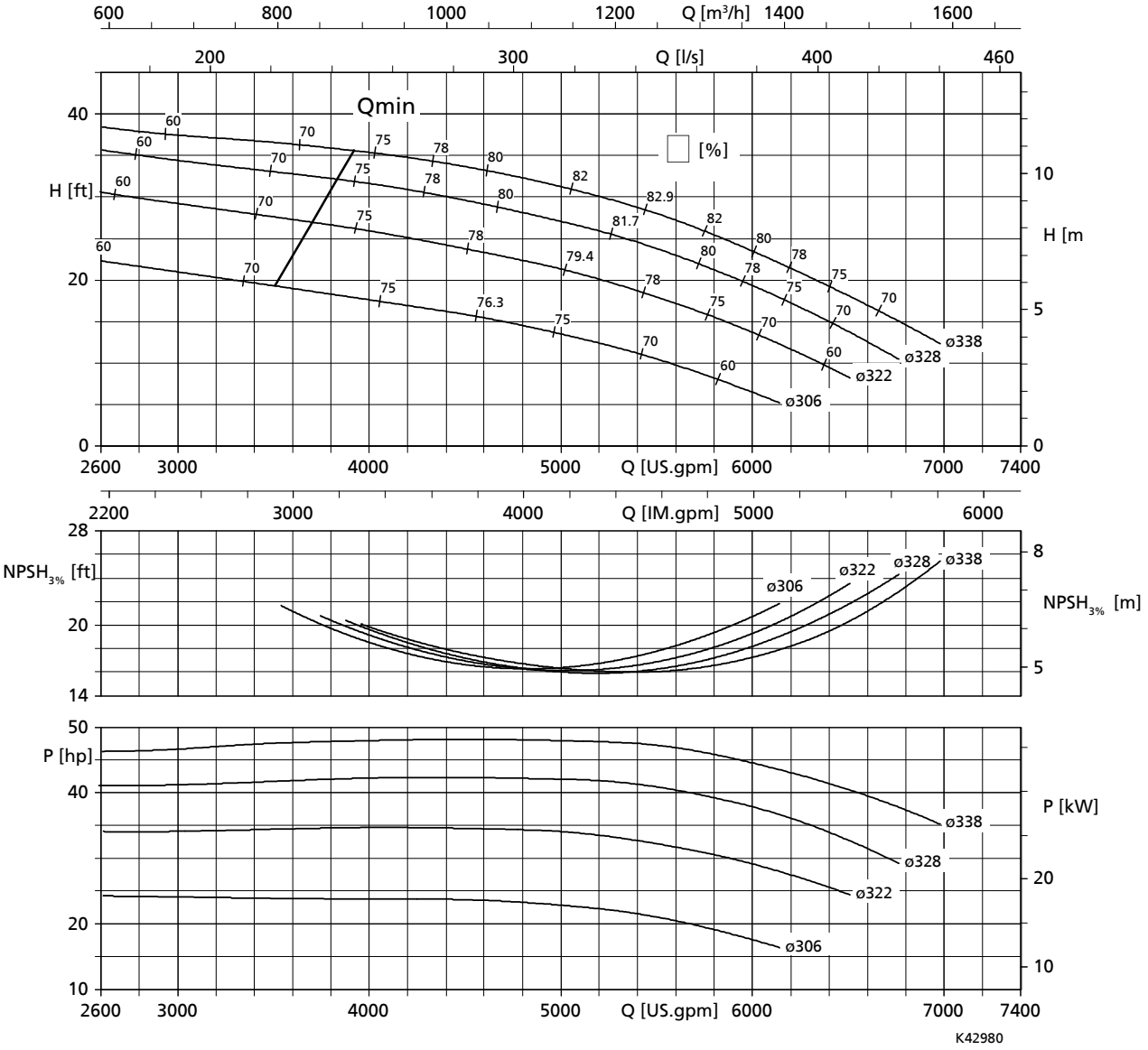
B Special range on request

Characteristic curves

n = 1180 rpm

Amacan S 650-364, n = 1180 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 1 ½" [39.0 mm]

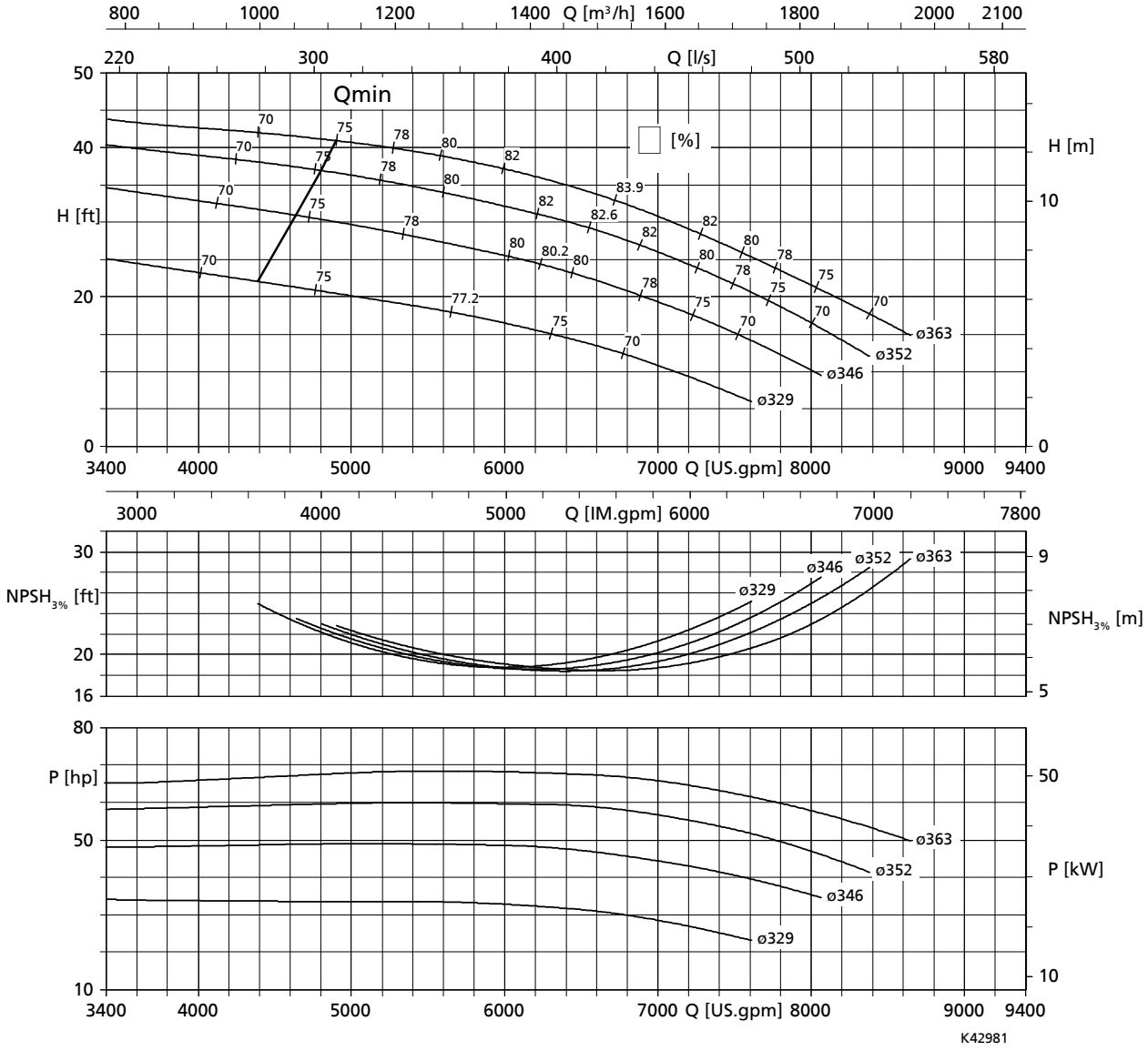
Rated power P_2 and mass moment of inertia J [20)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
650-364 / 26 6 UAG	33	25	0,67
650-364 / 30 6 UAG	45	35	0,67
650-364 / 50 6 UAG	63	47	0,68

20) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Amacan S 650-365, n = 1180 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 1 ½" [39.0 mm]

Rated power P_2 and mass moment of inertia J[21)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
650-365 / 30 6 UAG	45	35	0,67
650-365 / 50 6 UAG	63	47	0,68
650-365 / 65 6 UAG	80	60	0,77

21) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

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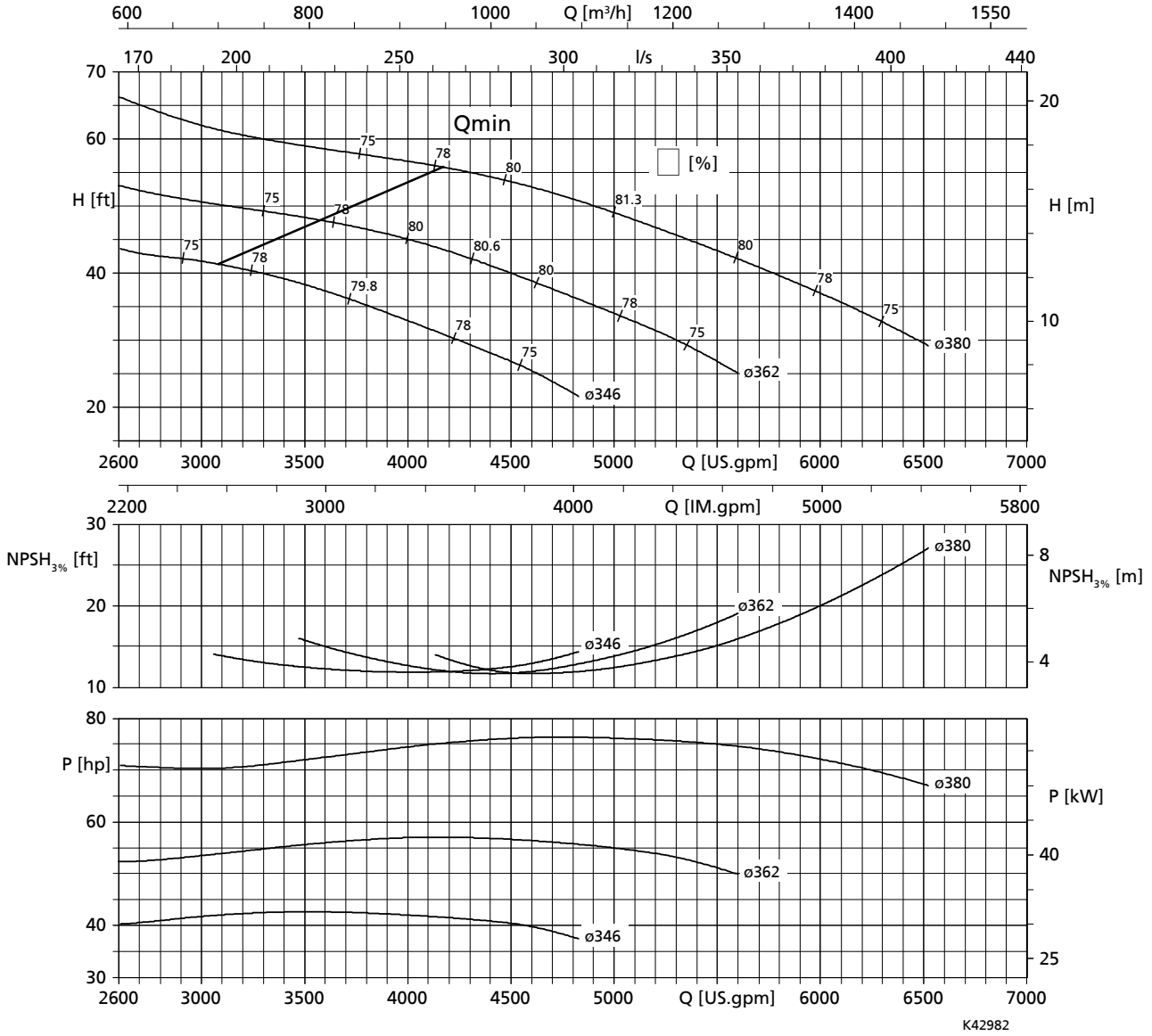
Amacan S 650-404, n = 1180 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 1 $^{5}/_{8}$" [42.0 mm]

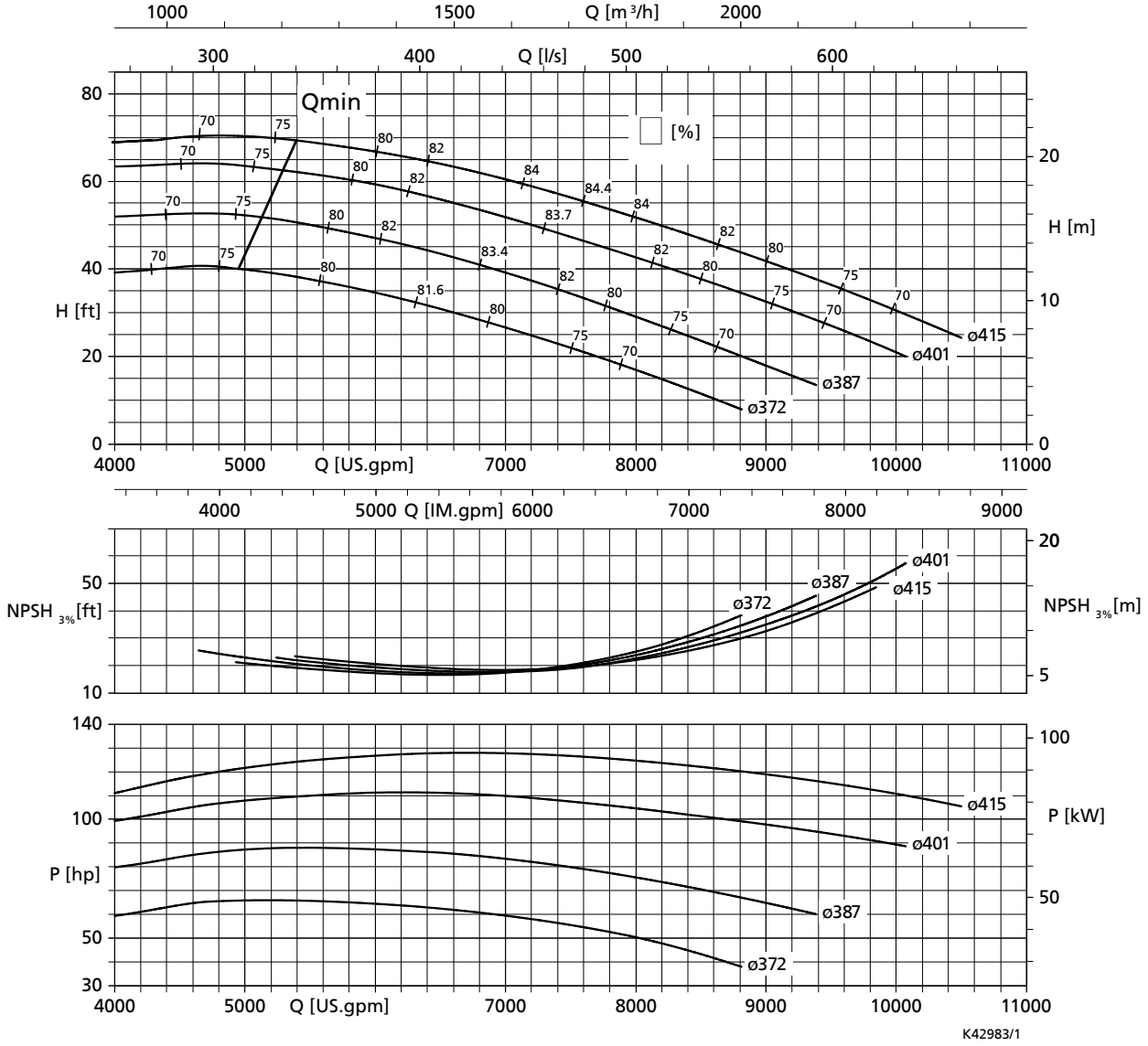
Rated power P_2 and mass moment of inertia J[22)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
650-404 / 30 6 UAG	45	35	0,87
650-404 / 50 6 UAG	63	47	0,88
650-404 / 65 6 UAG	80	60	0,97

22) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Amacan S 650-405, n = 1180 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 1 5/8" [42.0 mm]

Rated power P_2 and mass moment of inertia J[23)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
650-405 / 50 6 UAG	63	47	0,99
650-405 / 65 6 UAG	80	60	1,09
650-405 / 80 6 UAG	100	75	1,21
650-405 / 100 6 UAG	125	95	1,32
650-405 / 120 6 UAG	145	110	1,46

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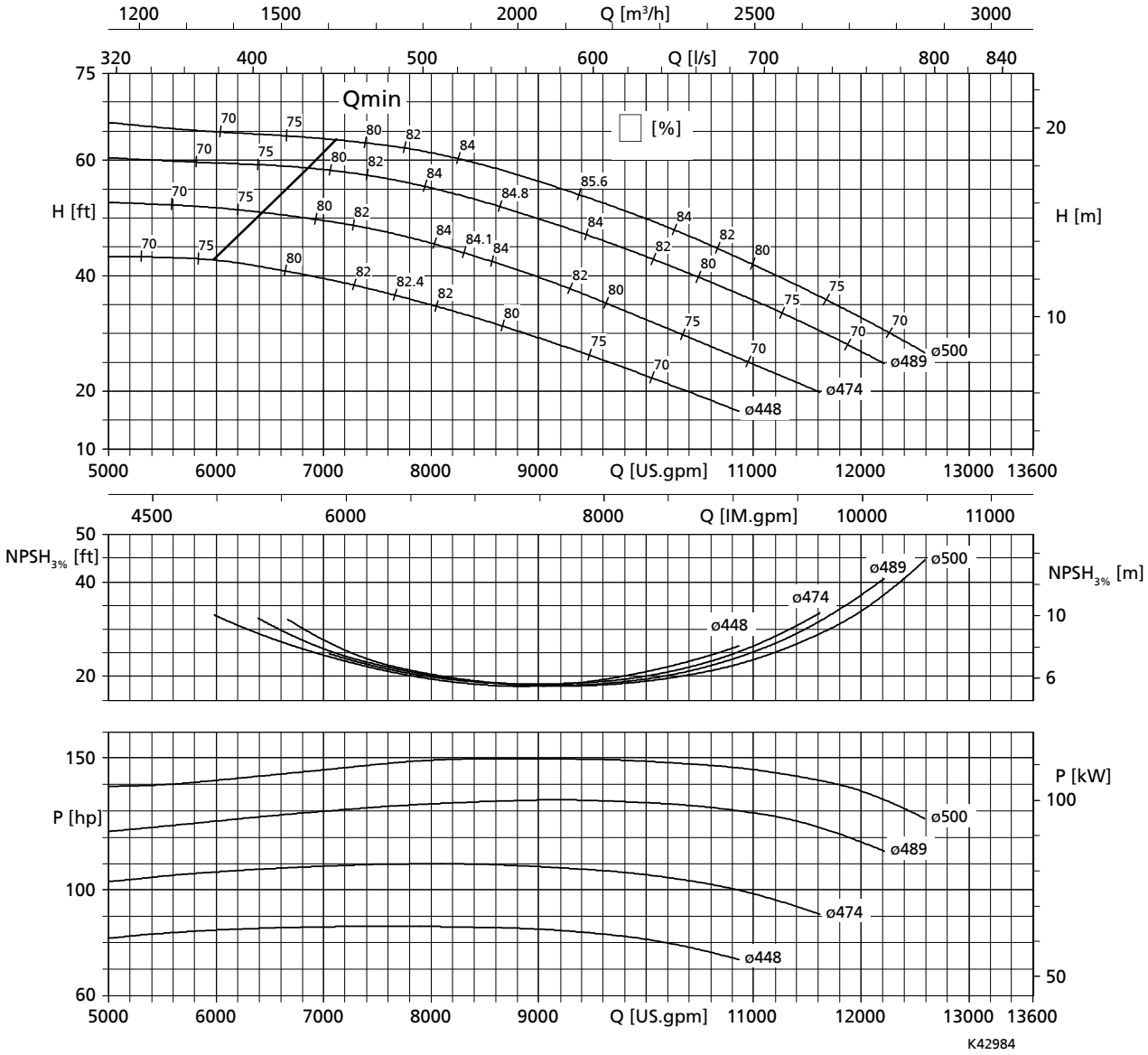
23) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

n = 880 rpm

Amacan S 800-505, n = 880 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 2 ¼" [57.0 mm]

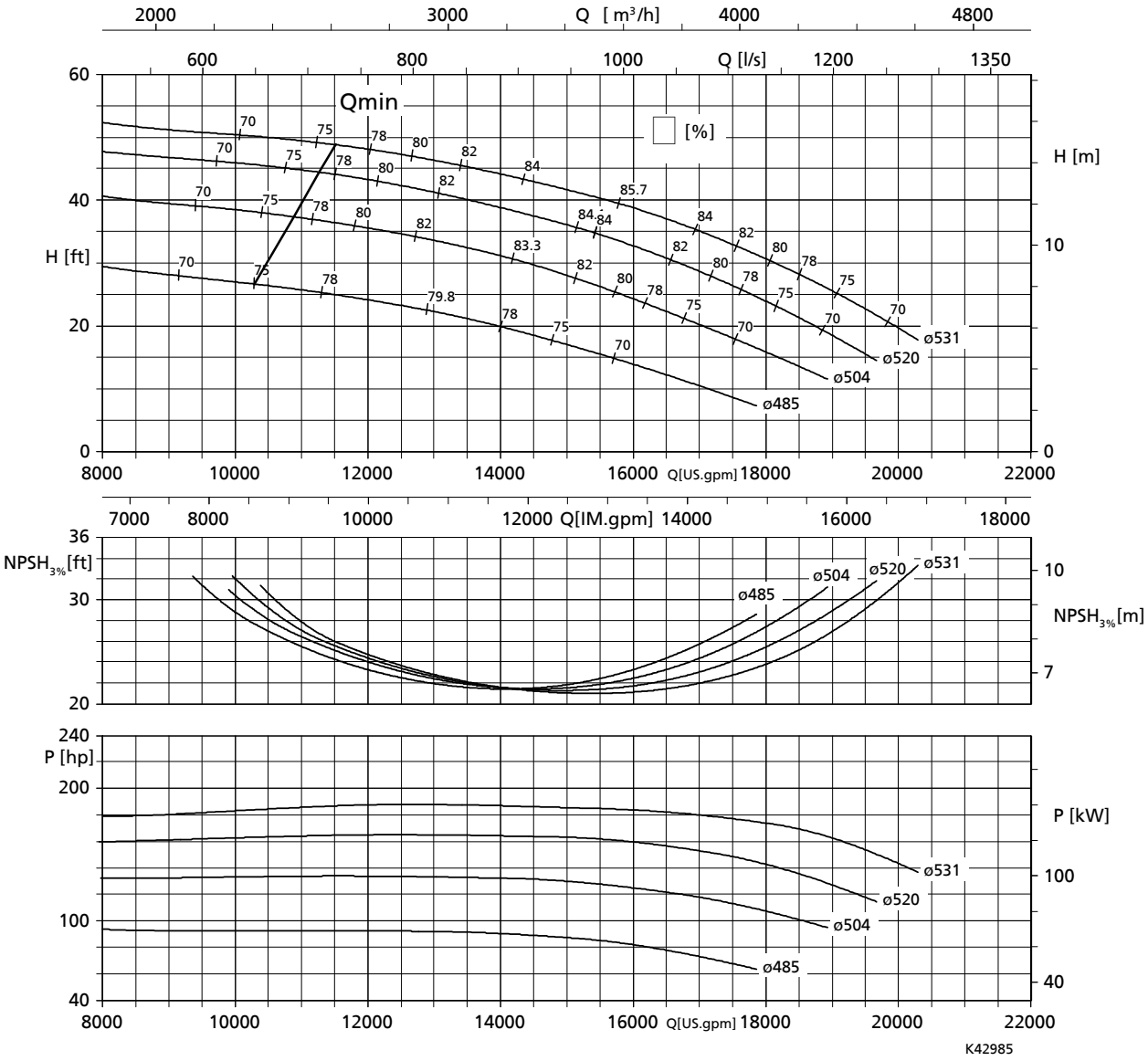
Rated power P_2 and mass moment of inertia J[24)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
800-505 / 75 8 UAG	100	75	3,03
800-505 / 100 8 UAG	135	100	3,34
800-505 / 120 8 UAG	165	125	3,56

24) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Amacan S 800-535, n = 880 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 2 $^{7}/_{8}$" [72.0 mm]

Rated power P_2 and mass moment of inertia J[25)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
800-535 / 85 8 UTG	115	85	3,3
800-535 / 120 8 UTG	160	120	3,3
800-535 / 160 8 UTG	215	160	3,9

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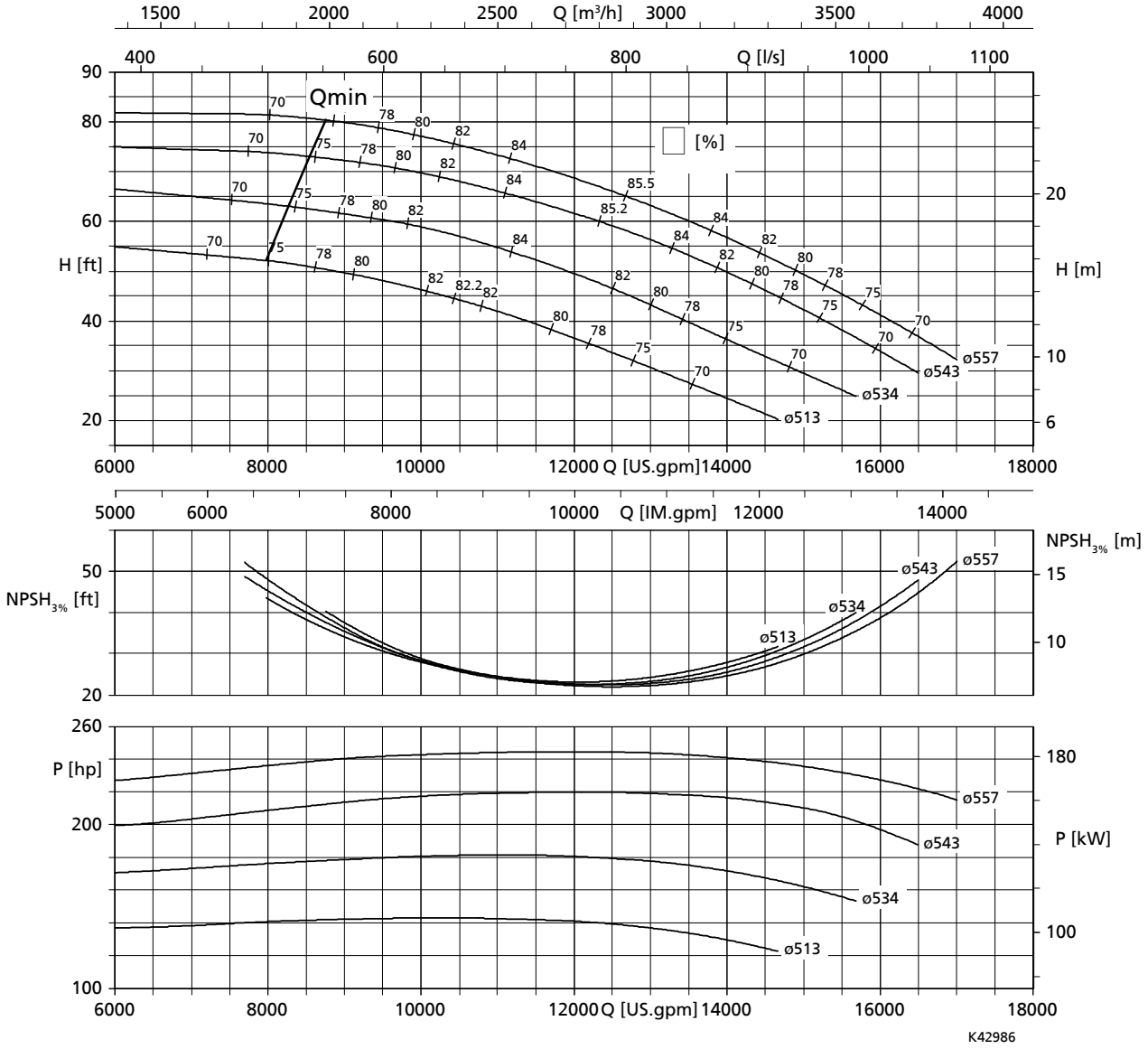
25) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Amacan S 850-550, n = 880 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 2 7/8" [72.0 mm]

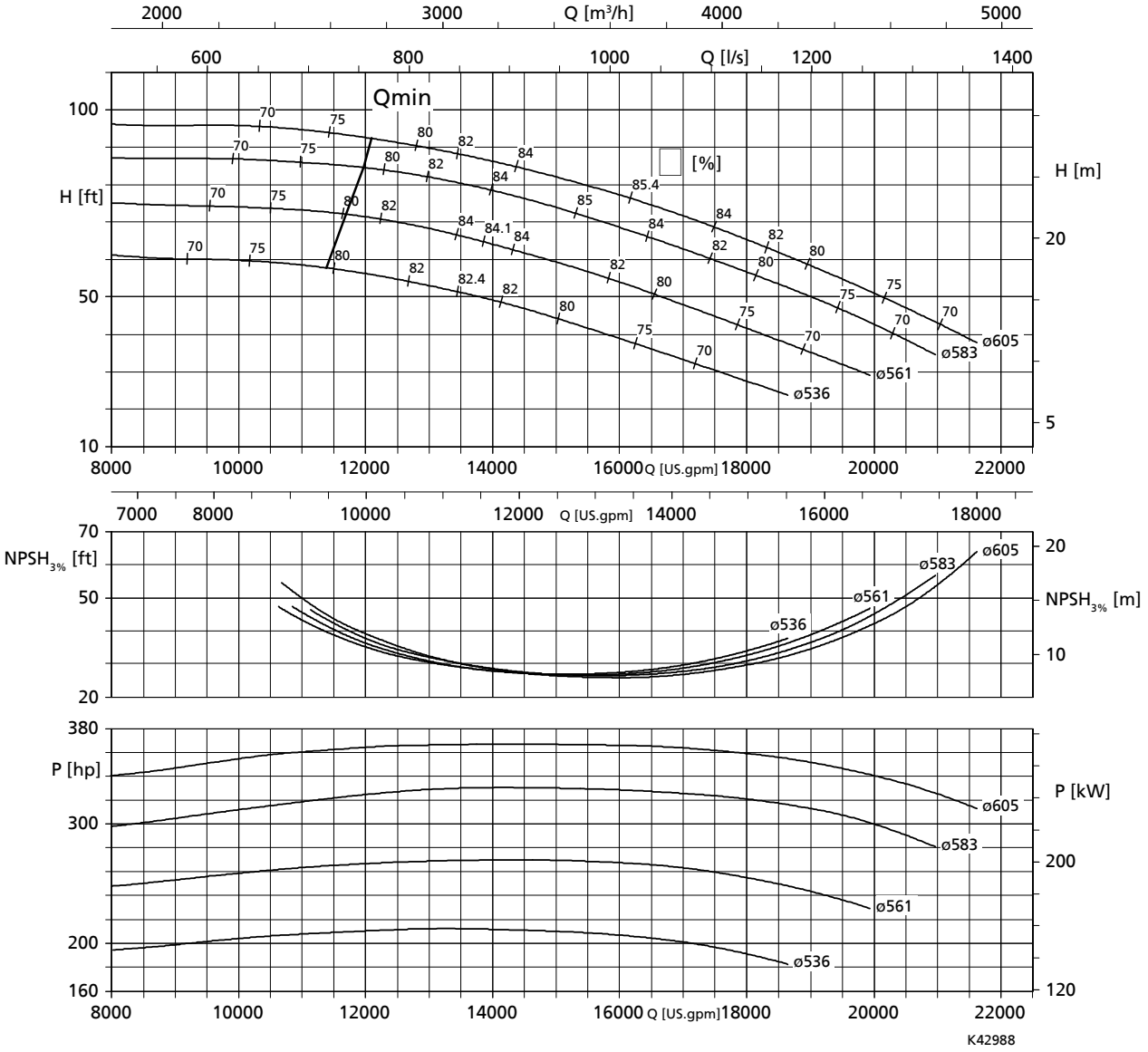
Rated power P_2 and mass moment of inertia J[26)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
850-550 / 120 8 UTG	160	120	4,7
850-550 / 160 8 UTG	215	160	5,3
850-550 / 205 8 UTG	275	205	9,9

26) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Amacan S 900-600, n = 880 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 2 $^{7}/_{8}$" [72.0 mm]

Rated power P_2 and mass moment of inertia J[27)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
900-600 / 205 8 UTG	275	205	10,8
900-600 / 250 8 UTG	335	250	12,1
900-600 / 290 8 UTG	390	290	13,4

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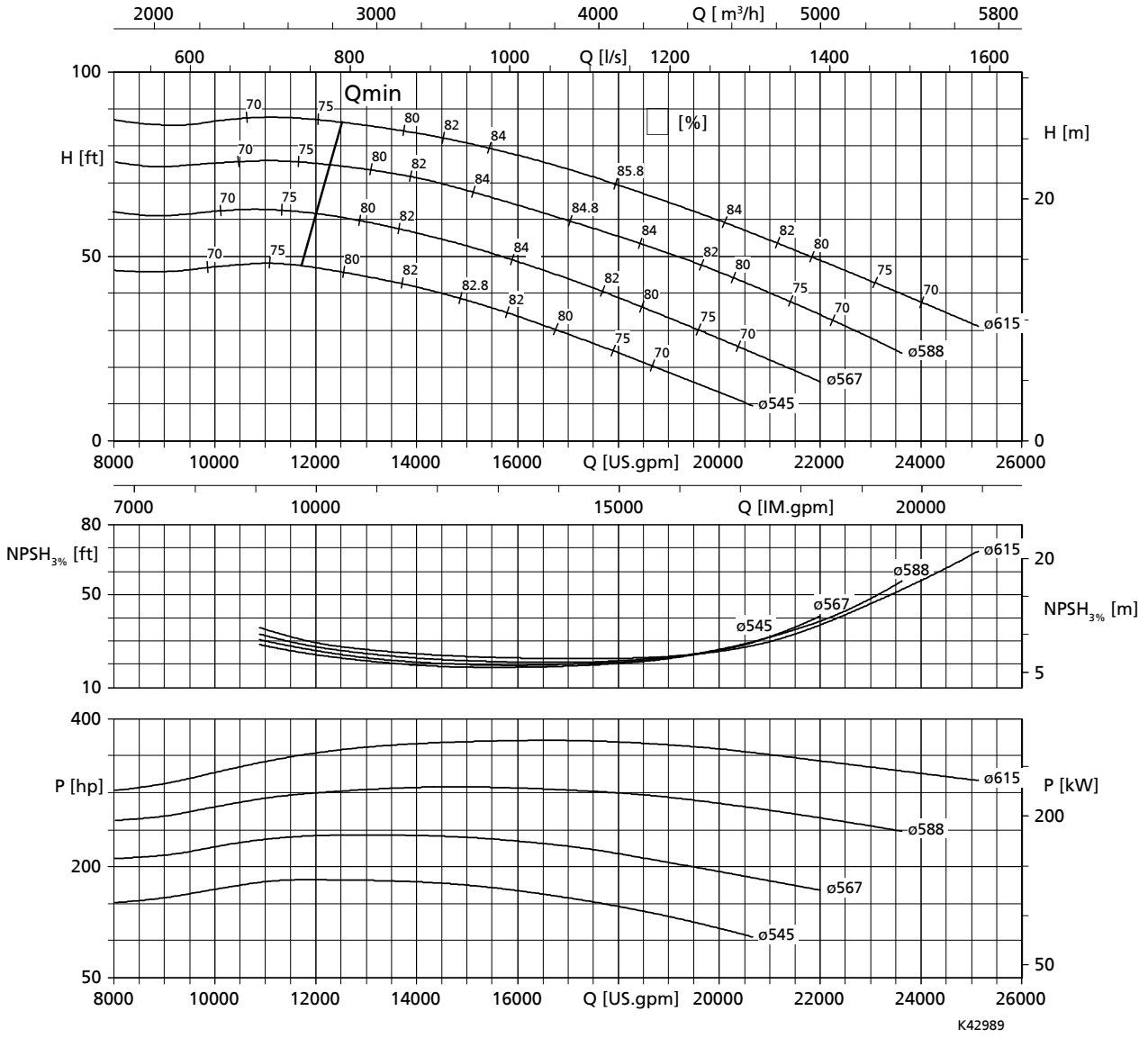
27) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Amacan S 900-615, n = 880 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 2 5/8" [67.0 mm]

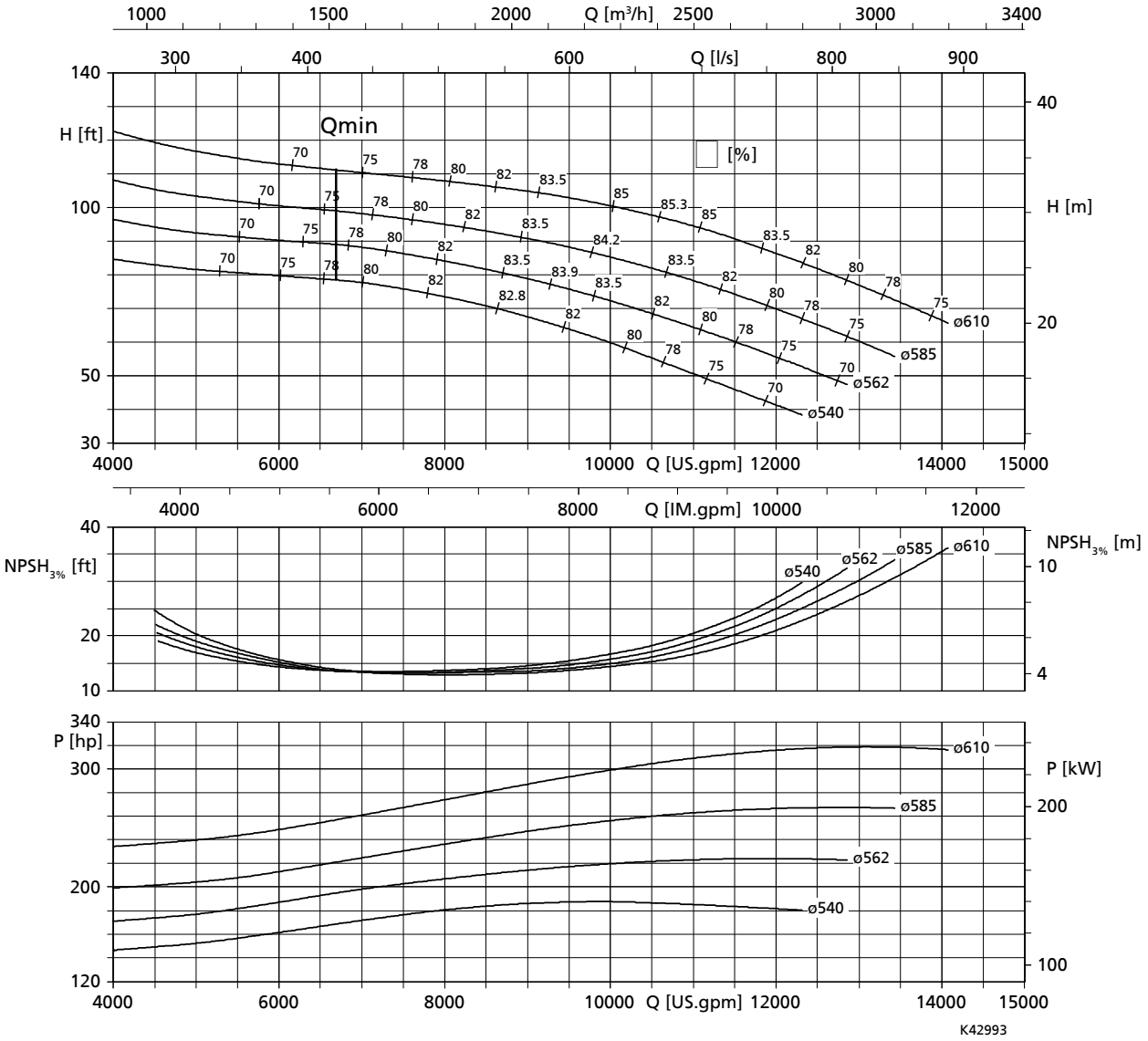
Rated power P_2 and mass moment of inertia J[28)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
900-615 / 205 8 UTG	275	205	11,1
900-615 / 250 8 UTG	335	250	12,4
900-615 / 290 8 UTG	390	290	13,7

28) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Amacan S 900-620, n = 880 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 2 1/4" [58.0 mm]

Rated power P_2 and mass moment of inertia J[29)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
900-620 / 205 8 UTG	275	205	14,1
900-620 / 250 8 UTG	335	250	15,4

29) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

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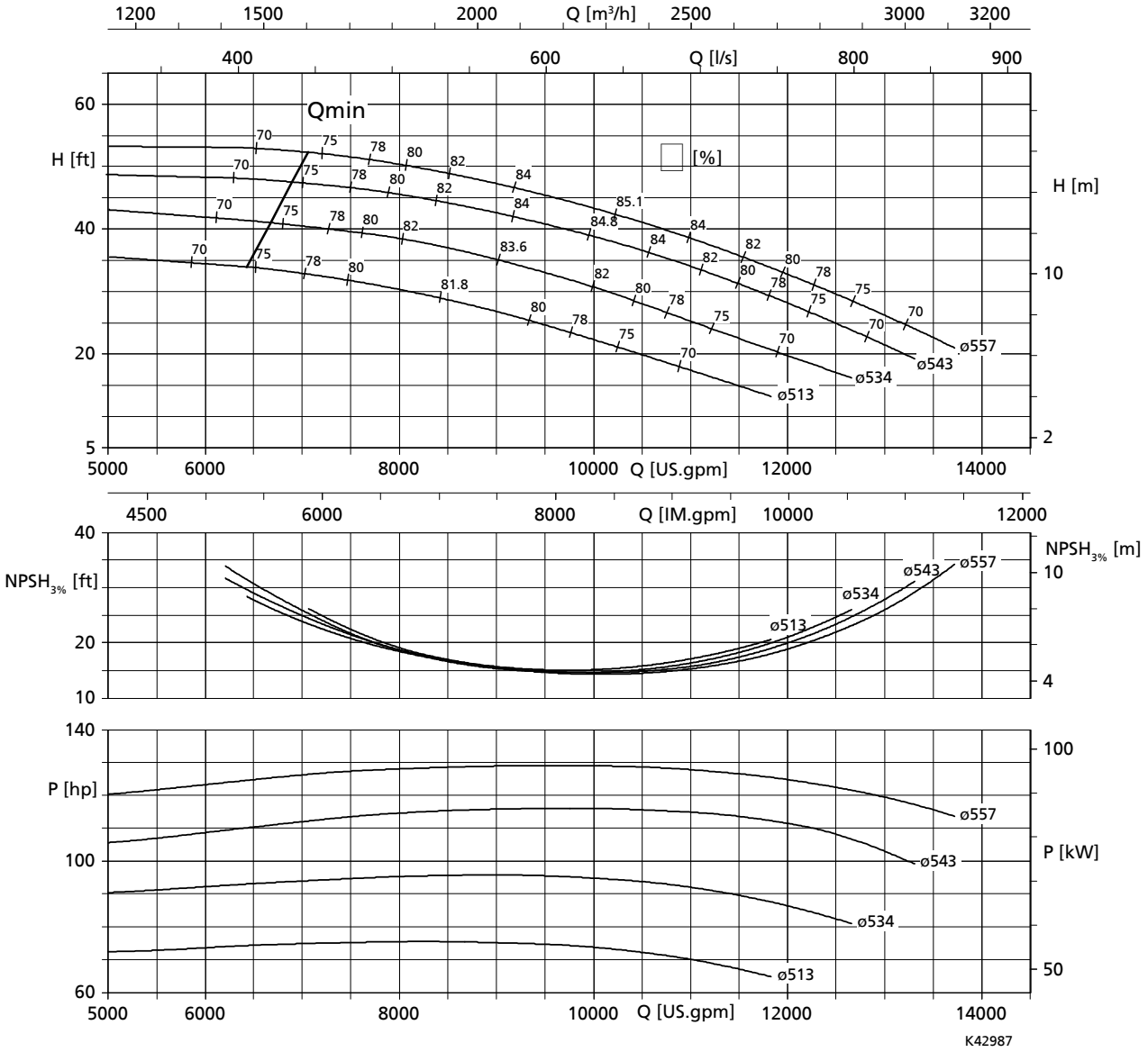
n = 710 rpm

Amacan S 850-550, n = 710 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 2 7/8" [72.0 mm]

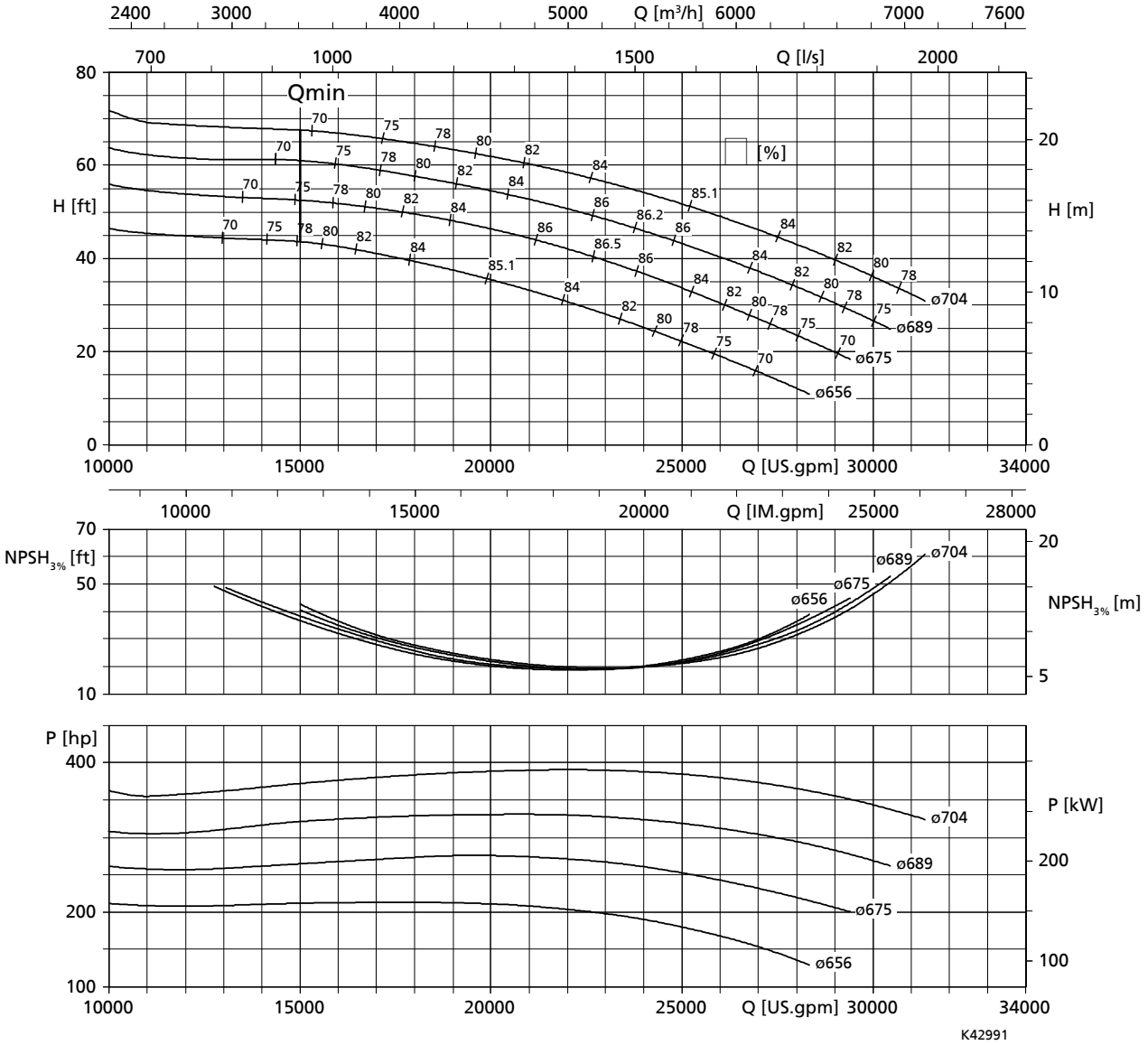
Rated power P_2 and mass moment of inertia J[30)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
850-550 / 60 10 UTG	75	60	4,5
850-550 / 90 10 UTG	120	90	4,9
850-550 / 120 10 UTG	160	120	5,2

30) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Amacan S 1000-655, n = 710 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.



Free passage 4" [103.0 mm]

Rated power P_2 and mass moment of inertia J[31)]

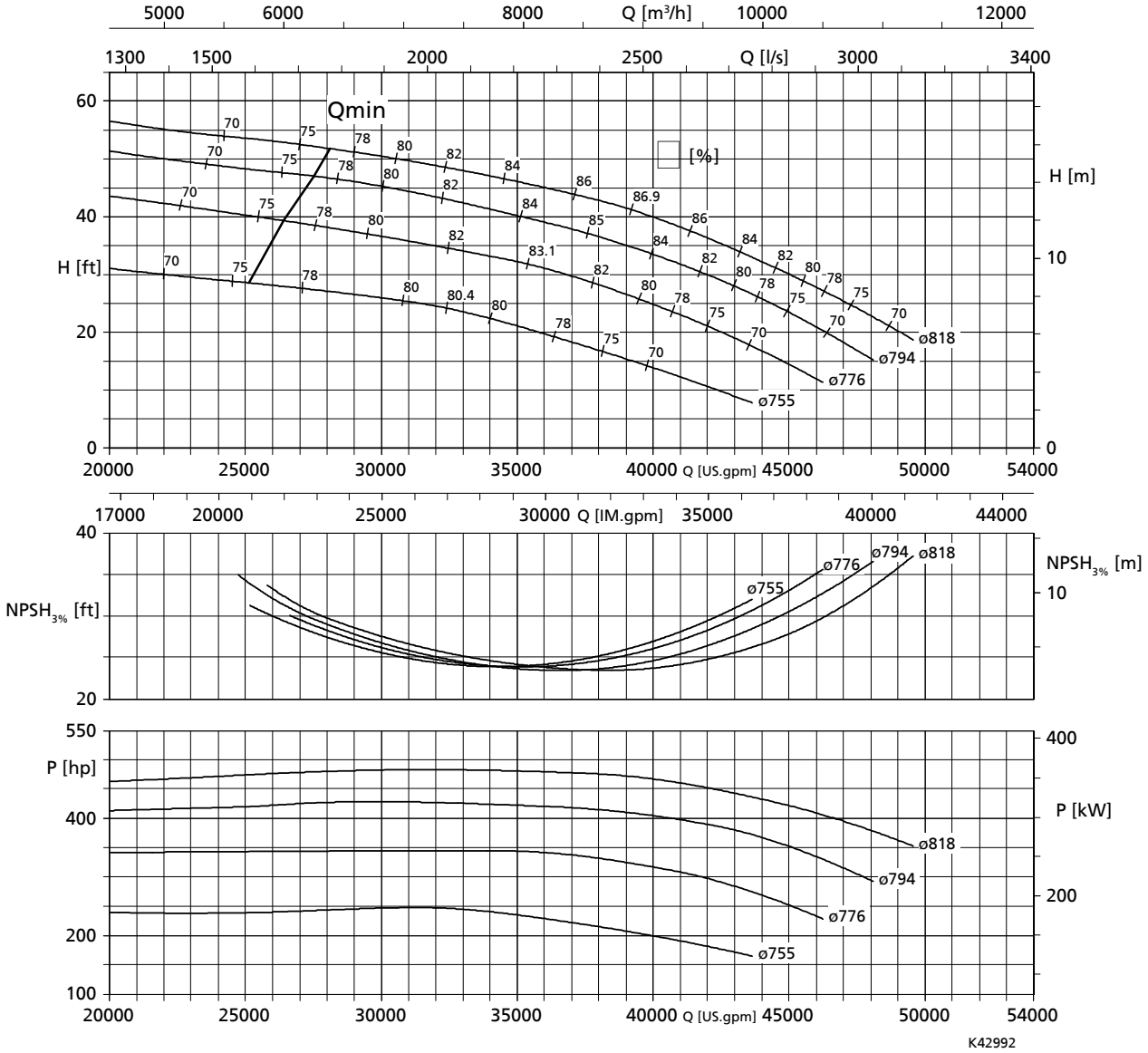
Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
1000-655 / 200 10 UTG	270	200	15,7
1000-655 / 250 10 UTG	335	250	17,8
1000-655 / 310 10 UTG	415	310	23,8

n = 590 rpm

Amacan S 1300-820, n = 590 rpm

Characteristic curves to ISO 9906 / 2 / 2B or Hydraulic Institute, Level B. The characteristic curves correspond to the effective motor speed.

31) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.



Free passage 4 1/2" [116.0 mm]

Rated power P_2 and mass moment of inertia J[32)]

Size	Rated power P_2		Mass moment of inertia J
	[hp]	[kW]	[kgm²]
1300-820 / 190 12 UTG	250	190	24,7
1300-820 / 250 12 UTG	335	250	30,6
1300-820 / 320 12 UTG	430	320	33,3
1300-820 / 370 12 UTG	500	370	36,0

32) These values are valid for a density = 1 kg/dm³ and a kinematic viscosity of up to 20 mm²/s.

Dimensions

UAG motors (650-364 to 800-505) [inch]

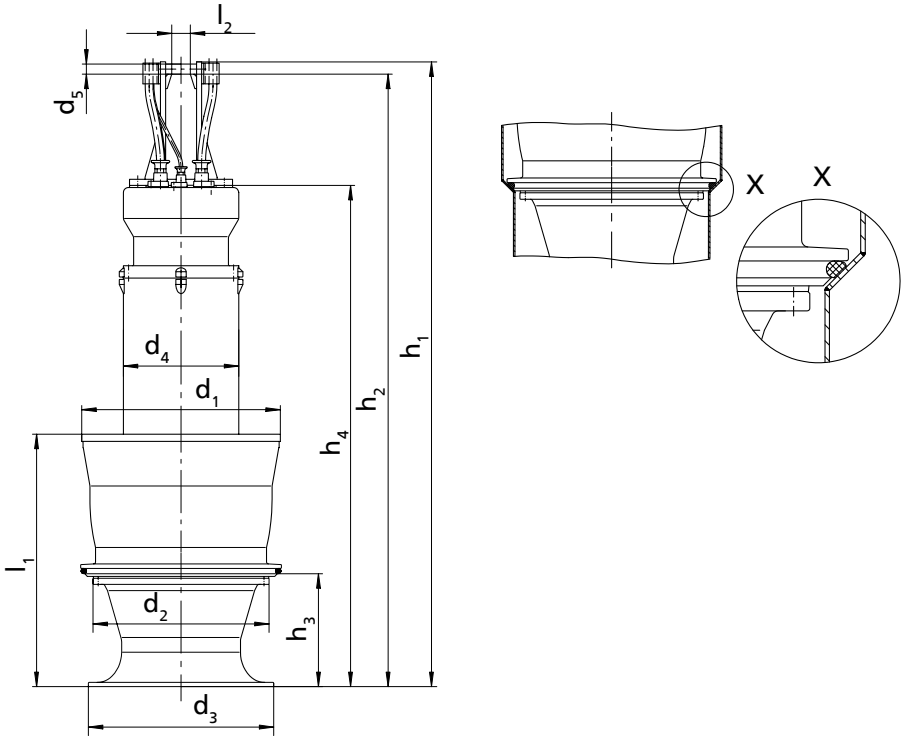


Fig. 1: Dimensions of the pump set

Dimensions of the pump set [inch]

Size	Motor size	Number of poles	h_1	h_2	h_3	h_4	l_1	l_2	d_1	d_2	d_3	d_4	d_5	[lbs][33]
650 - 364	26	6	82 1/4	80 3/4	10 1/4	63 1/4	25 5/8	2 3/4	24 5/8	19 11/16	20 1/16	15 3/8	1 3/8	2050
650 - 364	30	6	82 1/4	80 3/4	10 1/4	63 1/4	25 5/8	2 3/4	24 5/8	19 11/16	20 1/16	15 3/8	1 3/8	2072
650 - 364	50	6	82 1/4	80 3/4	10 1/4	63 1/4	25 5/8	2 3/4	24 5/8	19 11/16	20 1/16	15 3/8	1 3/8	2094
650 - 365	30	6	82 1/4	80 3/4	10 1/4	63 1/4	25 5/8	2 3/4	24 5/8	19 11/16	20 1/16	15 3/8	1 3/8	2039
650 - 365	50	6	82 1/4	80 3/4	10 1/4	63 1/4	25 5/8	2 3/4	24 5/8	19 11/16	20 1/16	15 3/8	1 3/8	2072
650 - 365	65	6	82 1/4	80 3/4	10 1/4	63 1/4	25 5/8	2 3/4	24 5/8	19 11/16	20 1/16	15 3/8	1 3/8	2138
650 - 404	30	6	82 7/8	81	11 3/8	63 3/4	26 1/8	2 3/4	24 7/16	21 1/4	19 11/16	15 3/8	1 3/8	2094
650 - 404	50	6	82 7/8	81	11 3/8	63 3/4	26 1/8	2 3/4	24 7/16	21 1/4	19 11/16	15 3/8	1 3/8	2116
650 - 404	65	6	82 7/8	81	11 3/8	63 3/4	26 1/8	2 3/4	24 7/16	21 1/4	19 11/16	15 3/8	1 3/8	2183
650 - 405	50	6	82 7/8	81	11 3/8	63 3/4	26 1/8	2 3/4	24 7/16	21 1/4	19 11/16	15 3/8	1 3/8	2072
650 - 405	65	6	82 7/8	81	11 3/8	63 3/4	26 1/8	2 3/4	24 7/16	21 1/4	19 11/16	15 3/8	1 3/8	2138
650 - 405	80	6	90 3/4	88 7/8	11 3/8	71 5/8	26 1/8	2 3/4	24 7/16	21 1/4	19 11/16	15 3/8	1 3/8	2425
650 - 405	100	6	90 3/4	88 7/8	11 3/8	71 5/8	26 1/8	2 3/4	24 7/16	21 1/4	19 11/16	15 3/8	1 3/8	2535
650 - 405	120	6	90 3/4	88 7/8	11 3/8	71 5/8	26 1/8	2 3/4	24 7/16	21 1/4	19 11/16	15 3/8	1 3/8	2673
800 - 505	75	8	94 1/2	92 2/8	14 5/8	75 3/8	31 1/4	3 1/2	30 1/2	26 3/16	25 1/4	18 3/4	1 3/4	3395
800 - 505	100	8	99 1/4	97	14 5/8	80 1/8	31 1/4	3 1/2	30 1/2	26 3/16	25 1/4	18 3/4	1 3/4	3660
800 - 505	120	8	99 1/4	97	14 5/8	80 1/8	31 1/4	3 1/2	30 1/2	26 3/16	25 1/4	18 3/4	1 3/4	3770

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33) Complete pump set with 32.8 ft [10 m] power cable (460 V) and 16.4 ft [5 m] support rope

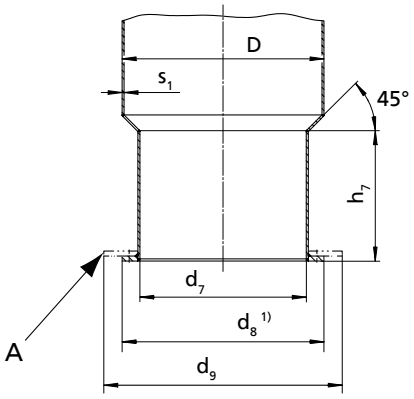

Fig. 2: Dimensions of the discharge tube

A	Suction umbrella; option for reducing the minimum water level
1)	This dimension depends on the type of installation, see booklet of general arrangement drawings.

Dimensions of the discharge tube [inch]

Size	Motor size	Number of poles	D	d_7	h_7	d_9	s_1
650 - 364	26	6	26	20 7/8	8 7/8	35 7/16	5/16
650 - 364	30	6	26	20 7/8	8 7/8	35 7/16	5/16
650 - 364	50	6	26	20 7/8	8 7/8	35 7/16	5/16
650 - 365	30	6	26	20 7/8	8 7/8	35 7/16	5/16
650 - 365	50	6	26	20 7/8	8 7/8	35 7/16	5/16
650 - 365	65	6	26	20 7/8	8 7/8	35 7/16	5/16
650 - 404	30	6	26	20 7/8	10 7/16	35 7/16	5/16
650 - 404	50	6	26	20 7/8	10 7/16	35 7/16	5/16
650 - 404	65	6	26	20 7/8	10 7/16	35 7/16	5/16
650 - 405	50	6	26	20 7/8	10 7/16	35 7/16	5/16
650 - 405	65	6	26	20 7/8	10 7/16	35 7/16	5/16
650 - 405	80	6	26	20 7/8	10 7/16	35 7/16	5/16
650 - 405	100	6	26	20 7/8	10 7/16	35 7/16	5/16
650 - 405	120	6	26	20 7/8	10 7/16	35 7/16	5/16
800 - 505	75	8	32	26 3/4	13 3/16	41 3/8	5/16
800 - 505	100	8	32	26 3/4	13 3/16	41 3/8	5/16
800 - 505	120	8	32	26 3/4	13 3/16	41 3/8	5/16

UTG motors (800-535 to 1300-820) [inch]

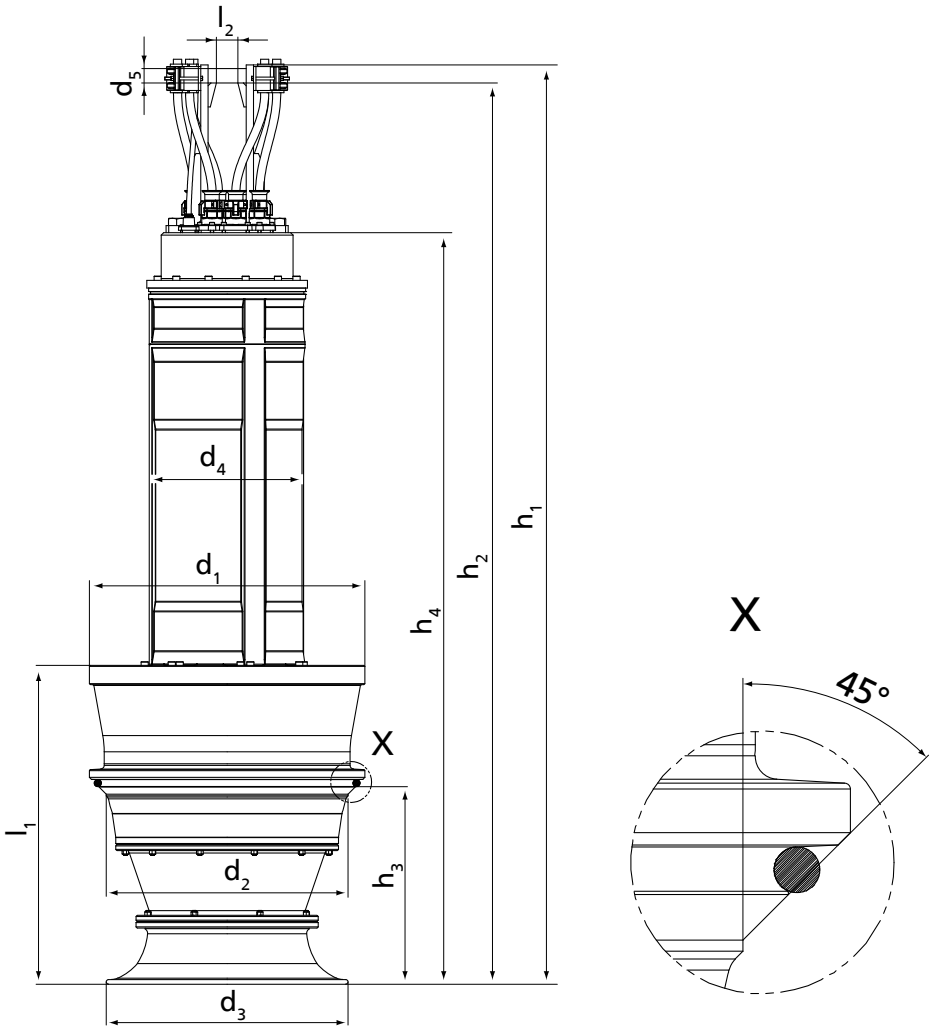

Fig. 3: Dimensions of the pump set

Dimensions of the pump set [inch]

Size	Motor size	Number of poles	h_1	h_2	h_3	h_4	d_1	d_2	d_3	d_4	d_5	l_1	l_2	[lbs][34]
800 - 535	85	8	107 7/8	106 5/16	13 3/4	80 11/16	30 1/2	26 3/8	27 9/16	18 11/16	1 9/16	34 13/16	3 1/8	3726
800 - 535	120	8	107 7/8	106 5/16	13 3/4	80 11/16	30 1/2	26 3/8	27 9/16	18 11/16	1 9/16	34 13/16	3 1/8	3748
800 - 535	160	8	107 7/8	106 5/16	13 3/4	80 11/16	30 1/2	26 3/8	27 9/16	18 11/16	1 9/16	34 13/16	3 1/8	4056
850 - 550	120	8	109 7/16	107 7/8	16 5/16	82 5/16	32 1/2	28 3/8	27 9/16	18 11/16	1 9/16	34 1/16	3 1/8	3825
850 - 550	160	8	109 7/16	107 7/8	16 5/16	82 5/16	32 1/2	28 3/8	27 9/16	18 11/16	1 9/16	34 1/16	3 1/8	4145
850 - 550	205	8	125 9/16	123 1/4	16 5/16	101 15/16	32 1/2	28 3/8	27 9/16	21 7/8	1 15/16	34 1/16	3 9/16	5456
850 - 550	60	10	109 7/16	107 7/8	16 5/16	82 5/16	32 1/2	28 3/8	27 9/16	18 11/16	1 9/16	34 1/16	3 1/8	3682
850 - 550	90	10	109 7/16	107 7/8	16 5/16	82 5/16	32 1/2	28 3/8	27 9/16	18 11/16	1 9/16	34 1/16	3 1/8	3902
850 - 550	120	10	109 7/16	107 7/8	16 5/16	82 5/16	32 1/2	28 3/8	27 9/16	18 11/16	1 9/16	34 1/16	3 1/8	4045
900 - 600	205	8	123 13/16	121 7/16	17 11/16	100 3/16	34 7/16	30 11/16	29 1/2	21 7/8	1 15/16	35 1/4	3 9/16	5677
900 - 600	250	8	123 13/16	121 7/16	17 11/16	100 3/16	34 7/16	30 11/16	29 1/2	21 7/8	1 15/16	35 1/4	3 9/16	6030
900 - 600	290	8	123 13/16	121 7/16	17 11/16	100 3/16	34 7/16	30 11/16	29 1/2	21 7/8	1 15/16	35 1/4	3 9/16	6349
900 - 615	205	8	122 13/16	120 1/2	1117 /16	99 3/16	34 1/4	29 15/16	28 3/4	21 7/8	1 15/16	32 1/16	3 9/16	6129
900 - 615	250	8	122 13/16	120 1/2	1117 /16	99 3/16	34 1/4	29 15/16	28 3/4	21 7/8	1 15/16	32 1/16	3 9/16	6504
900 - 615	290	8	122 13/16	120 1/2	1117 /16	99 3/16	34 1/4	29 15/16	28 3/4	21 7/8	1 15/16	32 1/16	3 9/16	6812
900 - 620	205	8	122 1/4	119 7/8	15 15/16	98 5/8	34 7/16	29 3/4	25 3/8	21 7/8	1 15/16	38 3/16	3 9/16	5831
900 - 620	250	8	122 1/4	119 7/8	15 15/16	98 5/8	34 7/16	29 3/4	25 3/8	21 7/8	1 15/16	38 3/16	3 9/16	6217
1000 - 655	200	10	127 3/8	125	21 5/8	103 3/4	38 3/8	33 11/16	35 7/16	21 7/8	1 15/16	48 1/16	3 9/16	6283
1000 - 655	250	10	127 3/8	125	21 5/8	103 3/4	38 3/8	33 11/16	35 7/16	21 7/8	1 15/16	48 1/16	3 9/16	6757
1000 - 655	310	10	145 1/16	142 1/8	21 5/8	117 1/2	38 3/8	33 11/16	35 7/16	25 9/16	2 3/8	48 1/16	3 9/16	8289
1300 - 820	190	12	129 1/8	126 3/4	23 5/8	105 1/2	47 1/4	38 3/16	41 5/16	21 7/8	1 15/16	47 1/16	3 9/16	8686

34) Complete pump set with 32.8 ft [10 m] power cable (460 V) and 16.4 ft [5 m] support rope

Size	Motor size	Number of poles	h_1	h_2	h_3	h_4	d_1	d_2	d_3	d_4	d_5	l_1	l_2	[lbs][34]
1300 - 820	250	12	140 15/16	138	23 5/8	113 3/8	47 1/4	38 3/16	41 5/16	25 9/16	2 3/8	47 1/16	3 9/16	10119
1300 - 820	320	12	149 13/16	146 7/8	23 5/8	122 1/4	47 1/4	38 3/16	41 5/16	25 9/16	2 3/8	47 1/16	3 9/16	11001
1300 - 820	370	12	149 13/16	146 7/8	23 5/8	122 1/4	47 1/4	38 3/16	41 5/16	25 9/16	2 3/8	47 1/16	3 9/16	11332

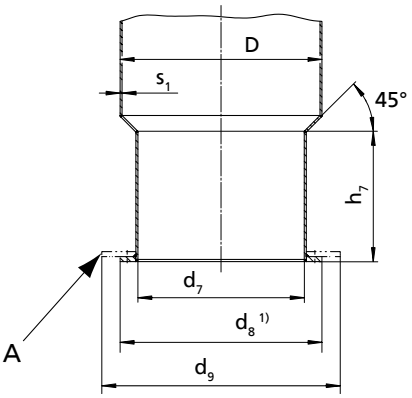

Fig. 4: Dimensions of the discharge tube

A	Suction umbrella; option for reducing the minimum water level
1)	This dimension depends on the type of installation, see booklet of general arrangement drawings.

Dimensions of the discharge tube [inch]

Size	Motor size	Number of poles	D	d_7	d_9	h_7	s_1
800 - 535	85	8	32	28 3/8	51 3/16	12 13/16	5/16
800 - 535	120	8	32	28 3/8	51 3/16	12 13/16	5/16
800 - 535	160	8	32	28 3/8	51 3/16	12 13/16	5/16
850 - 550	120	8	34 3/16	29 1/8	51 3/16	15 3/16	5/16
850 - 550	160	8	34 3/16	29 1/8	51 3/16	15 3/16	5/16
850 - 550	205	8	34 3/16	29 1/8	51 3/16	15 3/16	5/16
850 - 550	60	10	34 3/16	29 1/8	51 3/16	15 3/16	5/16
850 - 550	90	10	34 3/16	29 1/8	51 3/16	15 3/16	5/16
850 - 550	120	10	34 3/16	29 1/8	51 3/16	15 3/16	5/16
900 - 600	205	8	36	31 1/2	51 3/16	16 3/4	3/8
900 - 600	250	8	36	31 1/2	51 3/16	16 3/4	3/8
900 - 600	290	8	36	31 1/2	51 3/16	16 3/4	3/8
900 - 615	205	8	36	30 11/16	51 3/16	16 15/16	3/8
900 - 615	250	8	36	30 11/16	51 3/16	16 15/16	3/8
900 - 615	290	8	36	30 11/16	51 3/16	16 15/16	3/8
900 - 620	205	8	36	30 5/16	51 3/16	14 3/4	3/8
900 - 620	250	8	36	30 5/16	51 3/16	14 3/4	3/8
1000 - 655	200	10	40	36 1/4	59 1/16	20 11/16	3/8
1000 - 655	250	10	40	36 1/4	59 1/16	20 11/16	3/8
1000 - 655	310	10	40	36 1/4	59 1/16	20 11/16	3/8
1300 - 820	250	10	51 15/16	42 1/2	70 7/8	21 7/8	1/2
1300 - 820	310	10	51 15/16	42 1/2	70 7/8	21 7/8	1/2
1300 - 820	365	10	51 15/16	42 1/2	70 7/8	21 7/8	1/2
1300 - 820	420	10	51 15/16	42 1/2	70 7/8	21 7/8	1/2

UAG motors (650-364 to 800-505) [mm]

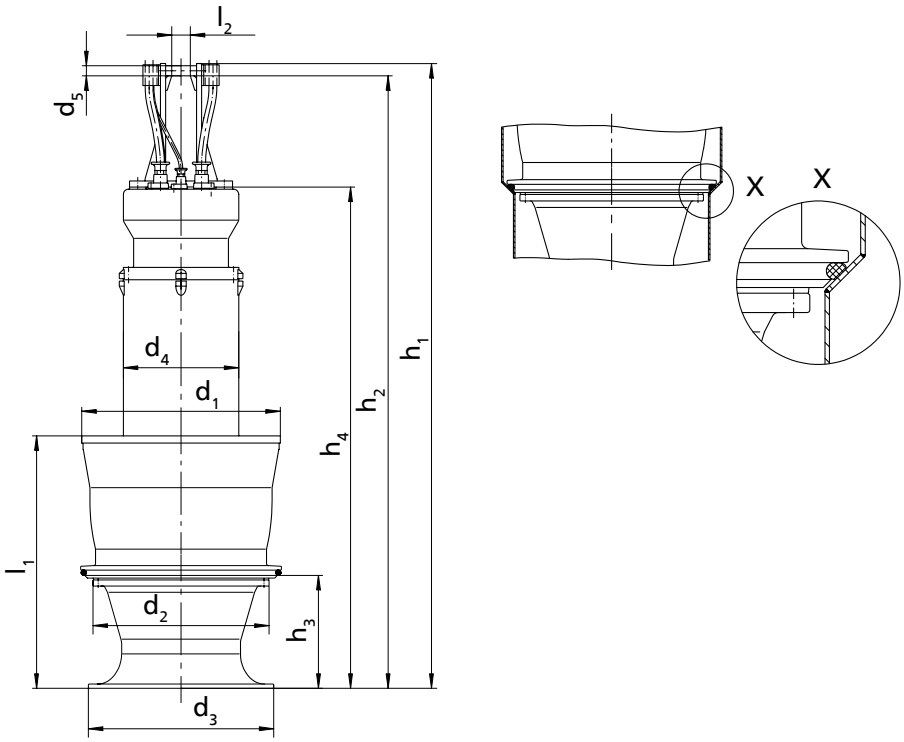

Fig. 5: Dimensions of the pump set

Dimensions of the pump set [mm]

Size	Motor size	Number of poles	h_1	h_2	h_3	h_4	l_1	l_2	d_1	d_2	d_3	d_4	d_5	[kg][35]
650 - 364	26	6	2090	2042	260	1605	651	70	625	500	510	390	35	940
650 - 364	30	6	2090	2042	260	1605	651	70	625	500	510	390	35	940
650 - 364	50	6	2090	2042	260	1605	651	70	625	500	510	390	35	950
650 - 365	30	6	2090	2042	260	1605	651	70	625	500	510	390	35	930
650 - 365	50	6	2090	2042	260	1605	651	70	625	500	510	390	35	940
650 - 365	65	6	2090	2058	260	1605	651	70	625	500	510	390	35	970
650 - 404	30	6	2105	2058	290	1620	665	70	620	–	500	390	35	950
650 - 404	50	6	2105	2058	290	1620	665	70	620	–	500	390	35	960
650 - 404	65	6	2105	2058	290	1620	665	70	620	–	500	390	35	990
650 - 405	50	6	2105	2058	290	1620	665	70	620	–	500	390	35	940
650 - 405	65	6	2105	2258	290	1620	665	70	620	–	500	390	35	970
650 - 405	80	6	2305	2258	290	1820	665	70	620	–	500	390	35	1100
650 - 405	100	6	2305	2258	290	1820	665	70	620	–	500	390	35	1150
650 - 405	120	6	2305	2343	290	1820	665	70	620	–	500	390	35	1190
800 - 505	75	8	2400	2463	370	1915	795	90	775	665	645	480	45	1540
800 - 505	100	8	2520	2463	370	2035	795	90	775	665	645	480	45	1660
800 - 505	120	8	2520	2463	370	2035	795	90	775	665	645	480	45	1710

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35) Complete pump set with 32.8 ft [10 m] power cable (460 V) and 16.4 ft [5 m] support rope

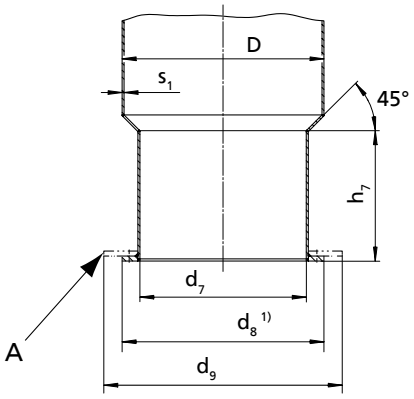

Fig. 6: Dimensions of the discharge tube

A	Suction umbrella; option for reducing the minimum water level
1)	This dimension depends on the type of installation, see booklet of general arrangement drawings.

Dimensions of the discharge tube [mm]

Size	Motor size	Number of poles	D	d_7	h_7	d_9	s_1
650 - 364	26	6	660	530	225	900	7,1
650 - 364	30	6	660	530	225	900	7,1
650 - 364	50	6	660	530	225	900	7,1
650 - 365	30	6	660	530	225	900	7,1
650 - 365	50	6	660	530	225	900	7,1
650 - 365	65	6	660	530	225	900	7,1
650 - 404	30	6	660	530	265	900	7,1
650 - 404	50	6	660	530	265	900	7,1
650 - 404	65	6	660	530	265	900	7,1
650 - 405	50	6	660	530	265	900	7,1
650 - 405	65	6	660	530	265	900	7,1
650 - 405	80	6	660	530	265	900	7,1
650 - 405	100	6	660	530	265	900	7,1
650 - 405	120	6	660	530	265	900	7,1
800 - 505	75	8	813	680	335	1050	8
800 - 505	100	8	813	680	335	1050	8
800 - 505	120	8	813	680	335	1050	8

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UTG motors (800-535 to 1300-820) [mm]

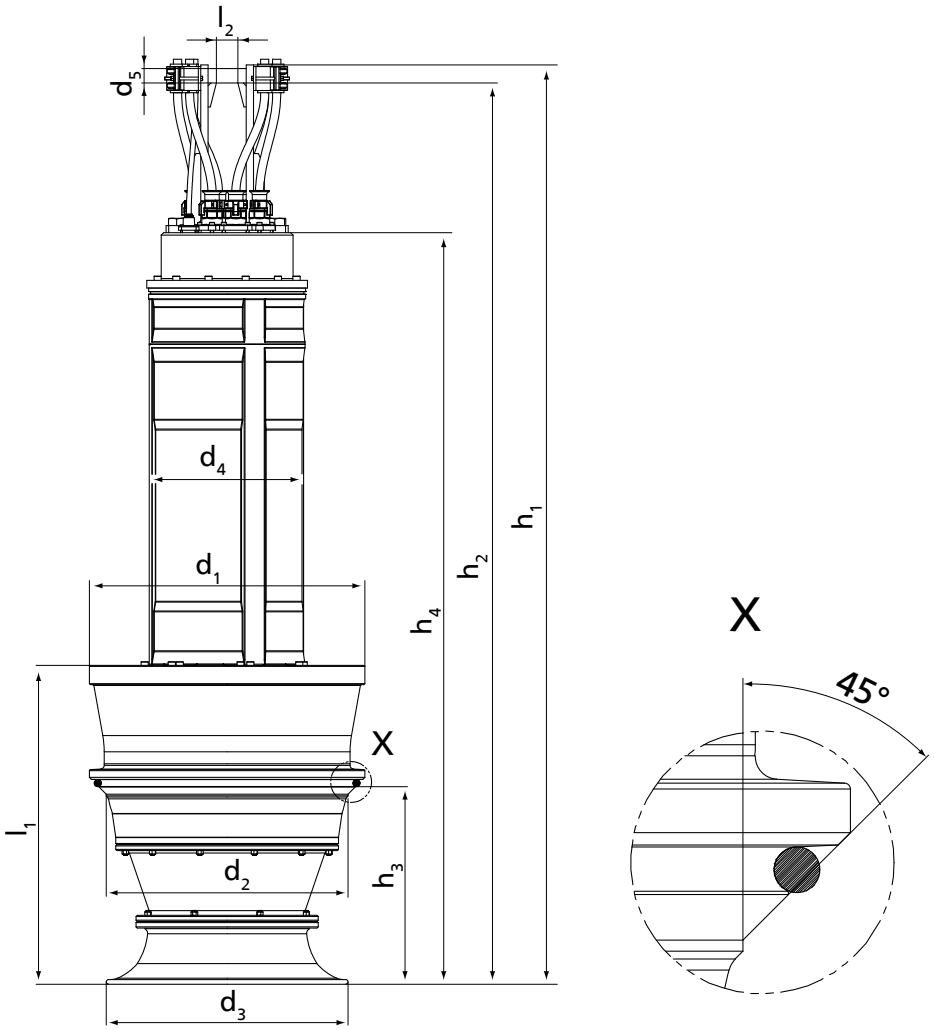


Fig. 7: Dimensions of the pump set

Dimensions of the pump set [mm]

Size	Motor size	Number of poles	h_1	h_2	h_3	h_4	d_1	d_2	d_3	d_4	d_5	l_1	l_2	[kg][36]
800 - 535	85	8	2740	2700	350	2050	775	670	700	475	40	885	80	1690
800 - 535	120	8	2740	2700	350	2050	775	670	700	475	40	885	80	1700
800 - 535	160	8	2740	2700	350	2050	775	670	700	475	40	885	80	1840
850 - 550	120	8	2780	2740	415	2090	826	720	700	475	40	865	80	1735
850 - 550	160	8	2780	2740	415	2090	826	720	700	475	40	865	80	1880
850 - 550	205	8	3190	3130	415	2590	826	720	700	555	50	865	90	2475
850 - 550	60	10	2780	2740	415	2090	826	720	700	475	40	865	80	1670
850 - 550	90	10	2780	2740	415	2090	826	720	700	475	40	865	80	1770
850 - 550	120	10	2780	2740	415	2090	826	720	700	475	40	865	80	1835
900 - 600	205	8	3145	3085	450	2545	875	780	750	555	50	895	90	2575
900 - 600	250	8	3145	3085	450	2545	875	780	750	555	50	895	90	2735
900 - 600	290	8	3145	3085	450	2545	875	780	750	555	50	895	90	2880
900 - 615	205	8	3120	3060	450	2520	870	760	730	555	50	815	90	2780
900 - 615	250	8	3120	3060	450	2520	870	760	730	555	50	815	90	2950
900 - 615	290	8	3120	3060	450	2520	870	760	730	555	50	815	90	3090
900 - 620	205	8	3105	3045	405	2505	875	755	645	555	50	970	90	2645
900 - 620	250	8	3105	3045	405	2505	875	755	645	555	50	970	90	2820
1000 - 655	200	10	3235	3175	550	2635	975	855	900	555	50	1220	90	2850
1000 - 655	250	10	3235	3175	550	2635	975	855	900	555	50	1220	90	3065

36) Complete pump set with 32.8 ft [10 m] power cable (460 V) and 16.4 ft [5 m] support rope

Size	Motor size	Number of poles	h_1	h_2	h_3	h_4	d_1	d_2	d_3	d_4	d_5	l_1	l_2	[kg][36]
1000 - 655	310	10	3685	3610	550	2985	975	855	900	650	60	1220	90	3760
1300 - 820	190	12	3280	3220	600	2680	1200	970	1050	555	50	1195	90	3940
1300 - 820	250	12	3580	3505	600	2880	1200	970	1050	650	60	1195	90	4590
1300 - 820	320	12	3805	3730	600	3105	1200	970	1050	650	60	1195	90	4990
1300 - 820	370	12	3805	3730	600	3105	1200	970	1050	650	60	1195	90	5140

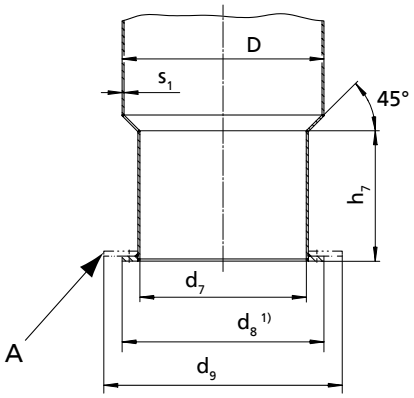


Fig. 8: Dimensions of the discharge tube

A	Suction umbrella; option for reducing the minimum water level
1)	This dimension depends on the type of installation, see booklet of general arrangement drawings.

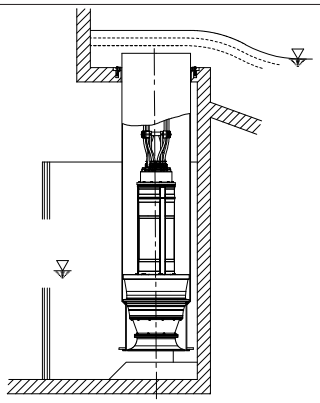
Dimensions of the discharge tube [mm]

Size	Motor size	Number of poles	D	d_7	d_9	h_7	s_1
800 - 535	85	8	813	720	1300	325	8
800 - 535	120	8	813	720	1300	325	8
800 - 535	160	8	813	720	1300	325	8
850 - 550	120	8	868	740	1300	375	8
850 - 550	160	8	868	740	1300	375	8
850 - 550	205	8	868	740	1300	375	8
850 - 550	60	10	868	740	1300	375	8
850 - 550	90	10	868	740	1300	375	8
850 - 550	120	10	868	740	1300	375	8
900 - 600	205	8	914	800	1300	415	10
900 - 600	250	8	914	800	1300	415	10
900 - 600	290	8	914	800	1300	415	10
900 - 615	205	8	914	780	1300	420	10
900 - 615	250	8	914	780	1300	420	10
900 - 615	290	8	914	780	1300	420	10
900 - 620	205	8	914	770	1300	365	10
900 - 620	250	8	914	770	1300	365	10
1000 - 655	200	10	1016	920	1500	515	10
1000 - 655	250	10	1016	920	1500	515	10
1000 - 655	310	10	1016	920	1500	515	10
1300 - 820	190	12	1320	1080	1800	545	12
1300 - 820	250	12	1320	1080	1800	545	12
1300 - 820	320	12	1320	1080	1800	545	12
1300 - 820	370	12	1320	1080	1800	545	12

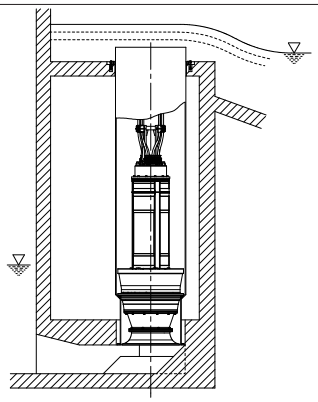
Installation types

Six design variants[37] are available for the following installation types:

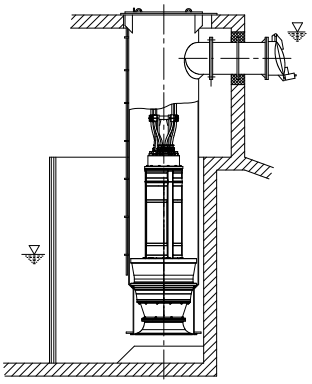
Types of installation



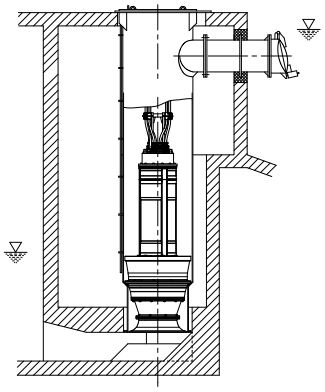
BU discharge tube
Overflow design for installation in open intake chamber



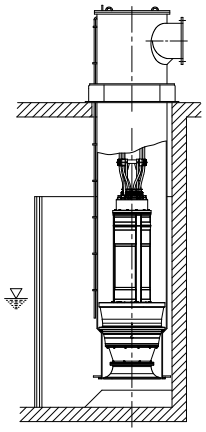
BG discharge tube
Overflow design for installation in covered intake chamber with low suction-side water levels



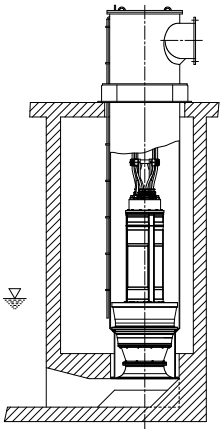
CU discharge tube
Design with underfloor discharge for installation in open intake chamber



CG discharge tube
Design with underfloor discharge for installation in covered intake chamber with low suction-side water levels



DU discharge tube
Design with above floor discharge nozzle for installation in open intake chamber



DG discharge tube
Design with above floor discharge nozzle for installation in covered intake chamber with low suction-side water levels

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37) For information on the various designs (foundation measurements, intake chamber, etc.) refer to the general arrangement drawings.

Scope of supply

Depending on the model, the following items are included in the scope of supply:

- **Basic variant:** pump set complete with power cable 32.8 ft [10 m]
- O-ring
- Back-up name plate

Accessories (optional):

- Support rope
- Accessories for installing the cable support
  - Spacer
  - Turnbuckle
  - Support
  - Shackle
  - Cable clamps
- Cable support sleeves
- Flow-straightening vane to prevent floor vortices
- Discharge tube in various designs (steel or GFK)

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Accessories

Flow-straightening vane and intake chamber

Design of the intake chamber wall surfaces (to prevent vortex formation)

The flow-straightening vane is indispensable for the inlet conditions of the pump set. It prevents the development of a submerged vortex (floor vortex) which could cause a drop in performance, for example. In addition, the floor and wall surfaces of the intake chamber should be designed as a rough concrete surface. Rough surfaces minimize the separation of boundary layers that may cause wall and floor vortices.

Flow-straightening vane and intake chamber

- The anti-vortex vanes in the bellmouth must be aligned with the flow-straightening vane.
- The bail of the pump is oriented in the same direction as the anti-vortex vanes in the bellmouth.

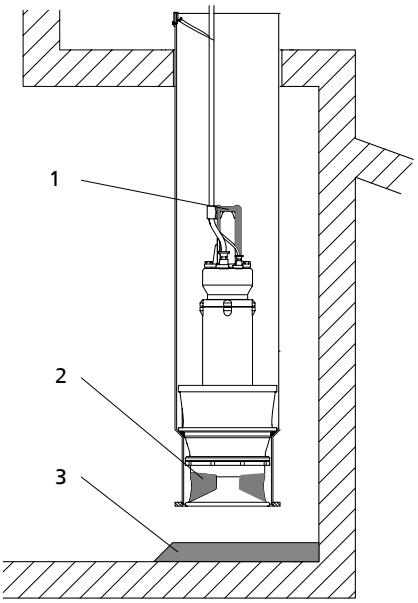
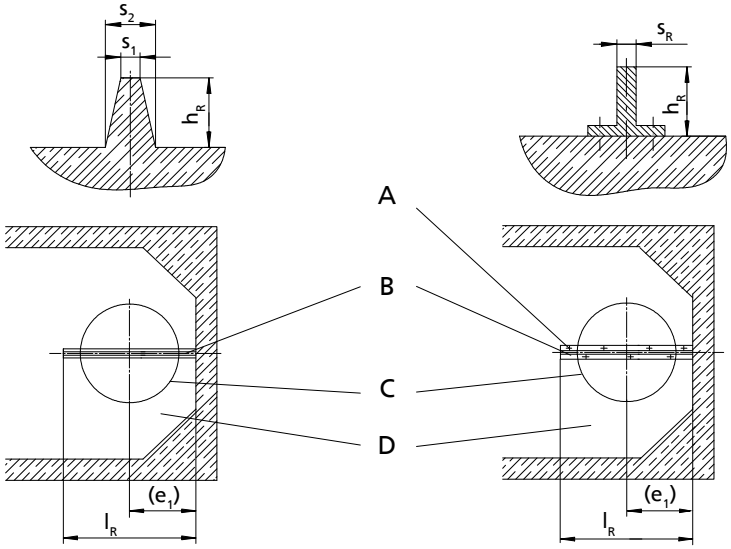


Fig. 9: Installation position of the pump set

1	Bail
2	Anti-vortex vanes
3	Flow-straightening vane

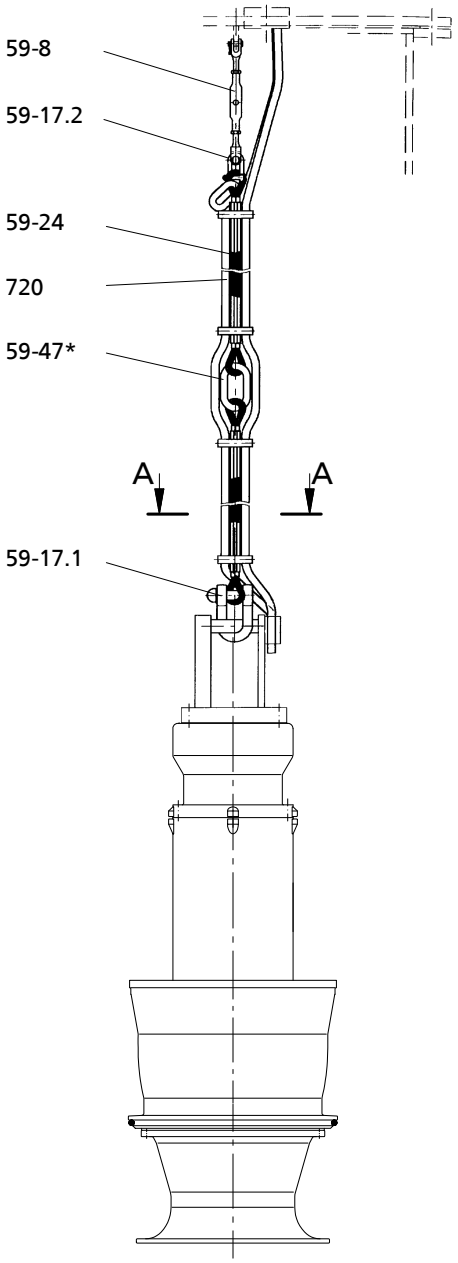
Variant 1
Flow-straightening vane cast from concrete

Variant 2
Steel section

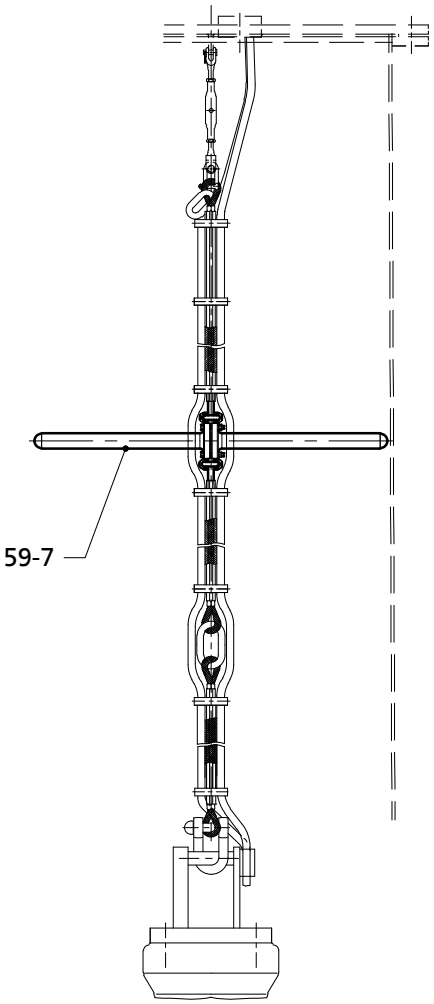


A	Bolted to the floor of the intake chamber
B	Flow-straightening vane centered beneath the discharge tube
C	Discharge tube
D	Intake chamber

Support rope and turnbuckle in the discharge tube



For large installation depths
(with support spacer)



*= The number of (intermediate) lifting rings depends on the lifting height of the lifting equipment and on the building structure. (Intermediate lifting rings are supplied as an option).

List of components

Part no.	Description	Material
59-8	Turnbuckle	Stainless steel
59-17.2	Shackle	Stainless steel
59-47	(Intermediate) lifting ring(s)	Stainless steel
59-24	Rope, low rotation design	Stainless steel

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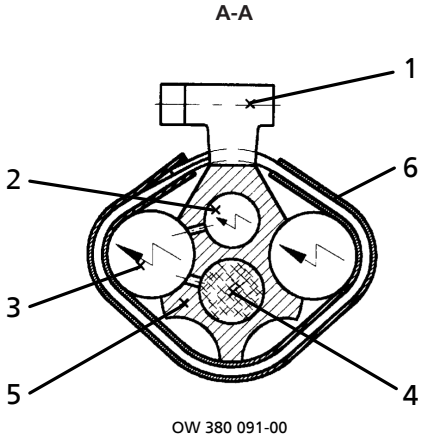
Part no.	Description	Material
720	Spacer	EPDM
59-17.1	Shackle	Galvanized steel (stainless steel optional)
59-7	Support spacer	GFRP

Cross-section of cable support

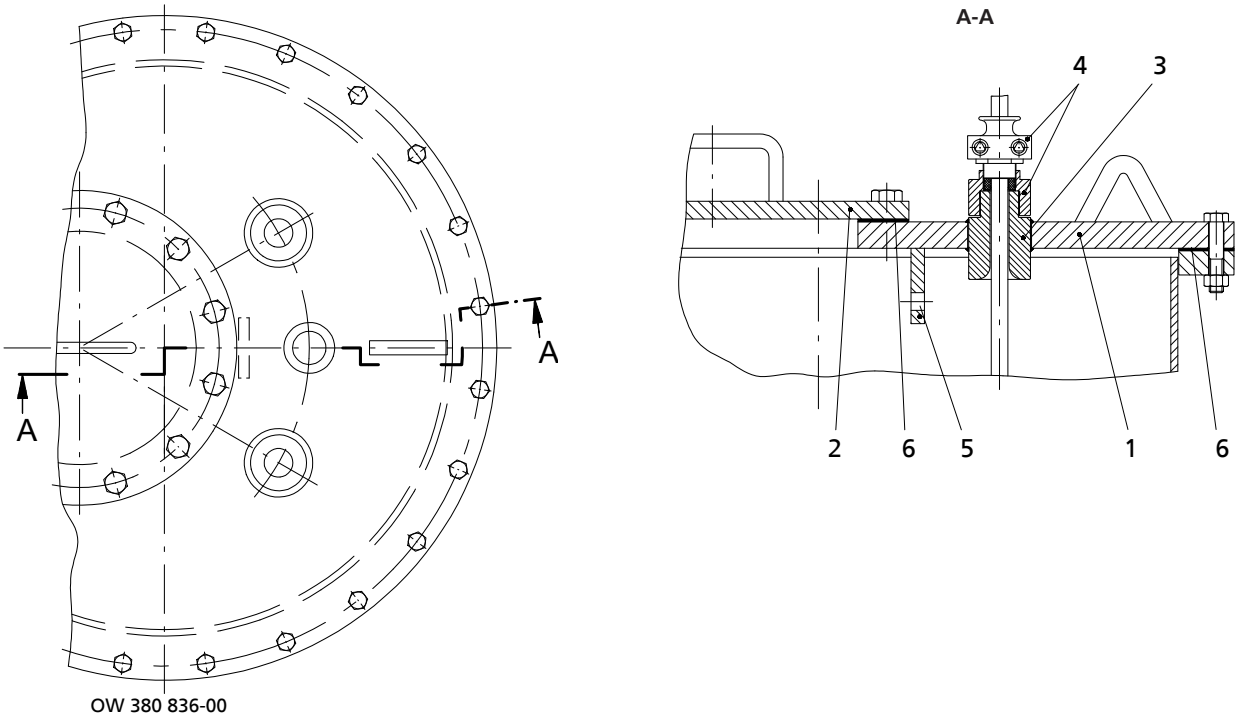


List of components

Part no.	Description	Part no.	Description
1	Cable clamp (approximately every 400 mm)	4	Support rope 59-24
2	Control cable	5	Spacer
3	Power cable	6	Clamp cover

Discharge tube cover with cable gland

Design variant with welding sleeve



List of components

Part No.	Description	Part No.	Description
1	Discharge tube cover	4	Threaded bush with cable entry to DIN 22419 with strain relief and protection against kinking and twisting
2	Cover	5	Eyeplate for fastening the cable support (support rope)
3	Welding sleeve	6	Gasket, e.g. fabric-reinforced rubber

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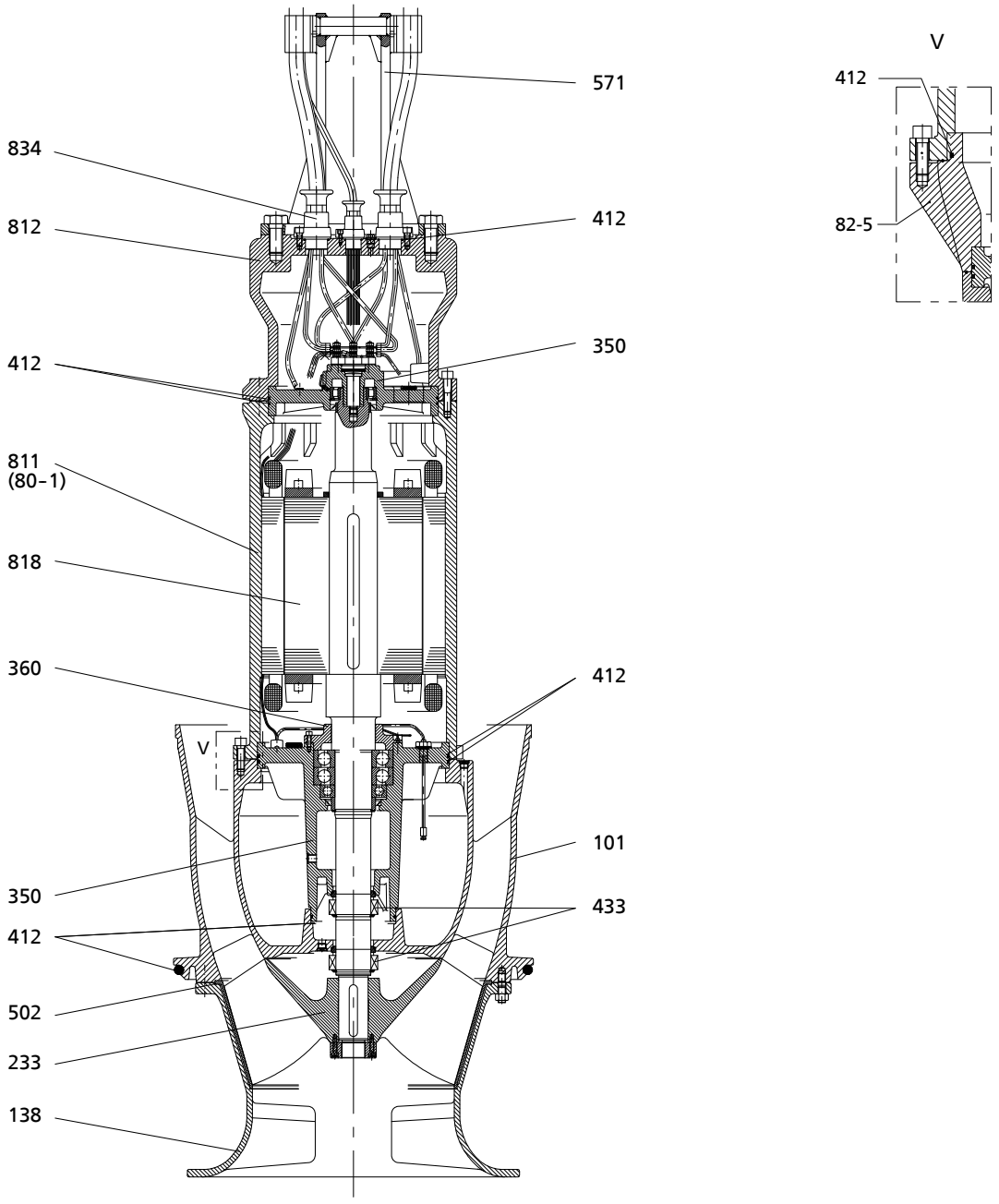
General assembly drawing

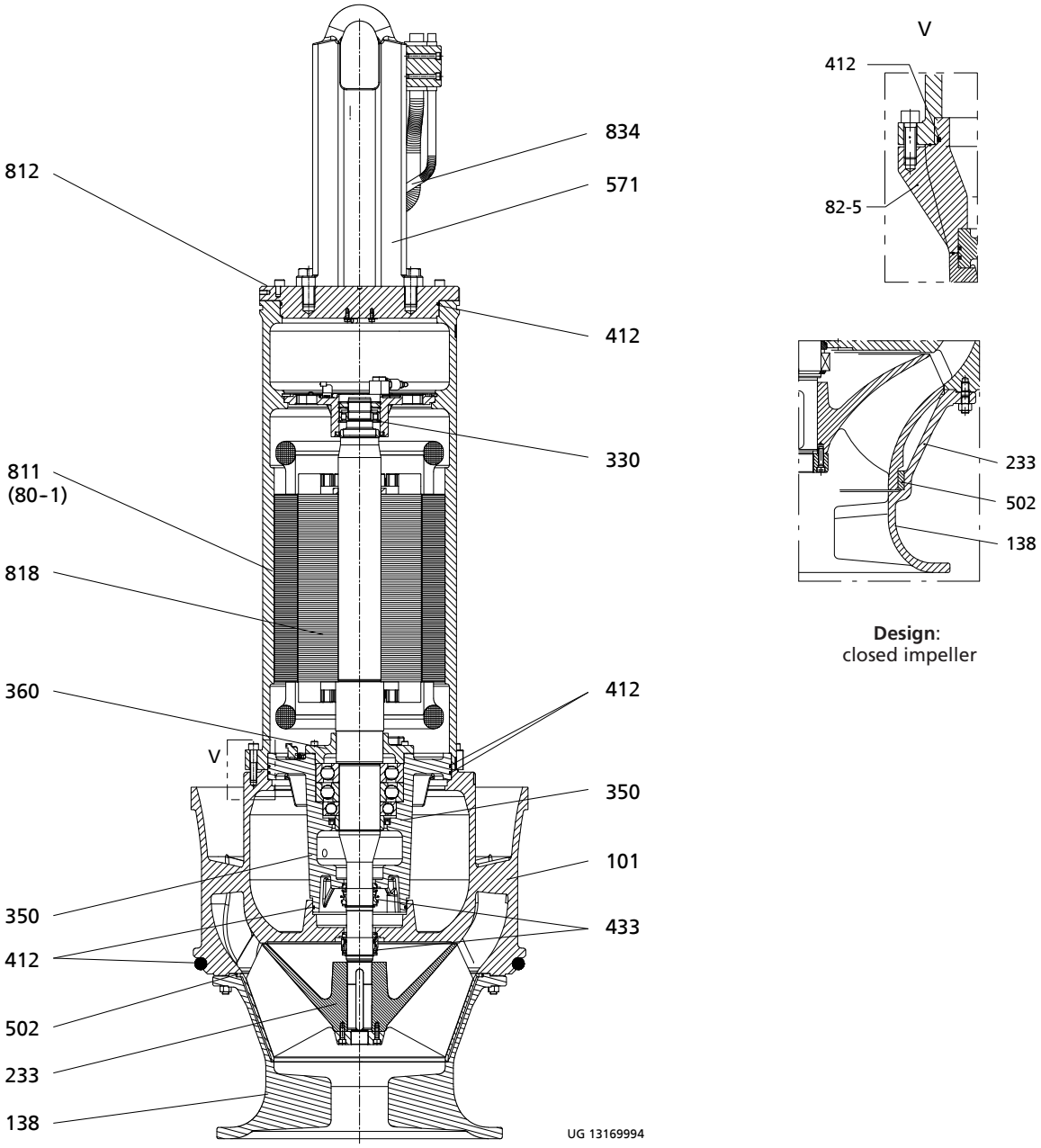
Amacan S 650-364 / 650-365
Amacan S 650-404 / 650-405
Amacan S 800-505
Motor version: UAG



List of components

Part No.	Description	Part No.	Description
101	Pump casing	502	Casing wear ring
138	Bellmouth	571	Bail
233	Open counter-clockwise impeller	811	Motor housing
350	Bearing housing	812	Motor housing cover
360	Bearing cover	82-5	Adapter
412	O-ring	818	Shaft (rotor)
433	Mechanical seal	834	Cable gland

Amacan S 800-535
Amacan S 850-550
Amacan S 900-600 / 900-615 / 900-620
Amacan S 1000-655
Amacan S 1300-820
Motor version: UTG



Design:
closed impeller

List of components

Part No.	Description	Part No.	Description
101	Pump casing	433	Mechanical seal
138	Bellmouth	502	Casing wear ring
233	Open counter-clockwise impeller	571	Bail
	Closed counter-clockwise impeller	811	Motor housing
330	Bearing bracket	812	Motor housing cover
350	Bearing housing	82-5	Adapter
360	Bearing cover	818	Shaft (rotor)
412	O-ring	834	Cable gland

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