ENGINEERING FLOW SOLUTIONS

HMS CIRIS

BOREHOLE SUBMERSIBLE PUMPS

CONTENTS

HMS CIRIS PUMPS: GENERAL DESCRIPTION

APPLICATION

- Municipal Water Supply
- Agriculture, Irrigation, Sprinkler systems
- Industrial Water Supply
- Mining Industry
- Pressure Boosting
- Ground Water Lowering

OPERATING CONDITIONS

Pumped liquid..water
Liquid temperature............................ up to 25 °C
Total dissolved solids (TDS)..........up to 1500 mg/l
Sulphates......................................up to 500 mg/l
Chlorides......................................up to 350 mg/l
Hydrogen sulfide...................... less than 1.5 mg/l
Sand ....up to 100 mg/l

TECHNICAL DATA

Diameter range (inches) 6, 8, 10, 12
Capacity range .... 2.5 - 290 m^3/h
Head range ....up to 550 m
DAP series motor power................. up to 130 kW
Rotation speed......................................3000 rpm
Rated voltage................50Hz, 3-phase, 380/400 V
Min. cooling flow-rate: ....0.2 m/sec

The HMS CIRIS pump consists of a single or multistage single-entry pump and a rigidly coupled rewindable water-filled electric motor.

The HMS CIRIS pumps have been engineered in accordance with modern requirements to efficiency and reliability: taking into account heavy duty operation conditions and unstable power supply quality.

DESIGN FEATURES: SUBMERSIBLE PUMPS

- CFD pump design methods
- Extensive range of sizes (from 6 to 12 inches) enables precise pump selection in accordance with operating conditions. That will increase reliability and efficiency of operation
- Single/multistage centrifugal pumps in ring-section design
- Radial or mixed flow stages
- Built-in suction strainer
- Built-in check valve
- Stainless steel straps
- Corrosion resistance

DESIGN FEATURES: SUBMERSIBLE MOTORS

- High-efficient rewindable electric motor
- Reliable and easy in operation and service
- Voltage surges resistance

RELIABILITY

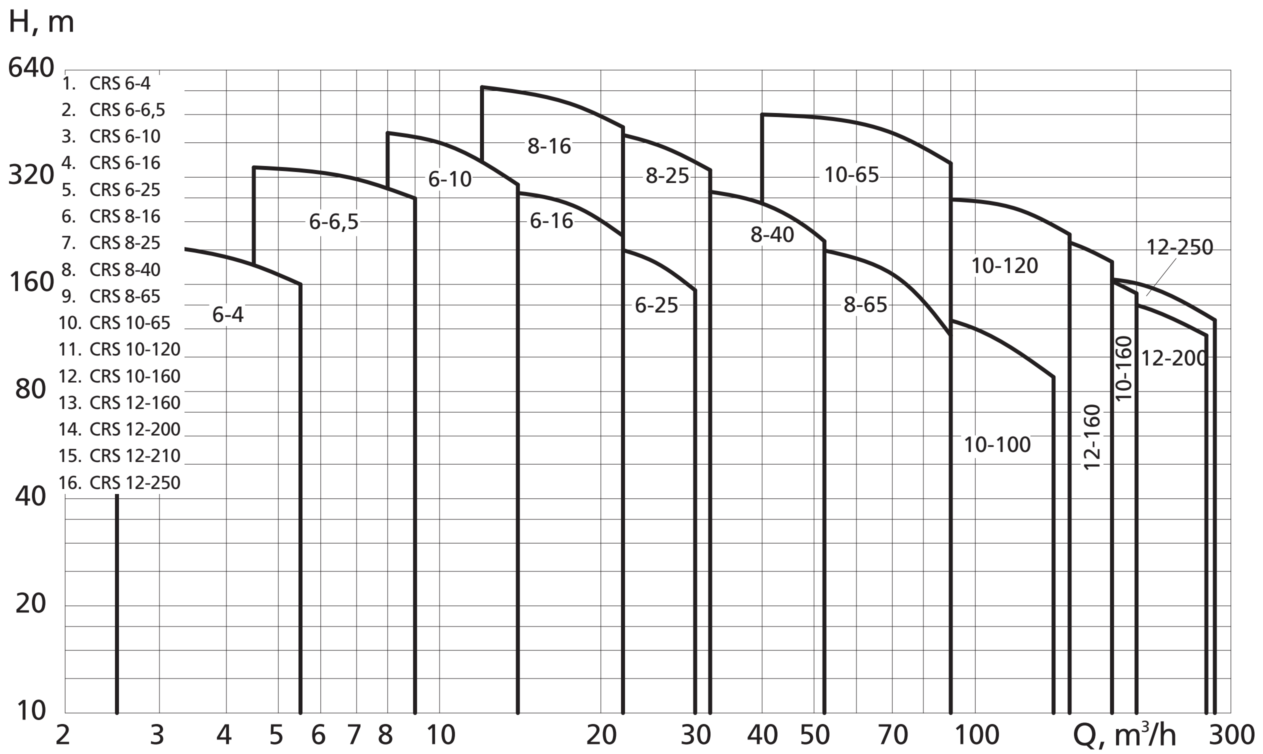
The HMS Ciris pumps are covered with a three (3) year warranty. Estimated operation lifetime is four (4) years provided that the pump is operated accordingly to the operation manual and manufacturer's recommendations.

Vertical Installation: borehole, water lowering, etc.

Horizontal Installation: reservoirs, fountains, booster modules, etc.

The HMS Ciris pumps shall be connected to the power supply via the «HMS Control L3» series control panel or other control panel.

PERFORMANCE RANGE



PUMP SERIES DESIGNATION

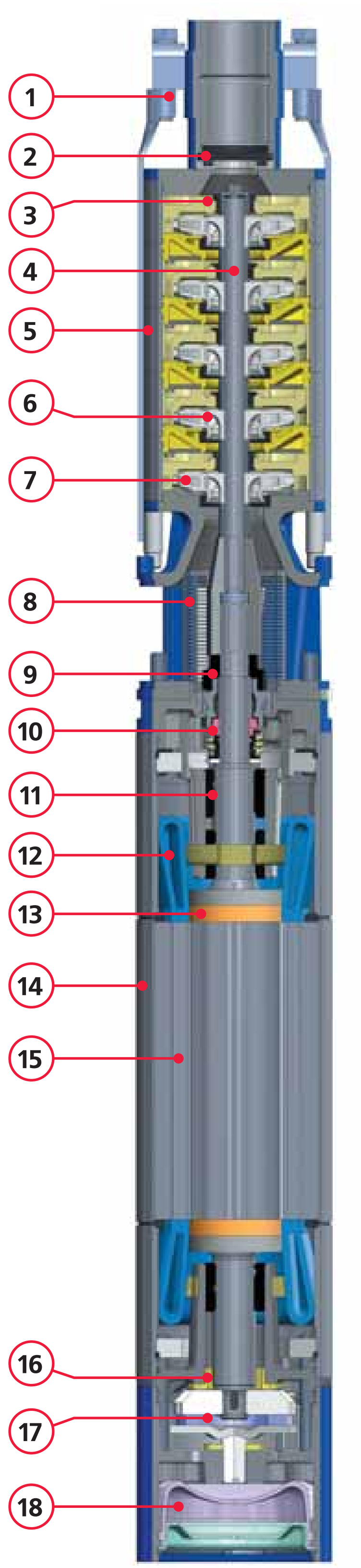
CRS 8 - 25 / 10 - 22 ssi

- Pump series: HMS Ciris
- Well diameter, inches
- Capacity, m³/h
- Number of stages
- Motor rated power, kW
- Material*

* Options (if applicable): ssi - stainless steel impeller ssp - stainless steel pump

FEATURES, ADVANTAGES, BENEFITS

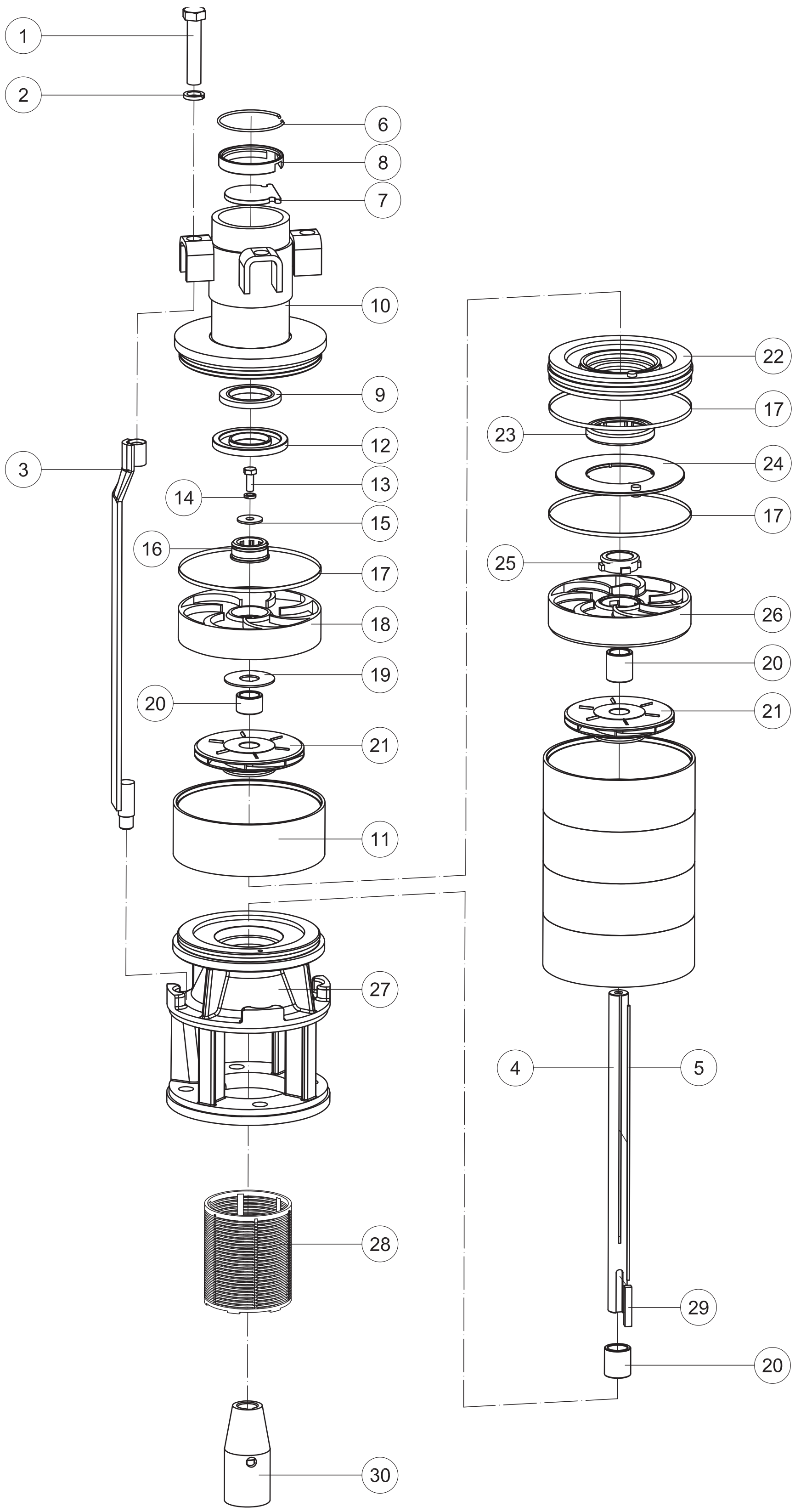
1. AISI 316 stainless steel straps
2. Built-in non-return valve to prevent water hummer and reverse rotation
3. Octagonal bearings for sand removal
4. AISI 420 stainless steel shaft
5. AISI 316 stainless steel thick-tube stages casings for maximum structural rigidity and damage prevention during installation and corrosion protection of pump stages
6. Patented design of the plastic impellers reinforced with stainless steel notably increases their service life
7. Impellers with hydraulic axial unloading with expeller vanes
8. Built-in strainer on the pump inlet
9. Sand guard for motor protection from the solid particles
10. Mechanical seal isolating internal cavity of the motor from pumped water
11. Radial bearings of advanced composite (graphite-based) materials with helical grooves for better lubrication
12. High temperature insulated winding wire (100 °C)
13. Squirrel cage type rotor made of copper for increased reliability and efficiency
14. AISI 316 stainless steel motor casing
15. Increased length of stator and rotor enhance reliability and improves cooling
16. Reverse trust bearing prevents rotor's vertical displacement
17. Self-aligning water lubricated thrust bearing ensures trouble-free operation
18. Rubber membrane compensating liquid thermal expansion



- Rewindable electric motors
- Keyed coupling; NEMA coupling is available
- Motors are filled with a liquid allowing contact with potable water and be stored at low temperatures to -30 °C. Motors can be filled with clean fresh water
- 100% of pump units are factory-tested

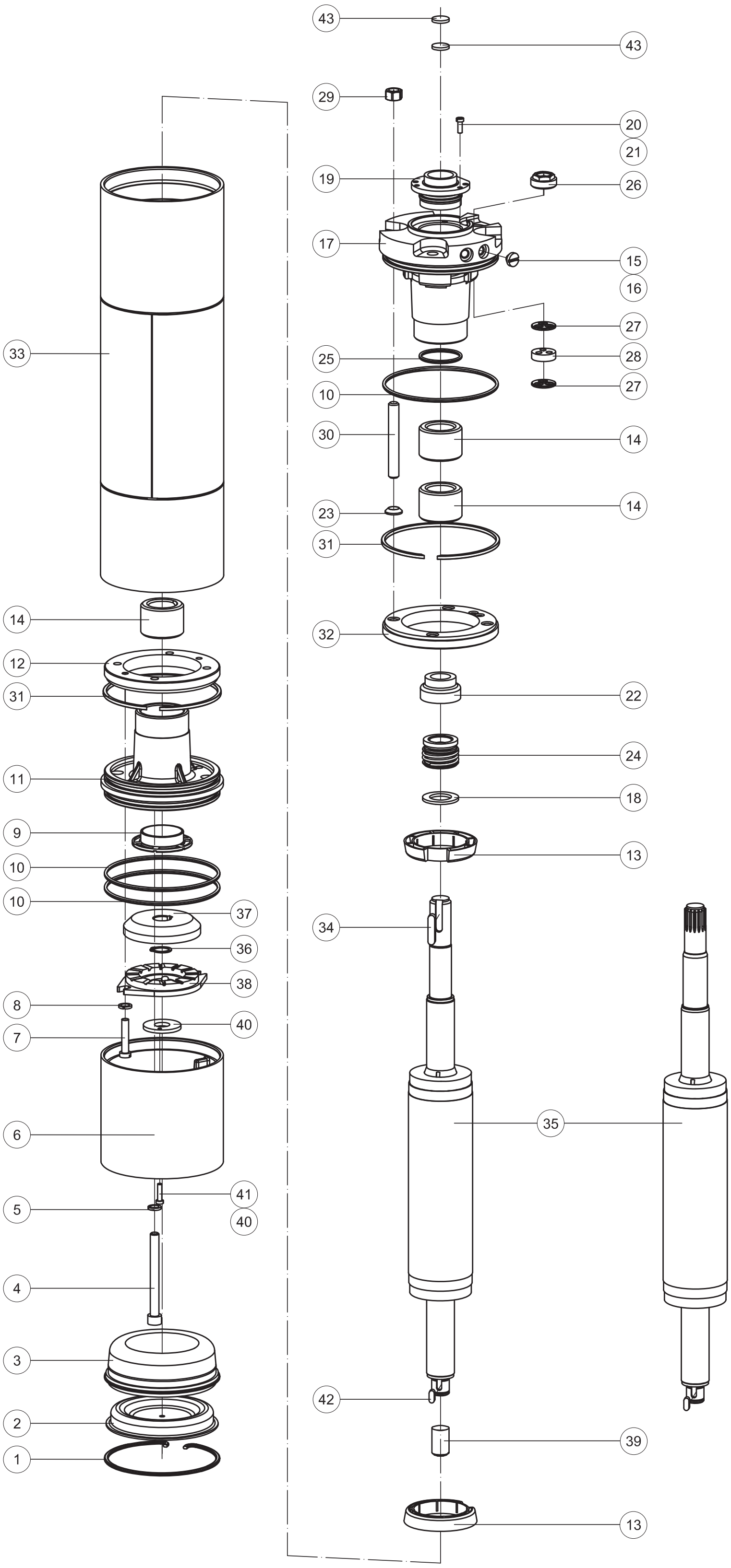
GENERAL ASSEMBLING DRAWING: SUBMERSIBLE PUMP

1. Bolt
2. Washer
3. Strap
4. Shaft
5. Key
6. Spring ring
7. Non-return valve
8. Ring
9. Sealing ring
10. Discharged head
11. Stage casing
12. Ring
13. Bolt
14. Washer
15. Washer
16. Bearing
17. Ring
18. Diffuser
19. Ring
20. Spacer
21. Impeller
22. Diaphragm
23. Wearing ring
24. Diaphragm cover
25. Bushing
26. Diffuser
27. Motor adapter
28. Strainer
29. Key
30. Coupling



GENERAL ASSEMBLING DRAWING: SUBMERSIBLE MOTOR

1. Lockin ring
2. Diaphragm cover
3. Diaphragm
4. Screw
5. Washer
6. Bottom
7. Screw
8. Washer
9. Revers thrust bearing
10. O-ring
11. Lower bearing casing
12. Ring
13. Winding fixator
14. Sleeve bearing
15. Plug
16. O-ring
17. Upper bearing casing
18. Washer
19. Mechanical seal cover
20. Screw
21. Washer
22. Sand protector
23. Stud sealing
24. Mechanical seal
25. O-ring
26. Cable nut
27. Cable sealing
28. Cable sealing
29. Cable sealing
30. Stud
31. Lock ring
32. Thrust ring
33. Stator
34. Key
35. Rotor
36. Ring
37. Thrust journal
38. Thrust bearing
39. Screw
40. Lock nut
41. Screw
42. Key
43. Plate



MATERIAL SELECTION

<table>
<tr><th rowspan="2">Model</th><th colspan="4">Pump</th><th colspan="2">Motor</th></tr>
<tr><th>Impeller</th><th>Diffuser</th><th>Stage casing</th><th>Shaft</th><th>Casing</th><th>Bearing housing</th></tr>
<tr><td>CRS 6 – 4</td><td rowspan="5">Thermoplastic resin armored with stainless steel</td><td rowspan="5">Thermoplastic resin</td><td rowspan="17">AISI 316</td><td rowspan="17">AISI 420</td><td rowspan="17">AISI 316</td><td rowspan="17">Cast iron with powder coating</td></tr>
<tr><td>CRS 6 - 6.5</td></tr>
<tr><td>CRS 6 – 10</td></tr>
<tr><td>CRS 6 – 16</td></tr>
<tr><td>CRS 6 - 25</td></tr>
<tr><td>CRS 8 - 16</td><td>Thermoplastic resin armored with stainless steel</td><td>Thermoplastic resin</td></tr>
<tr><td>CRS 8 - 25</td><td rowspan="2">Stainless steel; AISI 316</td><td rowspan="2">Thermoplastic resin</td></tr>
<tr><td>CRS 8 - 40</td></tr>
<tr><td>CRS 8 - 65</td><td>Thermoplastic resin armored with stainless steel</td><td>Thermoplastic resin</td></tr>
<tr><td>CRS 10 - 65</td><td rowspan="8">AISI 316</td><td>Thermoplastic resin</td></tr>
<tr><td>CRS 10 - 100</td><td rowspan="7">AISI 316</td></tr>
<tr><td>CRS 10 - 120</td></tr>
<tr><td>CRS 10 - 160</td></tr>
<tr><td>CRS 12 - 160</td></tr>
<tr><td>CRS 12 - 200</td></tr>
<tr><td>CRS 12 - 210</td></tr>
<tr><td>CRS 12 - 250</td></tr>
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PUMP SELECTION AND OPERATION GUIDELINE

The information in this section provides the recommendations on selection, installation and operation of the submersible pumps in the most efficient way, avoiding the most typical mistakes and significantly reducing the number of failures.

MAIN PARAMETERS

The water supply system consists of many elements and the main of them are the pumps, pipes, valves, tanks and reservoirs. Each element influences on others so the whole system efficiency and reliability depends on consistency of its components operation (Fig. 1).

THE MAIN PARAMETERS OF THE PUMP

- Q-H curve to show head vs. capacity relation
- Q-P curve: power vs. capacity relationship for multistage pumps the curve can be shown for one stage or whole pump
- Efficiency curve to show stage efficiency with taking into account losses in non-return valve and at the pump inlet

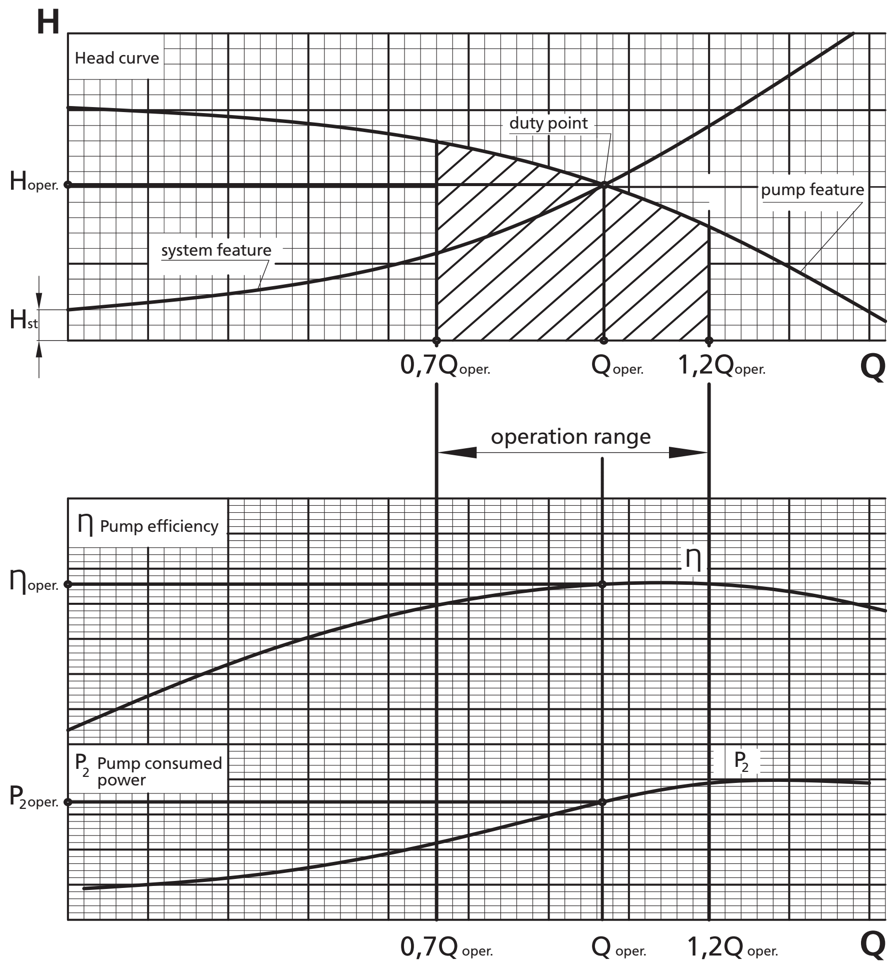


Fig. 1. The pump and the water supply system parameters

WATER SUPPLY SYSTEM PARAMETERS

The water supply system feature shows the relation between its hydraulic resistance and the fluid consumption. The system includes a set of tanks, pipes, valves and filters which the liquid goes through to a pump and from the pump to consumer. Each of these elements has their own hydraulic features that collectively represent the system's feature.

Pumps efficiency is primarily determined by their correct selection, which is with taking into account all process specifics. Therefore, energy efficient operation is based on the best match of pump and system features so the operating point would stay in the performance range of pump.

Finding the operating point within that range provides the most efficient operation. Fulfilling this requirement enables pump operation with high efficiency and reliability.

DUTY POINT

Duty point is determined by intersection of the system and pump curves (Fig. 2). The intersection point is called the duty point. One of the main conditions in a pump selection is to provide the preferred operating range of 70-120% of nominal capacity.

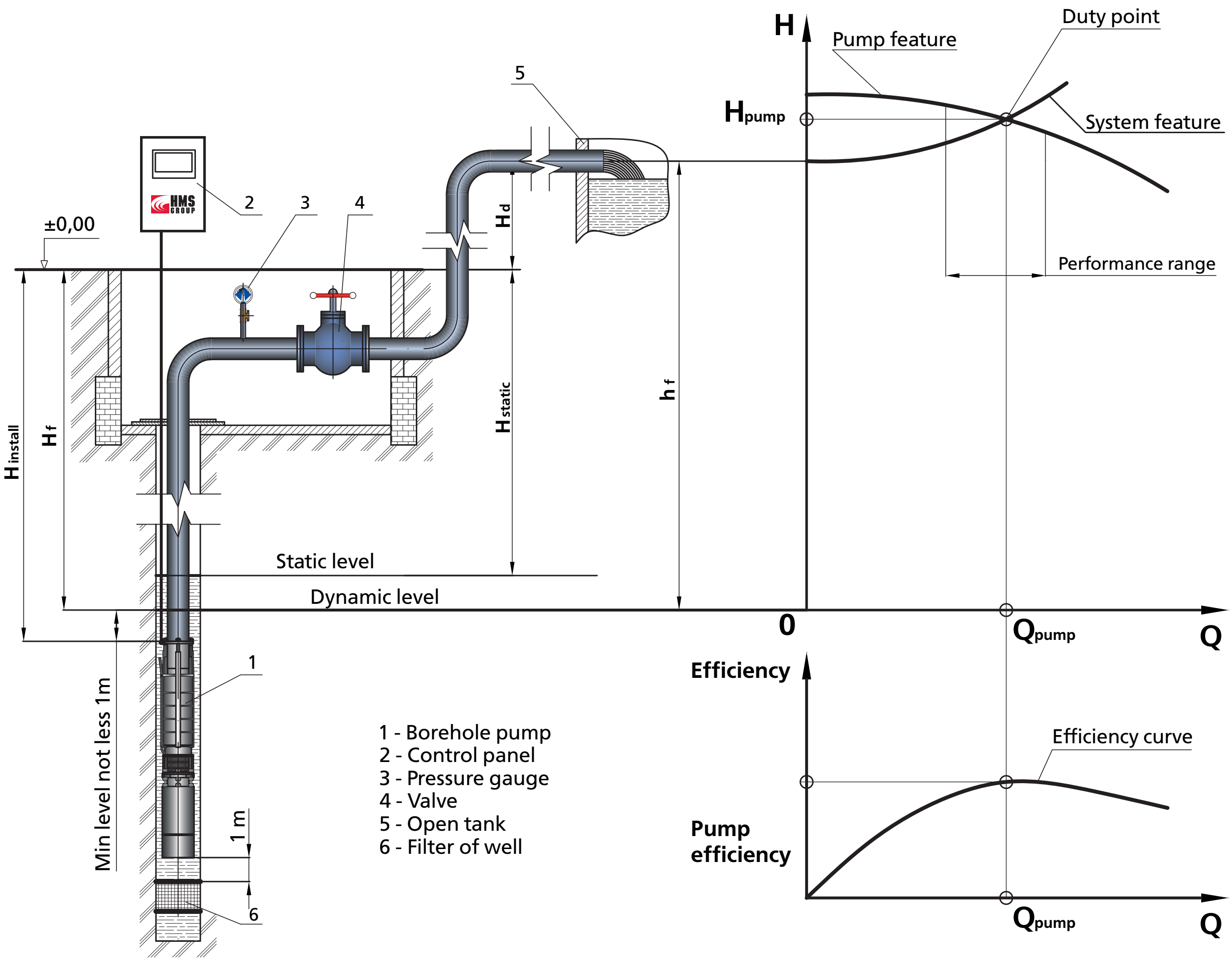


Fig. 2. The pump and the water supply system installation features

PUMP SELECTION SEQUENCE

Initial data

- Required capacity and head values
- Well (borehole) data or ones got by measurement:
  1. Internal well diameter (Tab. 1)
  2. Static water level
  3. Well yield (or output)
  4. Dynamic water level (pumping water level) to correspond with well yield
  5. Well screen/filter depth
  6. Chemical composition and solids content

1-st stage. Determining the pump diameter

Pump diameter shall correspond to the inner diameter of the well albeit the certain min. clearance between motor casing surface and inside well diameter is required (Tab. 2).

2-nd stage. Determining the pump capacity

Pumps shall be selected so that well yield would exceed the nominal capacity by at least 25% (Tab. 3).

Table 1. Corresponding diameters of the borehole pipe casing (well) and pumps

Borehole pipe casing/well inner diameter, not less, mm	98	150	199	250	301
Pump size, inches	4	5,6	8	10	12

Table 2. HMS Ciris pumps nominal capacity range

Ø, inches	4					5		6				8				10			10,12	12	
Q, m³/h	1.5	2.5	4.0	6.5	10.0	6.5	10.0	6.5	10.0	16.0	25.0	16.0	25.0	40.0	65.0	65.0	100.0	120.0	160.0	210	250

Table 3. Well yield vs. HMS Ciris pumps nominal capacity range

Well yield, m³/hour	**Capacity, m³/hour**													
	1	2.5	4	6.5	10	16	25	40	65	100	120	160	210	250
1.3….3	*													
3…...5	*	*												
5…...8	*	*	*											
8…..12	*	*	*	*										
12…..20	*	*	*	*	*									
20…..30	*	*	*	*	*	*								
30…..50	*	*	*	*	*	*	*							
50…..80	*	*	*	*	*	*	*	*						
80…125	*	*	*	*	*	*	*	*	*					
125…150	*	*	*	*	*	*	*	*	*	*				
150…200	*	*	*	*	*	*	*	*	*	*	*			
200…260	*	*	*	*	*	*	*	*	*	*	*	*		
260…350	*	*	*	*	*	*	*	*	*	*	*	*	*	
350…450	*	*	*	*	*	*	*	*	*	*	*	*	*	*

3–rd stage. Determining required pump head

Duty point is determined by the system characteristic:

$$H_{syst.}(Q) = h_{stat.} + h_f(Q)$$

System characteristic consists of two parts: static and dynamic heads.

Static head of system characteristic

According to installation position static part is determined by geometric height of water lift relative to dynamic water level and geometric height of the tank. In case of operating with accumulating tank or water collector the back pressure must be taken into account.

Formula for the static part calculation:

$$h_{stat.} = H_{dyn} + H_{geo} + \frac{p_{res}}{\text{p} \cdot g}$$

where

- H_{dyn} – dynamic water level, m
- H_{geo} – height from wellhead to max water level in the tank, m
- P_{res} – pressure in the tank
- ρ – water density, kg/m^3
- g – acceleration of gravity, kg/m^3

for a tank operating under atmospheric pressure

$$p_{res} = 0$$

Formula for determining dynamic water level:

$$H_f = H_{stat} + S$$

where

- S – level lowering according to the specific well yield chart, m
- H_{st} – static water level, m

Dynamic head of system characteristic

Dynamic head is determined by losses in the pipeline and takes the form of quadratic dependence: h_f (Q) = k·Q^2

where

- k – loss coefficient that depends on losses along the pipeline and elements resistances (valves, manifolds, valves, adapters, etc.). That relation is shown as parabola on chart.

Formula for head losses:

$$h_f = h_{100} \cdot L / 100 + \triangle h$$

where

- h_{100} – losses per every 100 m of a pipeline, m
- L – actual pipeline length, m
- △ h – elements loss value, m

Elements loss values according to flow rate are given in Valve reference books and manuals. h_{100} values for various material selection are also given in reference materials. Data on losses and flow rates in pipelines made of the most common materials is given in Table 4 and Table 5. (pp.13, 14).

Thus, by determining values of all system components for various capacities, system's head characteristic can be built:

$$H_{syst.}(Q) = h_{stat.} + h_f(Q)$$

Knowing required head, in accordance with 1-3 stages it is possible to determine a pump to comply with system features.

Table 4. Head losses in steel pipes

Upper value: Flow rate, m/sec. Lower value: Losses per every 100 m of a straight steel pipe

Capacity			Relative drift diameter / outer diameter x wall thickness / internal diameter, mm									
m^3/h	L/min	L/sec	dN 25 33.5x3.2 27.1	dN 32 42.3x3.2 35.9	dN 40 48x3.5 41.0	dN 50 60x3.5 53	dN 65 76x3.5 69	dN 80 89x3.5 82	dN 100 108x3.5 101	dN 125 133x4.5 124	dN 150 159x4.5 150	dN 200 219x5 209
1	16.67	0.28	0.48 **1.91**	0.27 **0.48**	0.21 **0.25**							
1.6	26.67	0.44	0.77 **4.63**	0.44 **1.14**	0.34 **0.59**	0.20 **0.17**						
2	33.33	0.56	0.96 **7.08**	0.55 **1.73**	0.42 **0.90**	0.25 **0.25**						
2.5	41.67	0.69	1.20 **10.85**	0.69 **2.63**	0.53 **1.36**	0.31 **0.38**	0.19 **0.11**					
3	50.00	0.83	1.44 **15.40**	0.82 **3.72**	0.63 **1.91**	0.38 **0.54**	0.22 **0.15**					
3.5	58.33	0.97	1.69 **20.74**	0.96 **4.99**	0.74 **2.56**	0.44 **0.71**	0.26 **0.19**	0.18 **0.08**				
4	66.67	1.11	1.93 **26.86**	1.10 **6.44**	0.84 **3.30**	0.50 **0.91**	0.30 **0.25**	0.21 **0.11**				
6.5	108	1.81	3.13 **69.25**	1.78 **16.39**	1.37 **8.34**	0.82 **2.28**	0.48 **0.61**	0.34 **0.26**	0.23 **0.09**			
8	133	2.22	3.85 **104.10**	2.20 **24.54**	1.68 **12.45**	1.01 **3.39**	0.59 **0.90**	0.42 **0.38**	0.28 **0.14**	0.18 **0.05**		
10	167	2.78		2.74 **37.92**	2.10 **19.19**	1.26 **5.19**	0.74 **1.37**	0.53 **0.58**	0.35 **0.21**	0.23 **0.08**		
12	200	3.33		3.29 **54.18**	2.52 **27.38**	1.51 **7.38**	0.89 **1.94**	0.63 **0.82**	0.42 **0.29**	0.28 **0.11**	0.19 **0.04**	
16	267	4.44		4.39 **95.38**	3.37 **48.07**	2.01 **12.88**	1.19 **3.36**	0.84 **1.41**	0.55 **0.50**	0.37 **0.18**	0.25 **0.07**	
20	333	5.56			4.21 **74.53**	2.52 **19.88**	1.49 **5.17**	1.05 **2.16**	0.69 **0.76**	0.46 **0.27**	0.31 **0.11**	
25	417	6.94			5.26 **115.71**	3.15 **30.76**	1.86 **7.96**	1.31 **3.31**	0.87 **1.15**	0.58 **0.41**	0.39 **0.16**	0.20 **0.03**
30	500	8.33				3.78 **44.00**	2.23 **11.34**	1.58 **4.70**	1.04 **1.63**	0.69 **0.58**	0.47 **0.23**	0.24 **0.04**
35	583	9.72				4.41 **59.59**	2.60 **15.32**	1.84 **6.33**	1.21 **2.19**	0.81 **0.78**	0.55 **0.30**	0.28 **0.06**
40	667	11.11				5.04 **77.53**	2.97 **19.89**	2.10 **8.20**	1.39 **2.84**	0.92 **1.01**	0.63 **0.39**	0.32 **0.07**
50	833	13.89				6.30 **120.48**	3,71 **30.80**	2.63 **12.68**	1.73 **4.36**	1.15 **1.54**	0.79 **0.59**	0.40 **0.11**
65	1083	18.06					4.83 **51.63**	3.42 **21.19**	2.25 **7.26**	1.50 **2.55**	1.02 **0.97**	0.53 **0.18**
80	1333	22.22					5.94 **77.80**	4.21 **31.86**	2.77 **10.89**	1.84 **3.81**	1.26 **1.45**	0.65 **0.27**
100	1667	27.78					7.43 **120.99**	5.26 **49.47**	3.47 **16.87**	2.30 **5.88**	1.57 **2.22**	0.81 **0.42**
120	2000	33.33						6.31 **70.92**	4.16 **24.13**	2.76 **8.39**	1.89 **3.17**	0.97 **0.59**
140	2333	38.89						7.36 **96.23**	4.85 **32.70**	3.22 **11.35**	2.20 **4.27**	1.13 **0.79**
160	2667	44.44						8.42 **125.38**	5.55 **42.56**	3.68 **14.75**	2.52 **5.54**	1.30 **1.02**
180	3000	50.00							6.24 **53.71**	4.14 **18.59**	2.83 **6.97**	1.46 **1.28**
200	3333	55.56							6.93 **66.16**	4.60 **22.87**	3.14 **8.57**	1.62 **1.57**
220	3667	61.11							7.63 **79.91**	5.06 **27.60**	3.46 **10.33**	1.78 **1.89**
240	4000	66.67							8.32 **94.95**	5.52 **32.78**	3.77 **12.26**	1.94 **2.23**
260	4333	72.22							9.01 **111.29**	5.98 **38.39**	4.09 **14.35**	2.11 **2.61**
280	4667	77.78								6.44 **40.45**	4.40 **16.60**	2.27 **3.01**
300	5000	83.33								6.90 **50.96**	4.72 **19.02**	2.43 **3.45**

Table 5. Head losses in plastic pipes

Upper value: Flow rate in m/sec. Lower value: Loss per every 100 m of a straight plastic pipe

Capacity			Outer diameter x wall thickness / internal diameter, mm												
m³/h	L/min	L/sec	25x2.8 19.4	32x3.0 26.0	40x3.7 32.6	50x4.6 40.8	63x5.8 51.4	75x6.8 61.4	90x8.2 73.6	110x10.0 90.0	125x11.4 102.2	140x12.7 114.6	160x14.6 130.8	180x16.4 147.2	200x18.2 163.6
1	16.67	0.28	0.94 **7.71**	0.52 **1.90**	0.33 **0.65**	0.21 **0.22**									
1.6	26.67	0.44	1.50 **17.74**	0.84 **4.38**	0.53 **1.49**	0.34 **0.51**	0.21 **0.17**								
2	33.33	0.56	1.88 **26.36**	1.05 **6.51**	0.67 **2.21**	0.42 **0.76**	0.27 **0.25**	0.19 **0.11**							
2.5	41.67	0.69	2.35 **39.17**	1.31 **9.68**	0.83 **3.29**	0.53 **1.13**	0.33 **0.37**	0.23 **0.16**							
3	50.00	0.83	2.82 **54.12**	1.57 **13.37**	1.00 **4.54**	0.64 **1.56**	0.40 **0.52**	0.28 **0.22**	0.20 **0.09**						
3.5	58.33	0.97	3.29 **71.14**	1.83 **17.58**	1.16 **5.97**	0.74 **2.05**	0.47 **0.68**	0.33 **0.29**	0.23 **0.12**						
4	66.67	1.11	3.76 **90.16**	2.09 **22.28**	1.33 **7.57**	0.85 **2.59**	0.54 **0.86**	0.38 **0.37**	0.26 **0.16**	0.17 **0.06**					
6.5	108	1.81	6.11 **213.34**	3.40 **52.72**	2.16 **17.90**	1.38 **6.13**	0.87 **2.04**	0.61 **0.87**	0.42 **0.37**	0.28 **0.14**	0.22 **0.08**				
8	133	2.22		4.19 **76.20**	2.66 **25.88**	1.70 **8.87**	1.07 **2.94**	0.75 **1.26**	0.52 **0.53**	0.35 **0.20**	0.27 **0.11**	0.22 **0.06**			
10	167	2.78		5.23 **113.20**	3.33 **38.44**	2.12 **13.17**	1.34 **4.37**	0.94 **1.87**	0.65 **0.79**	0.44 **0.30**	0.34 **0.16**	0.27 **0.10**	0.21 **0.05**		
12	200	3.33		6.28 **156.43**	3.99 **53.12**	2.55 **18.20**	1.61 **6.04**	1.13 **2.59**	0.78 **1.09**	0.52 **0.42**	0.41 **0.23**	0.32 **0.13**	0.25 **0.07**	0.20 **0.04**	
16	267	4.44			5.32 **88.50**	3.40 **30.32**	2.14 **10.07**	1.50 **4.31**	1.04 **1.81**	0.70 **0.69**	0.54 **0.38**	0.43 **0.22**	0.33 **0.12**	0.26 **0.07**	0.21 **0.04**
20	333	5.56			6.66 **131.48**	4.25 **45.05**	2.68 **14.96**	1.88 **6.40**	1.31 **2.69**	0.87 **1.03**	0.68 **0.56**	0.54 **0.33**	0.41 **0.17**	0.33 **0.10**	0.26 **0.06**
25	417	6.94				5.31 **66.92**	3.35 **22.22**	2.35 **9.51**	1.63 **4.00**	1.09 **1.53**	0.85 **0.84**	0.67 **0.48**	0.52 **0.26**	0.41 **0.15**	0.33 **0.09**
30	500	8.33				6.37 **92.48**	4.02 **30.70**	2.81 **13.14**	1.96 **5.53**	1.31 **2.12**	1.02 **1.15**	0.81 **0.67**	0.62 **0.36**	0.49 **0.20**	0.40 **0.12**
35	583	9.72				7.44 **121.57**	4.69 **40.36**	3.28 **17.27**	2.29 **7.27**	1.53 **2.78**	1.19 1.52	0.94 **0.88**	0.72 **0.47**	0.57 0.27	0.46 0.16
40	667	11.11					5.35 **51.15**	3.75 **21.89**	2.61 **9.22**	1.75 **3.53**	1.35 **1.92**	1.08 **1.11**	0.83 **0.59**	0.65 **0.34**	0.53 **0.20**
50	833	13.89					6.69 **75.99**	4.69 **32.52**	3.26 **13.69**	2.18 **5.24**	1.69 **2.86**	1.35 **1.65**	1.03 **0.88**	0.82 **0.50**	0.66 **0.30**
65	1083	18.06					8.70 **121.03**	6.10 **51.80**	4.24 **21.81**	2.84 **8.35**	2.20 **4.55**	1.75 **2.63**	1.34 **1.40**	1.06 **0.80**	0.86 **0.48**
80	1333	22.22						7.51 **74.87**	5.22 **31.52**	3.49 **12.06**	2.71 **6.57**	2.15 **3.81**	1.65 **2.02**	1.31 **1.15**	1,06 **0.70**
100	1667	27.78						9.38 **111.23**	6.53 **46.82**	4.37 **17.92**	3.39 **9.77**	2.69 **5.65**	2.07 **3.01**	1.63 **1.71**	1.32 **1.03**
120	2000	33.33							7.83 **64.70**	5.24 **24.77**	4.06 **13.50**	3.23 **7.81**	2.48 **4.16**	1.96 **2.36**	1.59 **1.43**
140	2333	38.89							9.14 **85.05**	6.11 **32.55**	4.74 **17.74**	3.77 **10.27**	2.89 **5.46**	2.29 **3.11**	1.85 **1.88**
160	2667	44.44							10.45 107.79	6.99 **41.26**	5.42 **22.49**	4.31 **13.02**	3.31 **6.92**	2.61 **3.94**	2.11 **2.38**
180	3000	50.00								7.86 **50.84**	6.10 **27.71**	4.85 **16.04**	3.72 **8.53**	2.94 **4.86**	2.38 **2.93**
200	3333	55.56								8.73 **61.29**	6.77 **33.41**	5.39 **19.34**	4.13 **10.29**	3.26 **5.85**	2.64 **3.53**
220	3667	61.11								9.61 **72.58**	7.45 **39.56**	5.92 **22.90**	4.55 **12.18**	3.59 **6.93**	2.91 **4.19**
240	4000	66.67								10.48 **84.70**	8.13 **46.16**	6.46 **26.72**	4.96 **14.21**	3.92 **8.09**	3.17 **4.88**
260	4333	72.22								11.35 **97.62**	8.80 **53.21**	7.00 **30.80**	5.37 **16.38**	4.24 **9.32**	3.44 **5.63**
280	4667	77.78								12.23 **111.34**	9.48 **60.68**	7.54 **35.13**	5.79 **18.69**	4.57 **10.63**	3.70 **6.42**
300	5000	83.33									10.16 **68.58**	8.08 **39.70**	6.20 **21.12**	4.90 **12.02**	3.96 **7.26**

HYDRAULIC ACCUMULATOR SELECTION

Hydraulic accumulator (pressure storage reservoir) installation in many cases prevents excessively frequent pump starts and reduces the water hammer impact. Hence, power consumption is optimized as well as pump operational life and head stability increase.

There are different methods of hydraulic accumulator selection. Many manufacturers of accumulators offer their own selection programs. Selecting hydraulic accumulator is a challenging task that requires taking into consideration many factors such as:

- Uneven water consumption
- Uneven water supply by pumps
- Control volume vs. Total tank volume
- Allowable number of pump starts per hour

Hydraulic accumulator selection based on UNI 9182 is given below with the main factors such as:

- Max pump capacity
- Recommended number of start/stop per hour
- Configuring pressure switch, i.e. setting cut-on and cut-off pressure values
- Initial pressure in the accumulator air chamber must be less than cut-on pressure at least by 0.5 bar

Pressure values are assumed in absolute terms. 1 bar is added to values received with pressure gauges. There is a formula below to define optimal volume of the hydraulic accumulator:

$$V_{accum} = 16.5 \cdot \frac{Q_{\max}}{a} \cdot \frac{(p_{off}) \cdot (p_{on})}{(p_{off} - p_{on}) \cdot p_{gas}}$$

where

V_{accum} – hydraulic accumulator volume, liters

a – number of start/stop for pump, per hour

Q_{max} – max. pump capacity, liters/min*

P(on) – cut-on pressure, bar

P(off) – cut-off pressure, bar

P(gas) – initial pressure in the accumulator air chamber, bar

The obtained value is rounded upwards to the nearest value of available hydraulic accumulator volume range.

*1 liter/min = 0,06 m^3/h

PUMP INSTALLATION REQUIREMENTS

If the required pump capacity is higher than the borehole (well) yield then a dry running sensor shall be applied. In this case the pump will operate in a interrupted mode. Number of start/stop per hour and interval between them shall be taken into consideration accordingly to the pump manual.

Possible well defects such as pipe misalignment, poor quality of weld, well curvature may make the pump installation difficult or even impossible. Therefore, if there are doubts in well serviceability a check-up of the corresponding diameters is recommended before the pump installation.

Please follow the requirements of the pump manual during installation.

For stable operation the pump suction strainer shall be below dynamic water level at least by 1 meter.

The installation level must be measured from the pump inlet. The motor bottom level must be at least 1 m above the well filter. Failure to do so carries the risk of large amount of sand ingress and increased wear of the pump.

Discharge pipe diameter shall be equal to discharge nozzle diameter or differ insignificantly. It shall be noted that rising pipes with less inner diameter have increased friction losses. Though application of the rising pipes with increased inner diameter is impractical due to higher cost of the pipes. In selecting discharge pipe diameter the liquid flow-rate shall remain within 1.5 - 3.0 m/s.

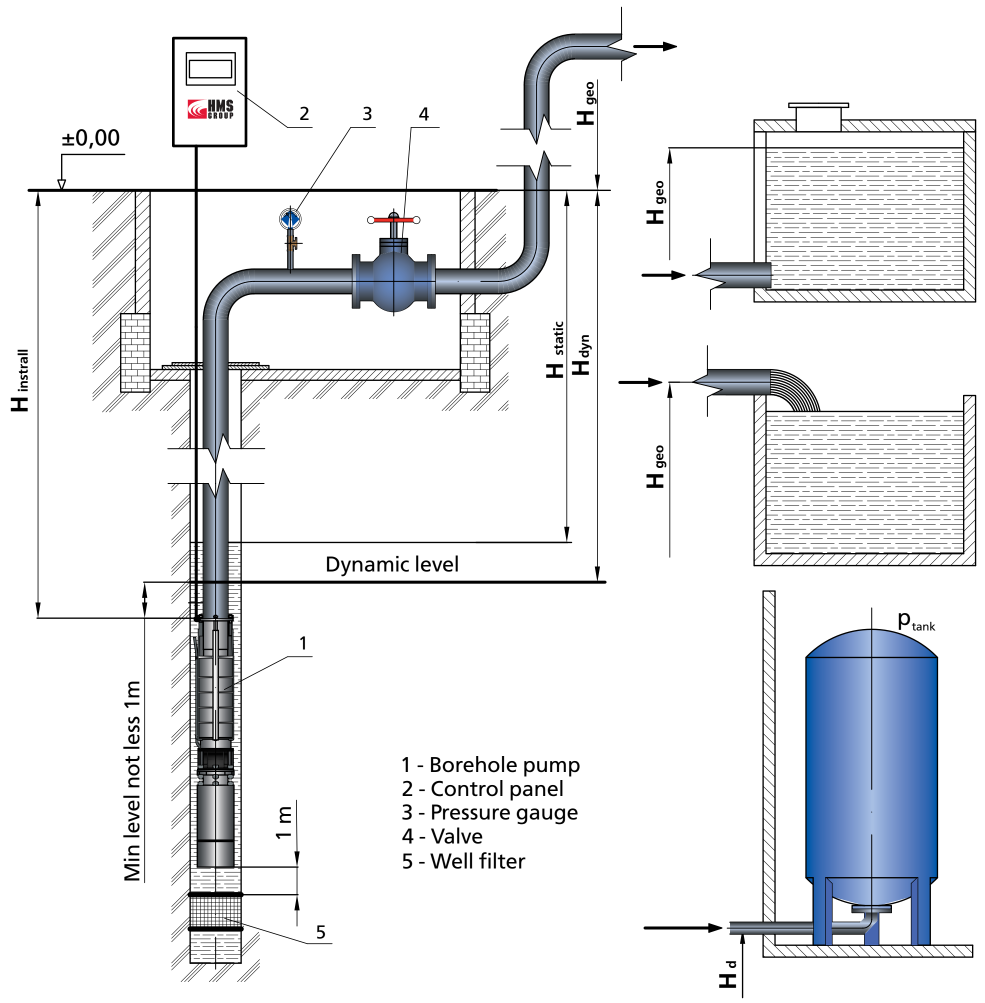


Fig. 3. Typical water intake options

PUMP SELECTION EXAMPLES

Example 1

Input data:

Water is supplied from the well into the water tower located 20 m above the well. (Fig. 4). Required pump capacity = 40 m³/h. Height from the ground level to the top water level in the water tower tank = 15 m. Water tower is located 100 m away from the well. Static water level in the well = 30 m. Level lowering S = 10 m according to the specific yield chart at 40 m³/h. Pipes are made of steel.

System characteristic calculation:

Dynamic water level will be at Hdyn = 40 m. Proceeding from recommended flow-rate 1.5-3.0 m/sec we select dN 80 in the Table 4. At Q=40 m³/h and dN 80 the flow rate will approximately be 2.1 m/sec. According to the Table 4 the head loss will be 8.2 m per every 100 meters of the pipeline. Total pipeline length with horizontal and vertical sections will be 40+100 =140 m.

Therefore losses per length will be:

$$h_f = 8.2 \cdot \frac{140}{100} = 11.5\ m$$

In accordance with the reference book head losses of DN 80 valve is 0.09 m; head losses of pipe bend DN 80 is 0.07 m. Dynamic head losses:

$$h_f = 8.2 \cdot \frac{140}{100} + 0.09 + 3 \cdot 0.07 = 11.8\, m$$

Static head will be:

$$h_{stat} = H_f + H_{geo} + \frac{p_{res}}{p \cdot g} = 40 + (20 + 15) + 0 = 75\, m$$

Total system head will be:

$$H_{syst} = h_f + h_{stat} = 75 + 11.9 = 86.8\ m$$

If there are no other unaccounted losses then pump with 86.8 m head would be needed.

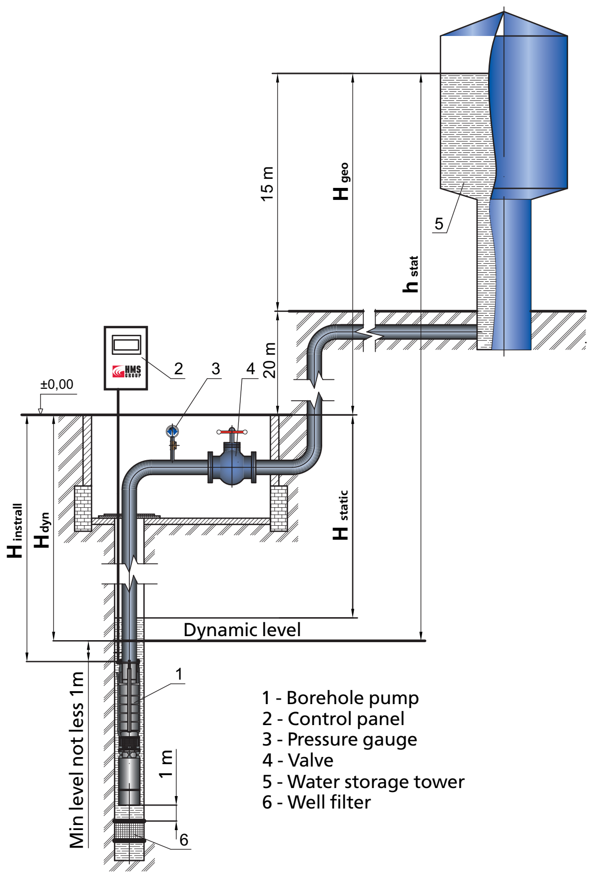


Fig. 4. Example 1

In the catalogue we select the pumps with the max efficiency at this head value. On the head curve we need to find the operating point and the closest pump curve (Fig. 5).

In our case we would select CRS 8-40/6-15 pump. At 40 m³/h capacity provides 90 m head.

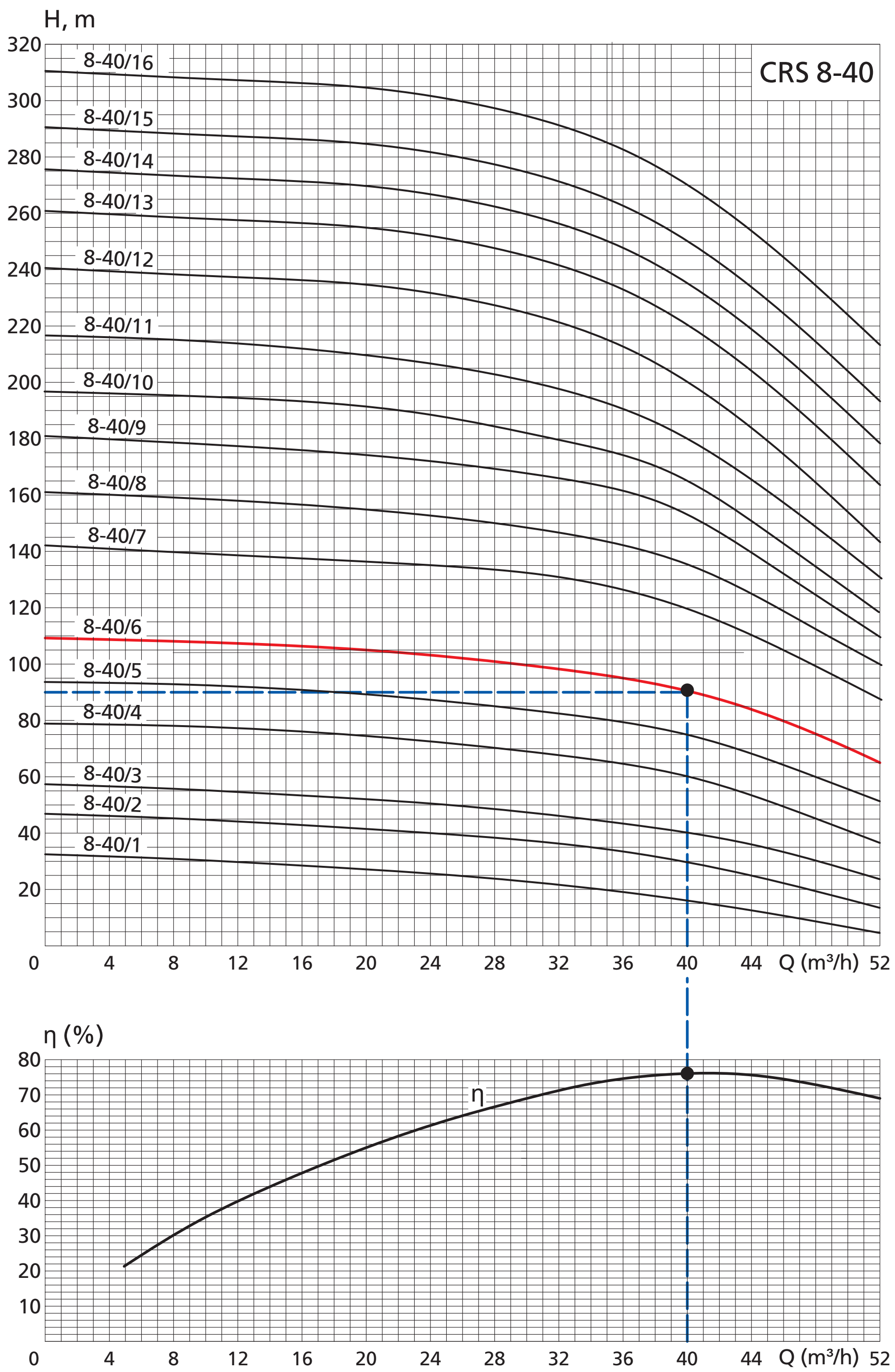


Fig. 5. HMS Ciris pump features

PUMP SELECTION EXAMPLES

Example 2

Input data:

Water is supplied from the well into hydraulic accumulator (Fig. 6). Required capacity = 8 m^3/h.

Static water level = 40 m. Level lowering S = 5 m according to the specific yield chart at 8 m^3/h.

Pressure switch shall provide:

- Cut-on pressure =1.8 bar
- Cut-off pressure = 4.5 bar
- Max. gas pressure in membrane = 1.5 bar
- Max. number of starts per hour = 6

Hydraulic accumulator selection: according to UNI 9182 we get:

$$V_{accum} = 16.5 \cdot \frac{Q_{max}}{a} \cdot \frac{(p_{off}) \cdot (p_{on})}{(p_{off} - p_{on}) \cdot p_{gas}} = 16.5 \cdot \frac{8 \cdot 1000 / 60}{6} \cdot \frac{(4.5+1) \cdot (1.8+1)}{[(4.5+1)-(1.8+1)] \cdot (1.5+1)} = 836.5 \; liters$$

the closest volume will be = 1000 l.

System feature calculation:

Dynamic water level will be at h_{dyn}= 45 m. Proceeding from recommended flow-rate 1.5 - 3 m/s we need to select pipeline diameter from the Table 5. As plastic pipeline has lower hydraulic resistance than steel pipelines we then can choose lower diameter, even lower than pump outlet diameter. Proceeding from recommended flow-rate 1.5 - 3 m/s we would select D = 40.8 mm from the Table 5.

At Q = 8 m^3/h and D = 40.8 mm the flow-rate will approximately make 1.7 m/s. According to the Table 5 head loss will be 8.87 m per every 100 m of the pipeline. Pipeline length = 45 m. Local losses are negligible compared to losses per length at vertical section and also compared to head and accumulator pressure.

$$h_f = h_{100} \cdot L/100 + \triangle h = 8.87 \cdot \frac{45}{100} = 4.0 \; m$$

$$h_{stat.} = H_{dynamic} + H_{static} + \frac{p_{gas}}{\rho \cdot g} = 45 + \frac{4.5 \cdot 10^5}{1000 \cdot 9.81} = 90.87 \, m$$

$$H_{syst}(Q) = h_{stat} + h_f(Q) = 90.87 + 4.0 = 94.87 \, m$$

If there are no other unaccounted losses then pump with 94.9 m head would be needed.

As in the previous example we need to select a pump from the catalogue with maximum efficiency at required head. By finding the operating point on the head feature and the closest pump curve we would select CRS 6-10/8-4 pump with 8 m^3/h capacity and 96 m head.

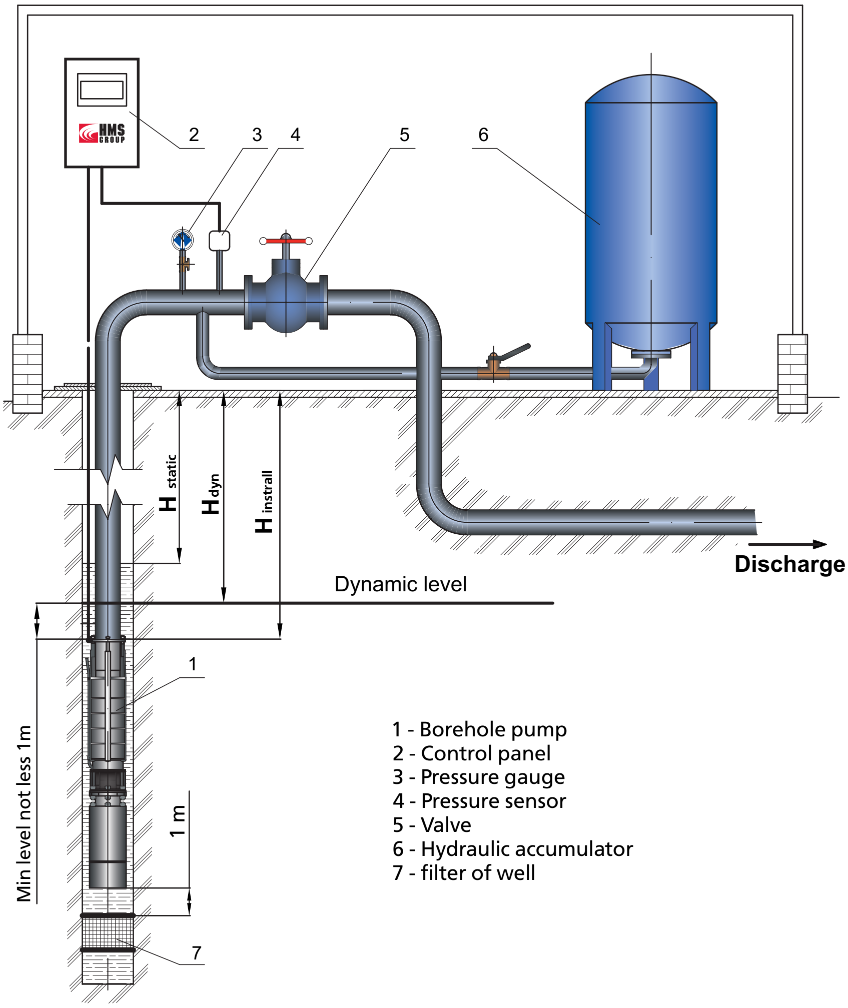


Fig. 6. Example 2

OPERATION WITH VARIABLE SPEED DRIVES

Pump operation with variable speed drives has become very common recently though it cannot always cut power consumption. Their use would be most beneficial in systems with dominant dynamic part, i.e. with friction losses in pipelines and valves (Fig. 7).

Use of VSD in a system with predominant static part (Fig. 8) leads to significant efficiency drop if capacity changes.

In this case start / stop control of required number of pumps installed in parallel connection would be the most effective.

Therefore significant optimization of power consumption lays within system feature and its change over time.

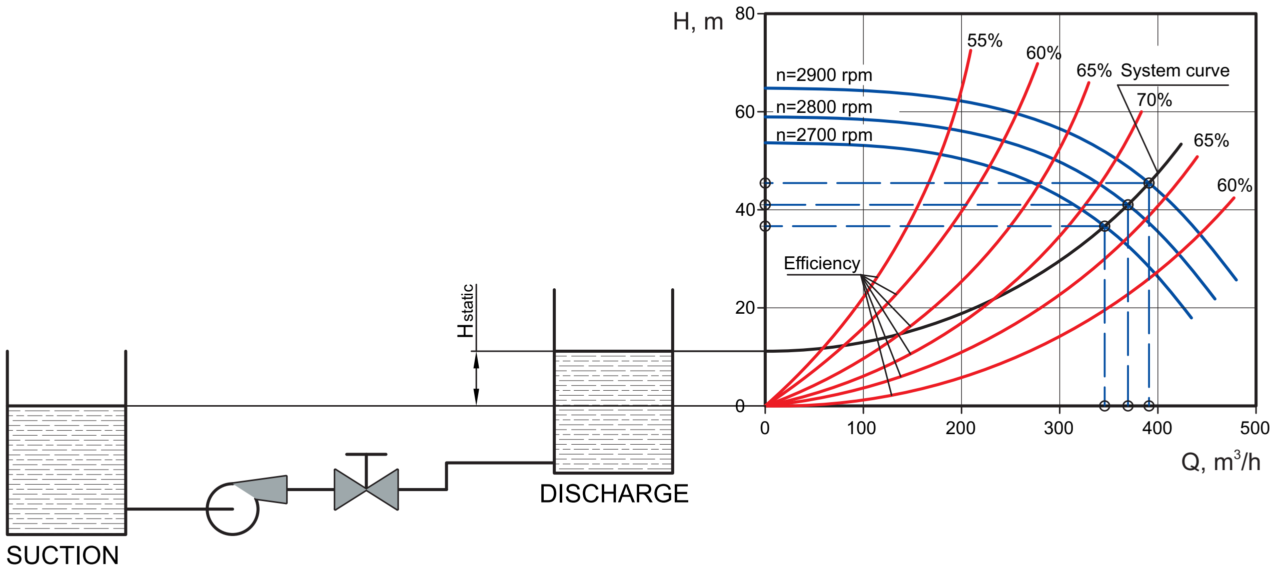


Fig. 7. Pump operation in system with predominant friction losses in case of speed control

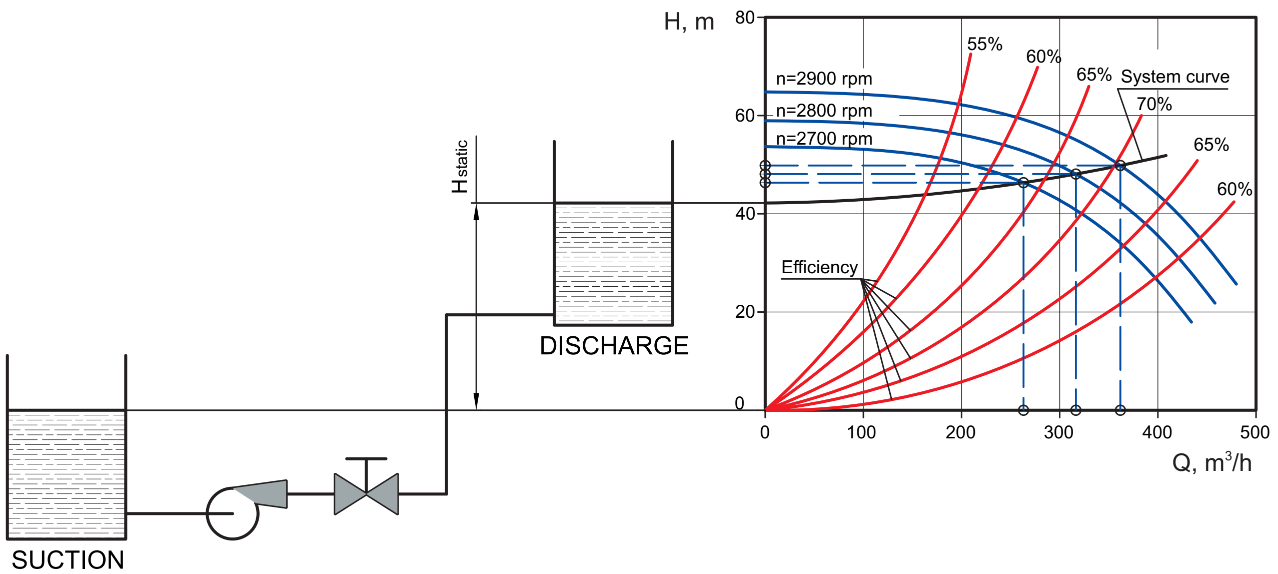


Fig. 8 Pump operation in system with predominant static part in case of speed control

BOREHOLE PUMPS OPERATION WITH FREQUENCY INVERTERS

In operation with frequency inverters the following requirements should be complied with:

- For efficient motor cooling the capacity shall be at least 20% of nominal capacity defined on Q-H curve. For example, CRS 6-10 nominal capacity = 8 m^3/h. Pump usually is controlled by pressure. Capacity may fall below a specified level therefore the flow sensor (switch) is recommended to be installed to switch off the motor in case of capacity drop below the operational range.
- Temperature sensor (to switch off motor at temperature higher than 70 °C) is recommended to be installed to protect the motor winding from overheating, blowing and breakdown.
- If a cable connecting the pump unit and the inverter is quite long then the output filters are recommended to be installed: dv/dt filters or sine wave filters for reducing motor insulation stress and protect from high voltage pulses, premature wear and breakdown. Recommendations of appropriate filters installation should be checked with the variable drive manufacturer.

In case of uneven water supply the frequency inverter shall be applied used with hydraulic accumulator or intermediate storage tank of appropriate capacity cooling. Please bear in mind that in case of large static part in the system characteristic using of variable speed drives does not result in energy efficiency, and only reduces volume and dimensions of intermediate storage tanks and risks of water hammer.

TYPICAL MISTAKES IN PUMP SELECTION AND OPERATION

Frequent pumps failures and excessive power consumption lays at the wrong pump selection and unqualified maintenance during operation.

Most typical mistakes are listed below:

1. Pump installation and operation with overestimated parameters (capacity, head) than required, i.e. use of oversized pump that would cause the unnecessarily high capital cost of equipment.

This problem may occur both at the construction stage (Fig. 9-12) and during operation if system features change.

The following below is typical in this case:

- real current consumption is significantly higher than nominal
- frequent triggering of the control panels under condition that control panel complies with the pump parameters
- frequent pump starts/stops

Pump operation in that mode may lead to:

- higher water turbidity and sand content, filter clogging and water quality deterioration
- increased power consumption at decreased efficiency
- motor overheating
- motor winding breakdown
- wear resistance from floating impellers

Throttling control with valves leads to excessive power loss due to friction.

2. Pump operation at a lower capacity results in:

- inadequate cooling and eventually motor overheating
- increased wear of bearings due to insufficient lubrication
- lower pump efficiency

3. Selection according to max capacity and head

Please bear in mind that besides operation at a max efficiency there are other modes of operation. Therefore the storage tanks installation and variable pump control methods are recommended.

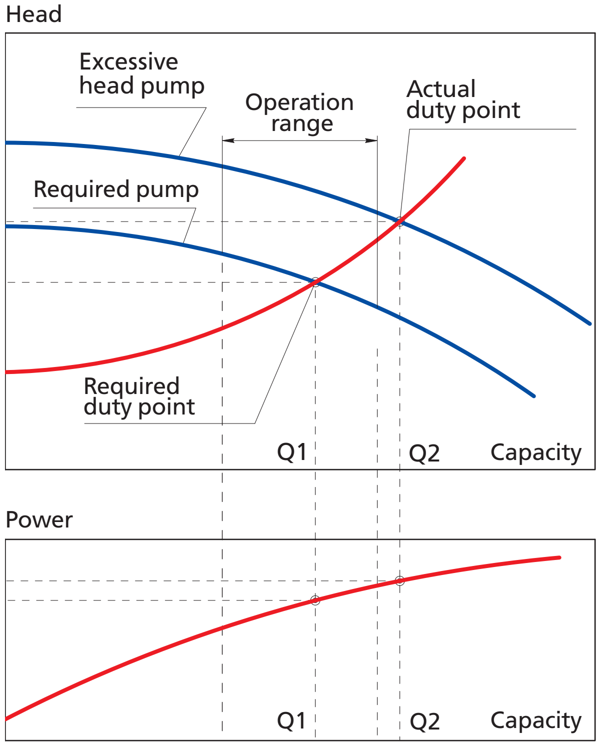


Fig. 9. Pump operation with excessive head

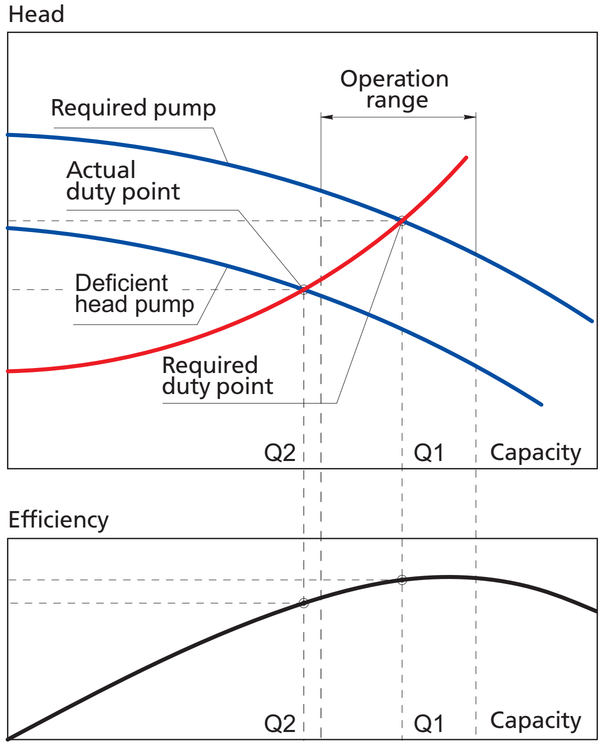


Fig.10. Pump operation with deficient head

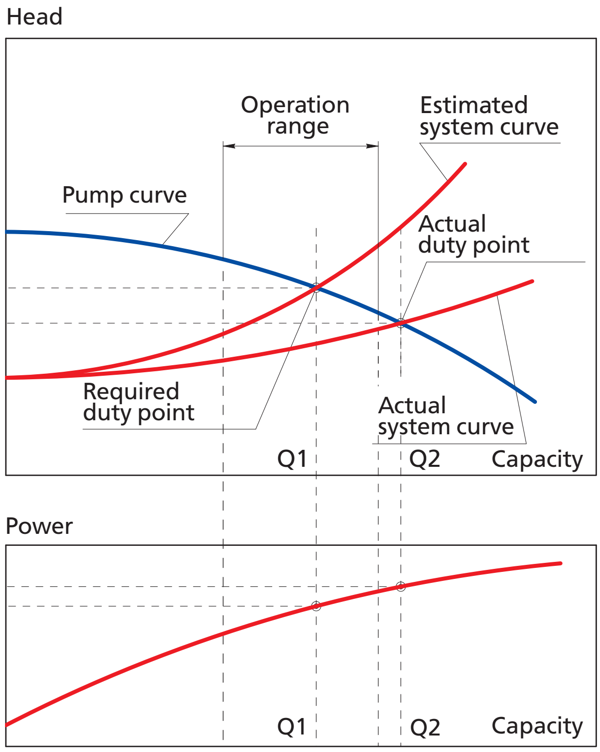


Fig.11. Pump operation at a higher capacity

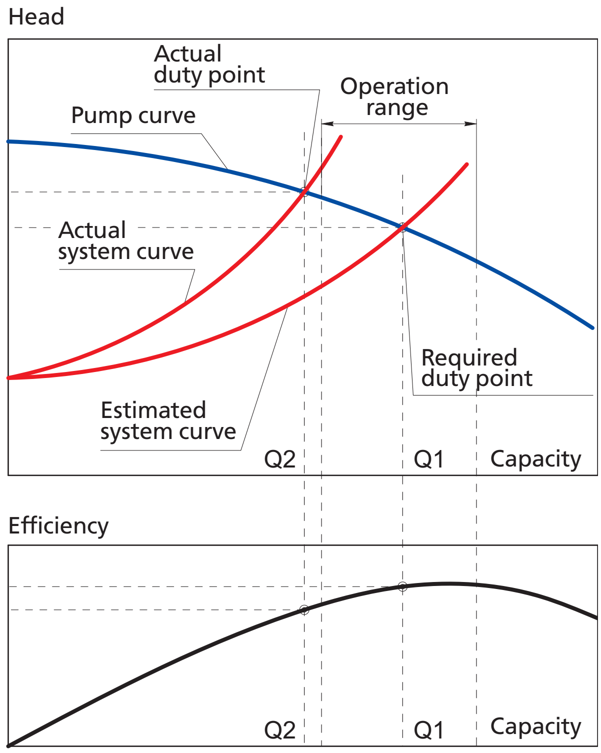


Fig.12. Pump operation at a lower capacity

4. Pump operation without cooling shroud in a well of larger diameter

Installation of a pump of lower diameter in respect to diameter of the well reduces significantly the liquid flow rate required for the motor cooling and leads to overheating and shortened operational life.

The pump diameter should be selected in a way to keep the liquid velocity at least 0.2 m/s.

$$Q = v \cdot S$$

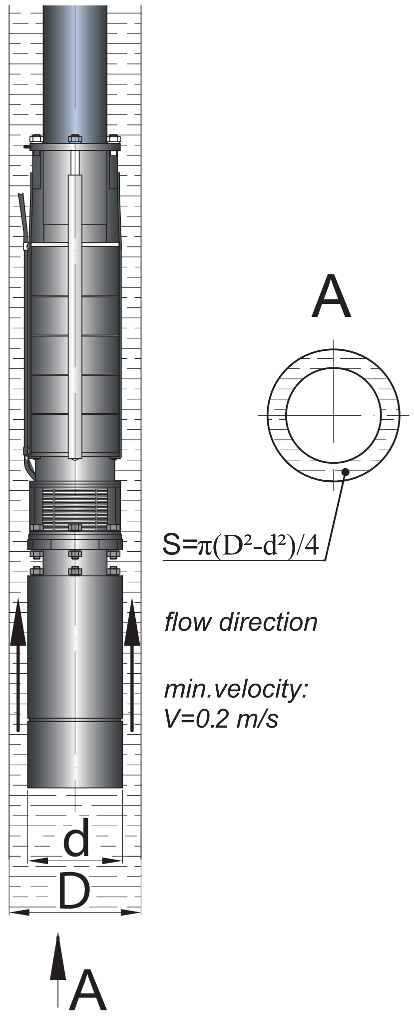
$$S = \frac{\pi \cdot (D^2 - d^2)}{4}$$

Pump diameter is selected according to required capacity:

$$d \geq \sqrt{D^2 - \frac{4 \cdot (Q/3600)}{\pi \cdot v}} = \sqrt{D^2 - \frac{Q}{900 \cdot \pi \cdot (0.2\, m/s)}}$$

where

- D – well diameter, m
- d – pump diameter, m
- Q – pump capacity, m^3/h
- v – average liquid velocity, m/s



5. Pipe selection of lower diameter

Use of pipes of lower diameter than size of discharge nozzle (thread or flanged) for saving purpose results in major loss due to friction and increase of required head. The required liquid flow presumably could not be reached at that.

6. Cable selection of smaller cross-section

Selecting cross-section lower than recommended will lead to significant voltage drop which would affect the motor and cause overheating.

7. Pump capacity exceeds well yield. That leads to dry running operation, which will cause:

- motor overheating
- rapid wear of bearings
- increased corrosion

8. Poor quality of supply voltage and absence of control panels

Direct connection to the power supply does not help to protect the motor from the most typical causes of failure such as current unbalance, phase reversal, under/overvoltage, etc.

9. Built-in non-return valve dismantling

Leads to pump parts experiencing water hammer when pump stops. Besides, after each start the pump is running to fill the pipeline.

10. Absence of instrumentation

Instrumentation and sensors (water level, pressure, flow rate, voltage, current, number of starts/stops and time of pump operation, etc.) provide valid data on the pump operation and system features for monitoring and timely intervention into pump operation.

PERFORMANCE CURVES AND DIMENSIONS

Performance curves are given according to ISO 9906:1999, Appendix A for the following conditions:

- rated rotation speed
- voltage supply frequency: 50 Hz
- pumped liquid: clean fresh water
- water temperature: +20°C
- kinematic viscosity: $1 \cdot 10^{-6}$ m^2/s (1cSt)

Hydraulic losses in non-return valve are taken into account.

Performance curves are given for one pump stage as well as power curves.

$$P_{2\_pump} = P_{2\_stg} \cdot n$$

where

P_{2_stg} – stage power, kW

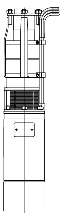
P_{2_pump} – pump shaft power, kW

n – number of stages

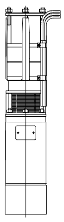
It is recommended to select a pump according to operation at max efficiency within 0.6 - 1.2 capacity range.

Delivery status (indicated in table):

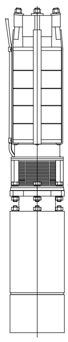
«+» - in storage. Empty field – model available on request.



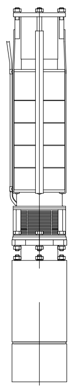
CRS 6–4
CRS 6–6,5
CRS 6–10



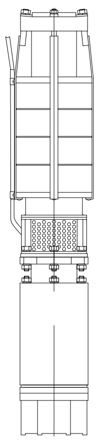
CRS 6–16
CRS 6–25



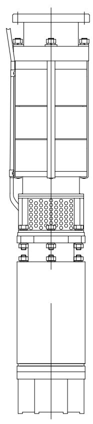
CRS 8–16
CRS 8–25
CRS 8–40



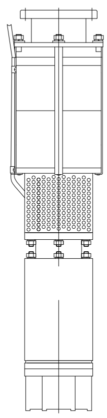
CRS 8–65



CRS 10–65

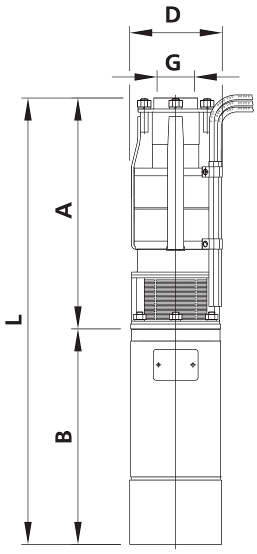


CRS 10–100
CRS 10–120
CRS 10–160

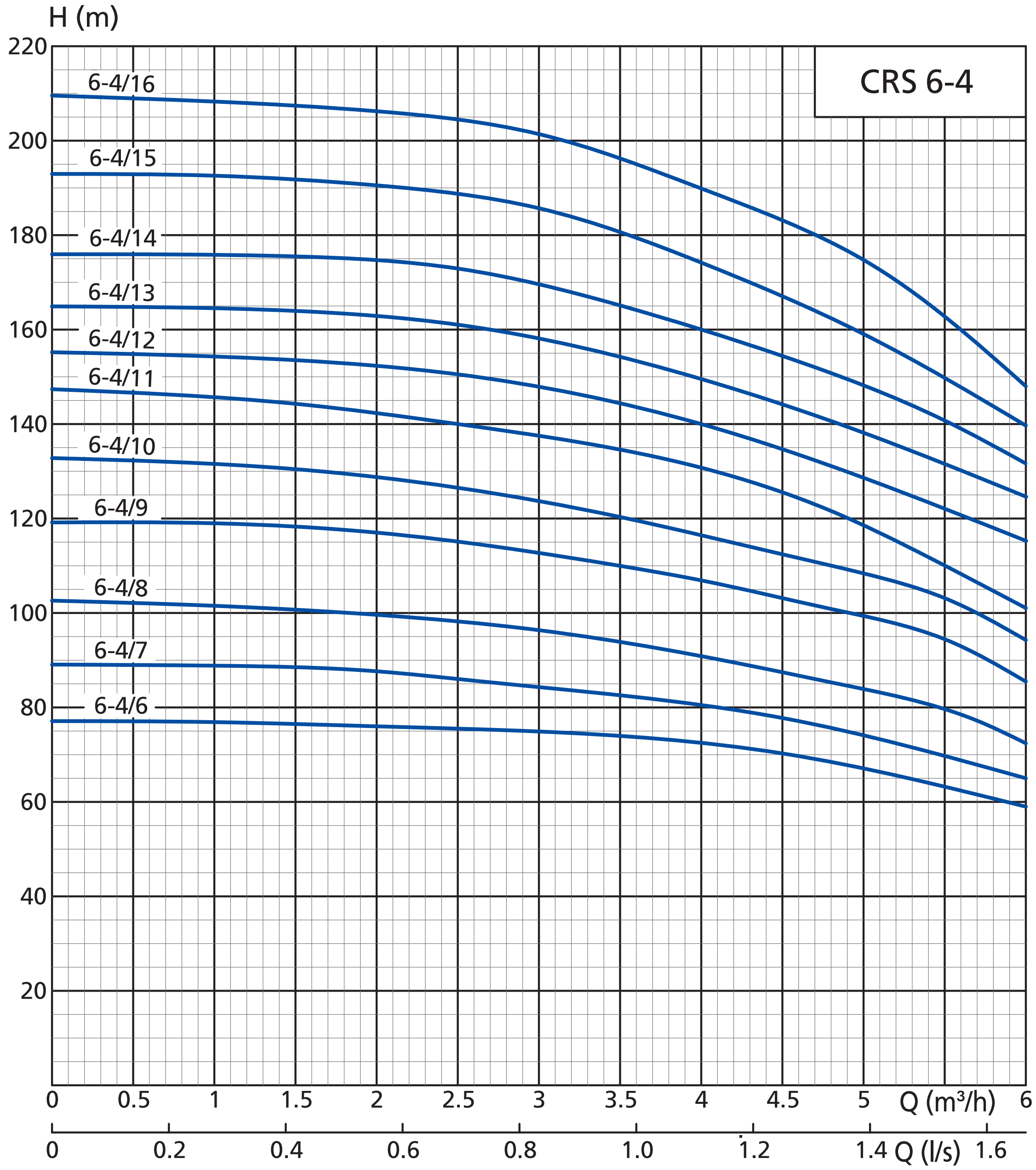


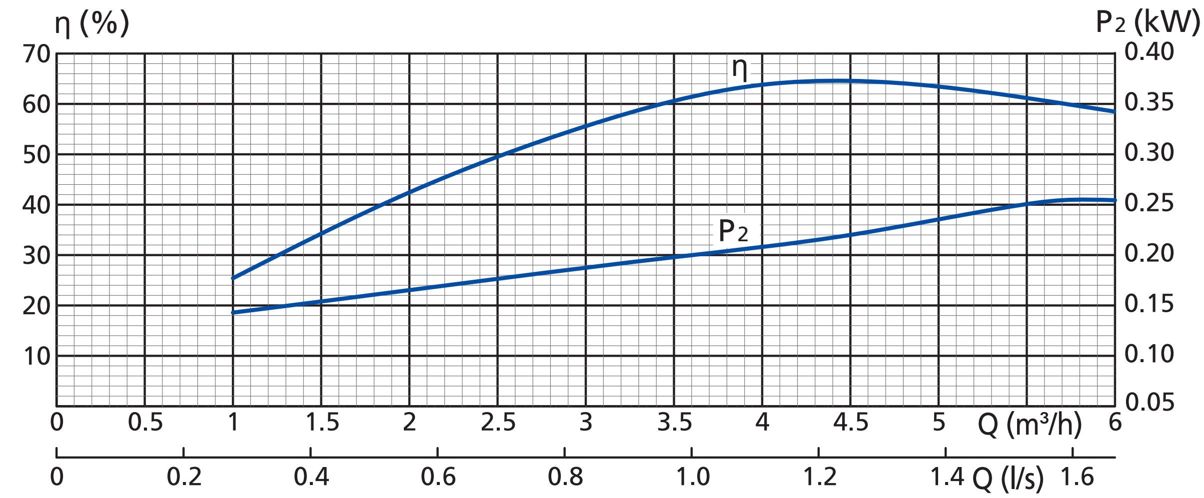
CRS 12–160
CRS 12–200
CRS 12–210
CRS 12–250

HMS CIRIS 6–4

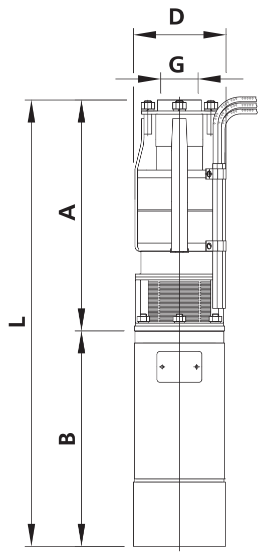


Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 6-4/6-3	DAP 6-3	3	144	1070	473	597	G2" – B GOST 6357 standard	57	+
CRS 6-4/7-3	DAP 6-3	3	144	1115	518	597		60	
CRS 6-4/8-3	DAP 6-3	3	144	1155	558	597		62	
CRS 6-4/9-3	DAP 6-3	3	144	1200	603	597		64	+
CRS 6-4/10-3	DAP 6-3	3	144	1240	643	597		67	
CRS 6-4/11-4	DAP 6-4	4	144	1270	649	621		69	+
CRS 6-4/12-4	DAP 6-4	4	144	1310	689	621		71	
CRS 6-4/13-4	DAP 6-4	4	144	1355	734	621		73	
CRS 6-4/14-4	DAP 6-4	4	144	1395	774	621		74	+
CRS 6-4/15-4	DAP 6-4	4	144	1440	819	621		75	
CRS 6-4/16-4	DAP 6-4	4	144	1480	859	621		76	+

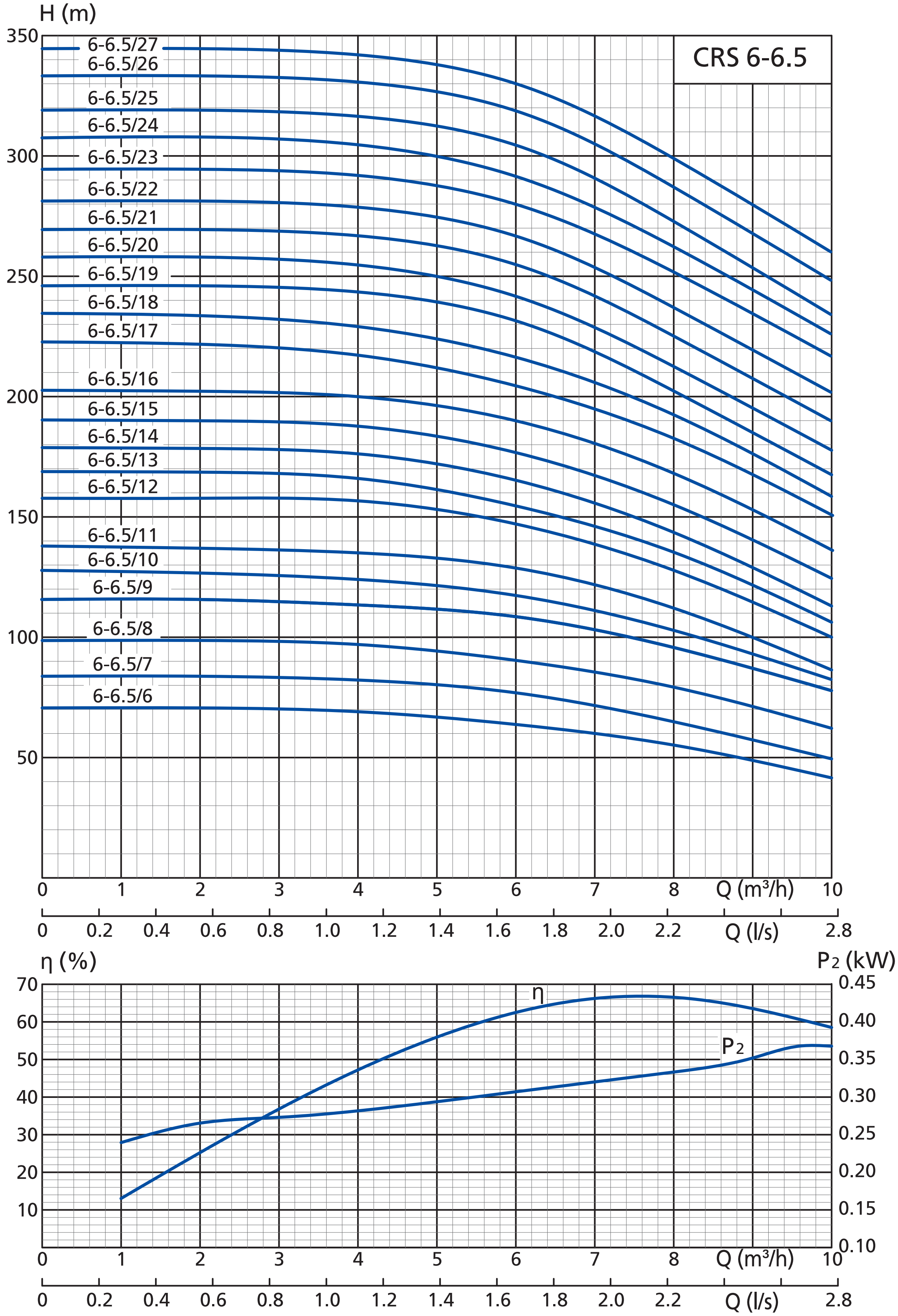

H (m)
CRS 6-4
6-4/16
6-4/15
6-4/14
6-4/13
6-4/12
6-4/11
6-4/10
6-4/9
6-4/8
6-4/7
6-4/6
220
200
180
160
140
120
100
80
60
40
20
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
6
Q (m³/h)
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
Q (l/s)


η (%)
P2 (kW)
η
P2
70
60
50
40
30
20
10
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
6
Q (m³/h)
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
Q (l/s)

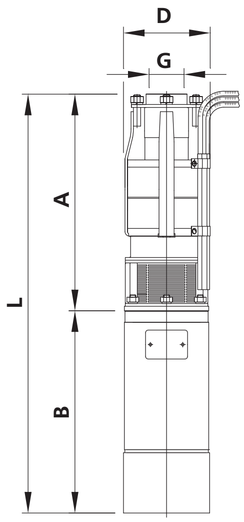
HMS CIRIS 6–6.5



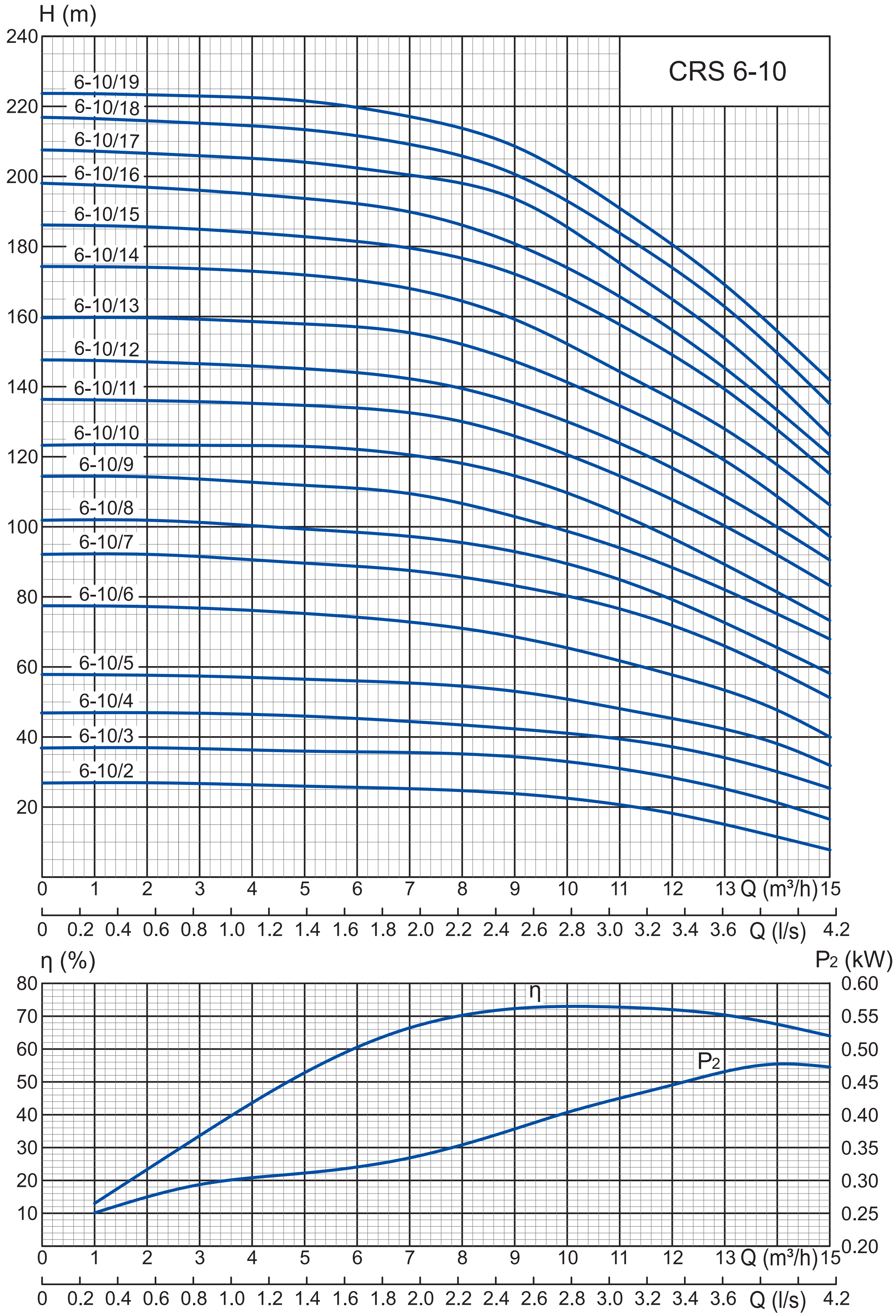
Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 6-6.5/6-3	DAP 6-3	3	144	1075	478	597	G2" – B GOST 6357 standard	62	+
CRS 6-6.5/7-3	DAP 6-3	3	144	1125	528	597		63	
CRS 6-6.5/8-3	DAP 6-3	3	144	1170	573	597		64	+
CRS 6-6.5/9-4	DAP 6-4	4	144	1230	609	621		66	+
CRS 6-6.5/10-4	DAP 6-4	4	144	1270	649	621		67	
CRS 6-6.5/11-4	DAP 6-4	4	144	1310	689	621		68	+
CRS 6-6.5/12-5.5	DAP 6-5.5	5.5	144	1410	769	641		74	+
CRS 6-6.5/13-5.5	DAP 6-5.5	5.5	144	1420	779	641		75	
CRS 6-6.5/14-5.5	DAP 6-5.5	5.5	144	1430	789	641		75	+
CRS 6-6.5/15-7.5	DAP 6-7.5	7.5	144	1540	834	706		84	
CRS 6-6.5/16-7.5	DAP 6-7.5	7.5	144	1590	884	706		85	+
CRS 6-6.5/17-7.5	DAP 6-7.5	7.5	144	1640	934	706		86	
CRS 6-6.5/18-7.5	DAP 6-7.5	7.5	144	1690	984	706		88	
CRS 6-6.5/19-7.5	DAP 6-7.5	7.5	144	1740	1034	706		89	+
CRS 6-6.5/20-9	DAP 6-9	9	144	1790	1059	731		90	
CRS 6-6.5/21-9	DAP 6-9	9	144	1840	1109	731		91	
CRS 6-6.5/22-11	DAP 6-11	11	144	1890	1124	766		92	
CRS 6-6.5/23-11	DAP 6-11	11	144	1940	1174	766		94	
CRS 6-6.5/24-11	DAP 6-11	11	144	1990	1224	766		95	
CRS 6-6.5/25-11	DAP 6-11	11	144	2040	1274	766		96	
CRS 6-6.5/26-13	DAP 6-13	13	144	2090	1269	821		97	
CRS 6-6.5/27-13	DAP 6-13	13	144	2140	1319	821		98	


H (m)
CRS 6-6.5
6-6.5/27
6-6.5/26
6-6.5/25
6-6.5/24
6-6.5/23
6-6.5/22
6-6.5/21
6-6.5/20
6-6.5/19
6-6.5/18
6-6.5/17
6-6.5/16
6-6.5/15
6-6.5/14
6-6.5/13
6-6.5/12
6-6.5/11
6-6.5/10
6-6.5/9
6-6.5/8
6-6.5/7
6-6.5/6
350
300
250
200
150
100
50
0
1
2
3
4
5
6
7
8
Q (m³/h)
10
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
Q (l/s)
2.8
η (%)
P2 (kW)
η
P2
70
60
50
40
30
20
10
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10

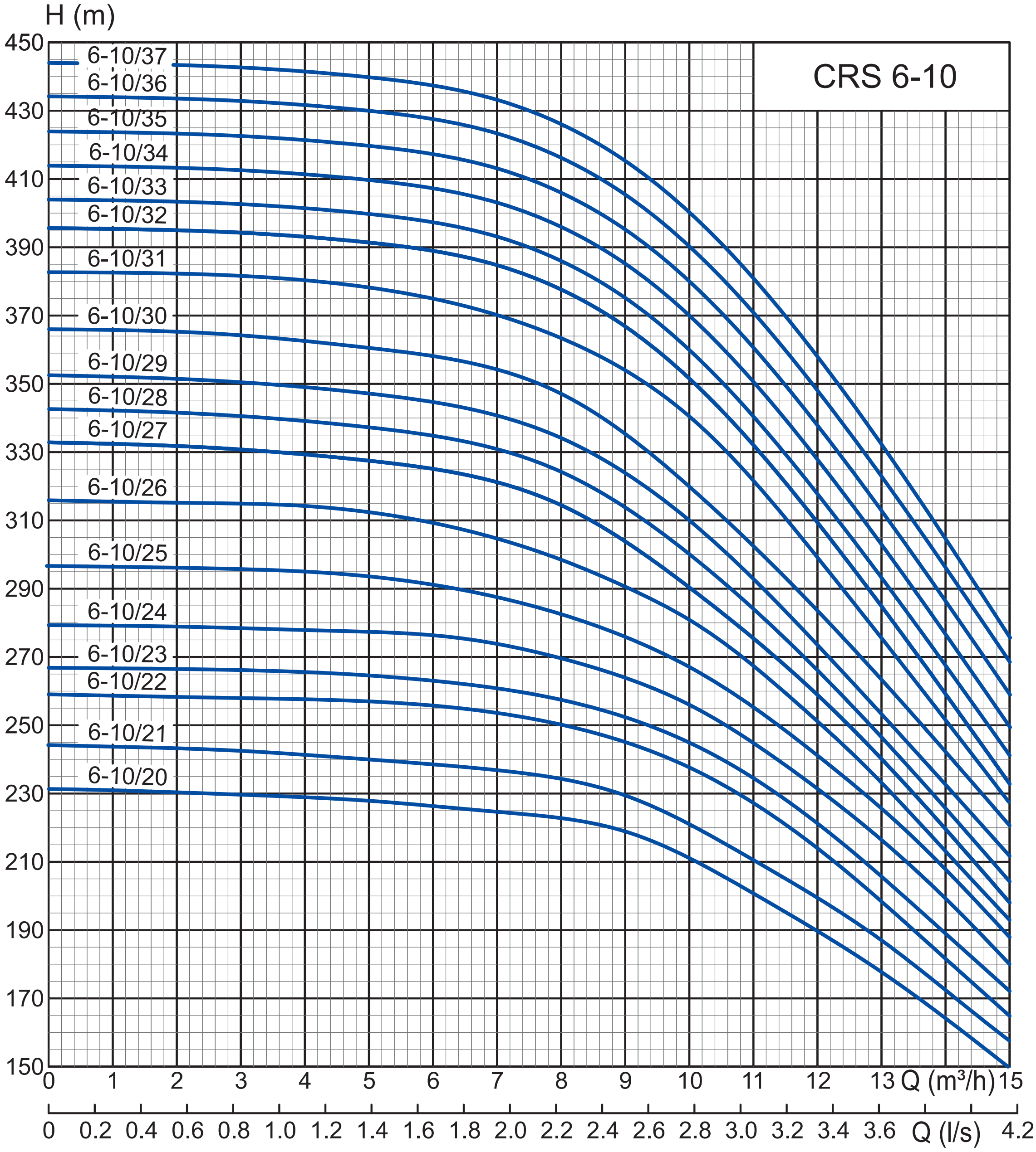
HMS CIRIS 6–10

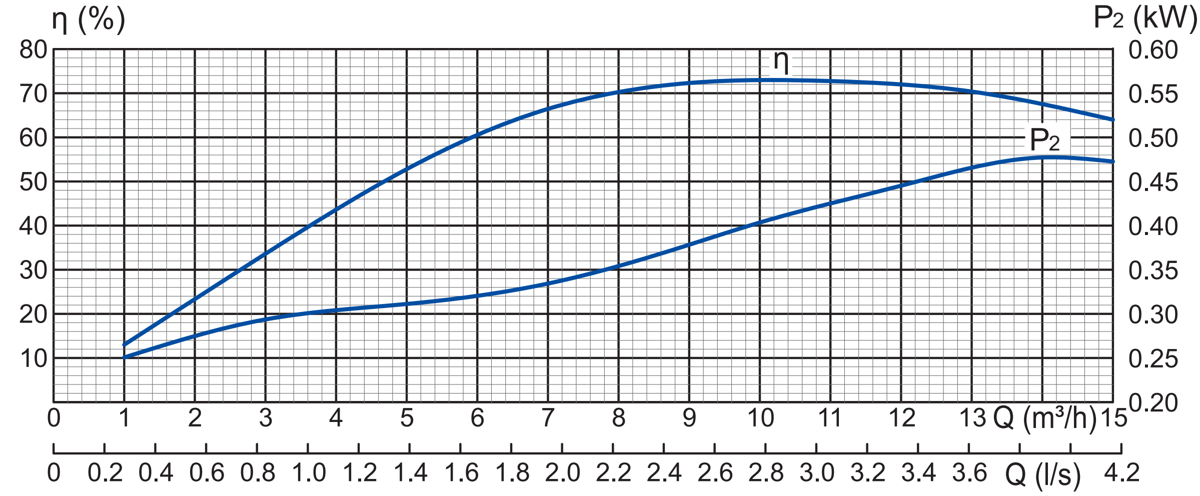


Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 6-10/2-3	DAP 6-3	3	144	930	333	597	G2" – B GOST 6357 standard	57	
CRS 6-10/3-3	DAP 6-3	3	144	970	373	597		58	
CRS 6-10/4-3	DAP 6-3	3	144	1010	413	597		59	
CRS 6-10/5-3	DAP 6-3	3	144	1050	453	597		60	+
CRS 6-10/6-3	DAP 6-3	3	144	1090	493	597		61	
CRS 6-10/7-4	DAP 6-4	4	144	1150	529	621		64	+
CRS 6-10/8-4	DAP 6-4	4	144	1190	569	621		65	
CRS 6-10/9-5.5	DAP 6-5.5	5.5	144	1250	609	641		68	
CRS 6-10/10-5.5	DAP 6-5.5	5.5	144	1320	679	641		69	+
CRS 6-10/11-5.5	DAP 6-5.5	5.5	144	1335	694	641		70	+
CRS 6-10/12-7.5	DAP 6-7.5	7.5	144	1435	729	706		79	
CRS 6-10/13-7.5	DAP 6-7.5	7.5	144	1470	764	706		80	+
CRS 6-10/14-7.5	DAP 6-7.5	7.5	144	1515	809	706		81	
CRS 6-10/15-9	DAP 6-9	9	144	1580	849	731		84	+
CRS 6-10/16-9	DAP 6-9	9	144	1620	889	731		85	
CRS 6-10/17-9	DAP 6-9	9	144	1660	929	731		86	+
CRS 6-10/18-9	DAP 6-9	9	144	1700	969	731		87	
CRS 6-10/19-11	DAP 6-11	11	144	1770	1004	766		92	
CRS 6-10/20-11	DAP 6-11	11	144	1810	1044	766		93	
CRS 6-10/21-11	DAP 6-11	11	144	1850	1084	766		94	
CRS 6-10/22-11	DAP 6-11	11	144	1890	1124	766		95	+
CRS 6-10/23-13	DAP 6-13	13	144	1990	1169	821		101	
CRS 6-10/24-13	DAP 6-13	13	144	2025	1204	821		102	
CRS 6-10/25-13	DAP 6-13	13	144	2065	1244	821		103	
CRS 6-10/26-13	DAP 6-13	13	144	2105	1284	821		104	
CRS 6-10/27-13	DAP 6-13	13	144	2145	1324	821		105	+
CRS 6-10/28-15	DAP 6-15	15	144	2225	1364	861		110	
CRS 6-10/29-15	DAP 6-15	15	144	2265	1404	861		111	
CRS 6-10/30-15	DAP 6-15	15	144	2305	1444	861		112	
CRS 6-10/31-15	DAP 6-15	15	144	2345	1484	861		113	
CRS 6-10/32-15	DAP 6-15	15	144	2385	1524	861		114	+
CRS 6-10/33-18.5	DAP 6-18.5	18.5	144	2470	1564	906		120	
CRS 6-10/34-18.5	DAP 6-18.5	18.5	144	2510	1604	906		121	
CRS 6-10/35-18.5	DAP 6-18.5	18.5	144	2550	1644	906		122	
CRS 6-10/36-18.5	DAP 6-18.5	18.5	144	2590	1684	906		123	
CRS 6-10/37-18.5	DAP 6-18.5	18.5	144	2630	1724	906		124	

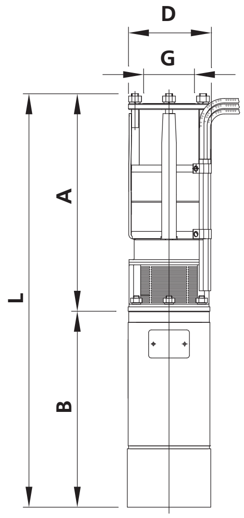


CRS 6-10
H (m)
240
220
200
180
160
140
120
100
80
60
40
20
6-10/19
6-10/18
6-10/17
6-10/16
6-10/15
6-10/14
6-10/13
6-10/12
6-10/11
6-10/10
6-10/9
6-10/8
6-10/7
6-10/6
6-10/5
6-10/4
6-10/3
6-10/2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 Q (m³/h) 15
0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 Q (l/s) 4.2
η (%)
80 70 60 50 40 30 20 10
P2 (kW)
0.60 0.55 0.50 0.45 0.40 0.35 0.30 0.25 0.20
η
P2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 Q (m³/h) 15
0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 Q (l/s) 4.2

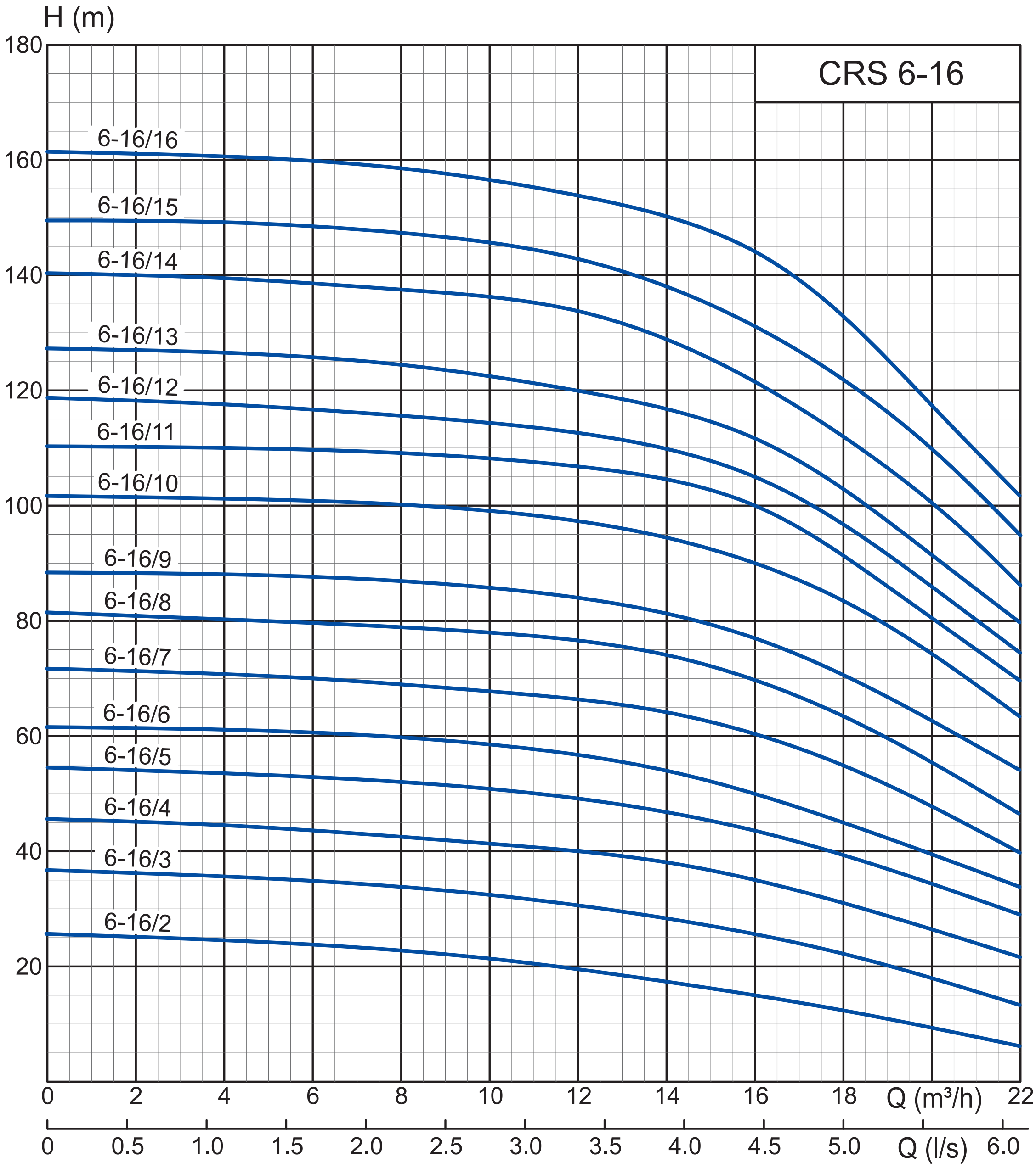

H (m)
CRS 6-10
6-10/37
6-10/36
6-10/35
6-10/34
6-10/33
6-10/32
6-10/31
6-10/30
6-10/29
6-10/28
6-10/27
6-10/26
6-10/25
6-10/24
6-10/23
6-10/22
6-10/21
6-10/20
450
430
410
390
370
350
330
310
290
270
250
230
210
190
170
150
0 1 2 3 4 5 6 7 8 9 10 11 12 13 Q (m³/h) 15
0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 Q (l/s) 4.2

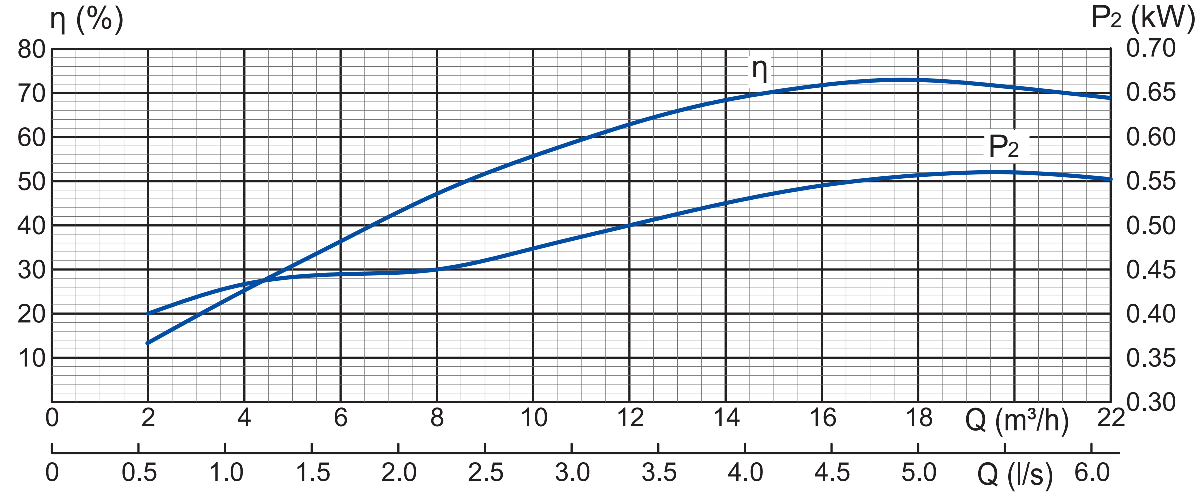

η (%)
P2 (kW)
η
P2
80 70 60 50 40 30 20 10
0.60 0.55 0.50 0.45 0.40 0.35 0.30 0.25 0.20
0 1 2 3 4 5 6 7 8 9 10 11 12 13 Q (m³/h) 15
0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 Q (l/s) 4.2

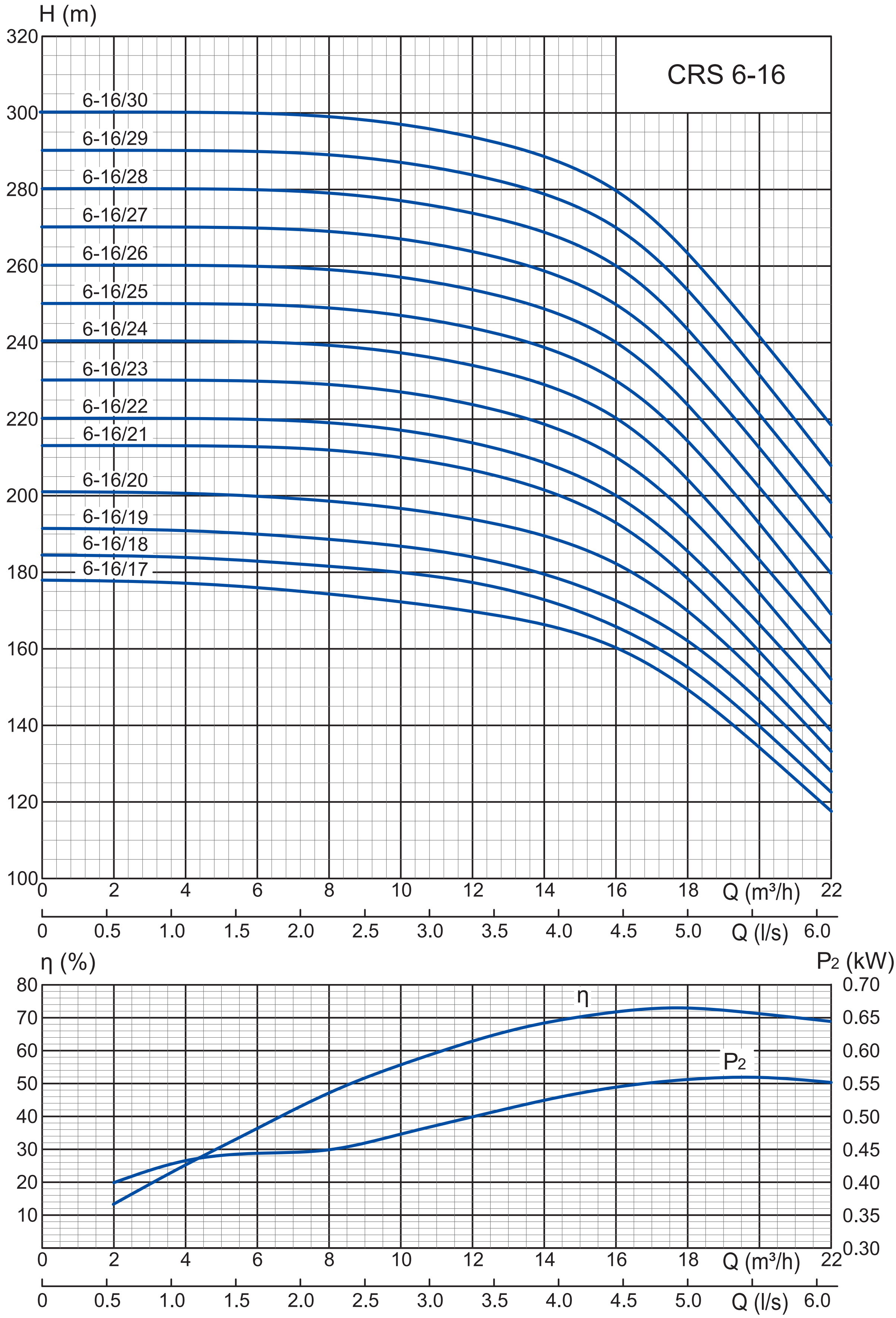
HMS CIRIS 6–16



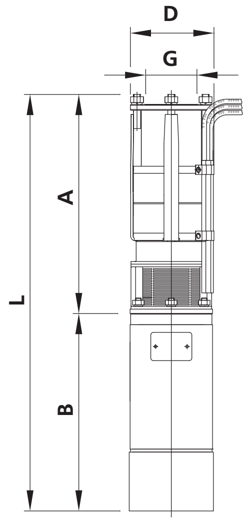
Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 6-16/2-3	DAP 6-3	3	144	1000	403	597	G 2½" – B GOST 6357 standart	64	
CRS 6-16/3-3	DAP 6-3	3	144	1050	453	597		65	
CRS 6-16/4-3	DAP 6-3	3	144	1100	503	597		66	
CRS 6-16/5-3	DAP 6-3	3	144	1150	553	597		67	
CRS 6-16/6-3	DAP 6-3	3	144	1200	603	597		68	+
CRS 6-16/7-4	DAP 6-4	4	144	1270	649	621		70	
CRS 6-16/8-5.5	DAP 6-5.5	5.5	144	1340	699	641		73	
CRS 6-16/9-5.5	DAP 6-5.5	5.5	144	1420	714	706		80	+
CRS 6-16/10-7.5	DAP 6-7.5	7.5	144	1430	724	706		73	+
CRS 6-16/11-7.5	DAP 6-7.5	7.5	144	1520	814	706		86	+
CRS 6-16/12-7.5	DAP 6-7.5	7.5	144	1570	864	706		87	
CRS 6-16/13-7.5	DAP 6-7.5	7.5	144	1620	914	706		88	+
CRS 6-16/14-9	DAP 6-9	9	144	1690	959	731		91	
CRS 6-16/15-9	DAP 6-9	9	144	1730	999	731		92	
CRS 6-16/16-11	DAP 6-11	11	144	1830	1064	766		97	+
CRS 6-16/17-13	DAP 6-13	13	144	1940	1119	821		103	+
CRS 6-16/18-13	DAP 6-13	13	144	1970	1149	821		104	
CRS 6-16/19-13	DAP 6-13	13	144	2000	1179	821		105	
CRS 6-16/20-13	DAP 6-13	13	144	2030	1209	821		106	
CRS 6-16/21-15	DAP 6-15	15	144	2090	1229	861		111	+
CRS 6-16/22-15	DAP 6-15	15	144	2135	1274	861		112	
CRS 6-16/23-15	DAP 6-15	15	144	2180	1319	861		113	
CRS 6-16/24-15	DAP 6-15	15	144	2220	1359	861		114	
CRS 6-16/25-18.5	DAP 6-18.5	18.5	144	2310	1404	906		120	
CRS 6-16/26-18.5	DAP 6-18.5	18.5	144	2350	1444	906		121	
CRS 6-16/27-18.5	DAP 6-18.5	18.5	144	2395	1489	906		122	
CRS 6-16/28-18.5	DAP 6-18.5	18.5	144	2440	1534	906		123	
CRS 6-16/29-18.5	DAP 6-18.5	18.5	144	2480	1574	906		124	
CRS 6-16/30-18.5	DAP 6-18.5	18.5	144	2520	1614	906		125	


H (m)
CRS 6-16
6-16/16
6-16/15
6-16/14
6-16/13
6-16/12
6-16/11
6-16/10
6-16/9
6-16/8
6-16/7
6-16/6
6-16/5
6-16/4
6-16/3
6-16/2
180
160
140
120
100
80
60
40
20
0 2 4 6 8 10 12 14 16 18 22
Q (m³/h)
0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 6.0
Q (l/s)

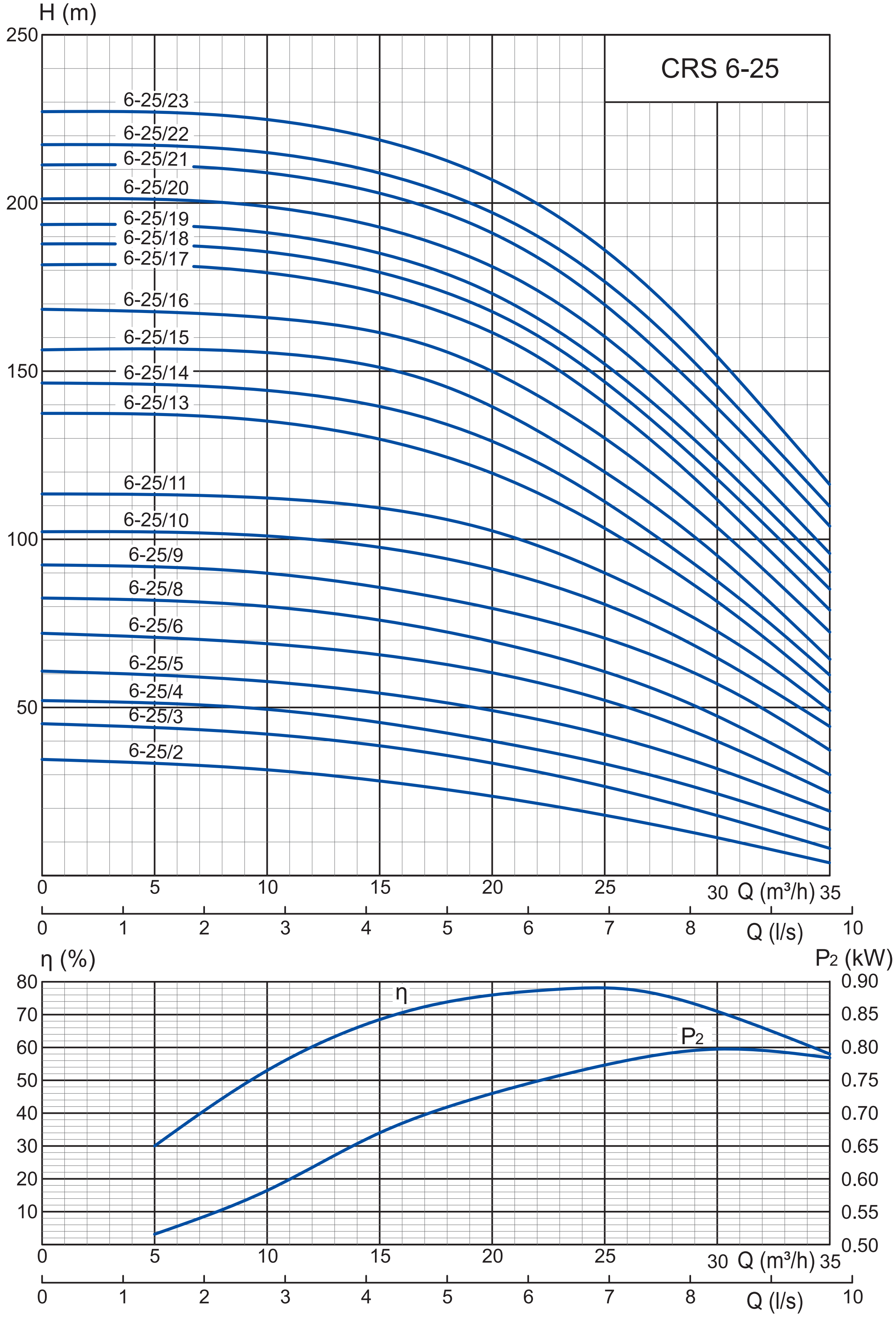

η (%)
P2 (kW)
η
P2
80 70 60 50 40 30 20 10 0
0.70 0.65 0.60 0.55 0.50 0.45 0.40 0.35 0.30
0 2 4 6 8 10 12 14 16 18 22
Q (m³/h)
0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 6.0
Q (l/s)


H (m)
CRS 6-16
6-16/30
6-16/29
6-16/28
6-16/27
6-16/26
6-16/25
6-16/24
6-16/23
6-16/22
6-16/21
6-16/20
6-16/19
6-16/18
6-16/17
320
300
280
260
240
220
200
180
160
140
120
100
0 2 4 6 8 10 12 14 16 18 22
Q (m³/h)
0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 6.0
Q (l/s)
η (%)
P2 (kW)
η
P2
80
70
60
50
40
30
20
10
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30

HMS CIRIS 6–25

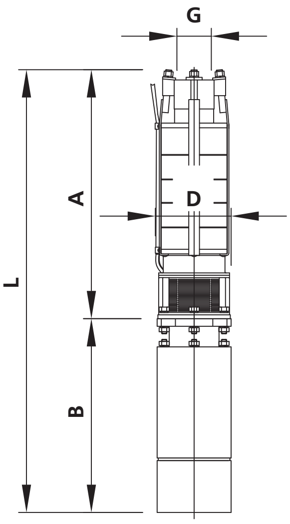


Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 6-25/2-3	DAP 6-3	3	144	970	373	597	SP-89-D GOST 633 standard - see adaptors p.p. 57-58	64	
CRS 6-25/3-3	DAP 6-3	3	144	1020	423	597		65	
CRS 6-25/4-3	DAP 6-3	3	144	1070	473	597		66	
CRS 6-25/5-4	DAP 6-4	4	144	1150	529	621		70	
CRS 6-25/6-5.5	DAP 6-5.5	5.5	144	1220	579	641		73	+
CRS 6-25/8-7.5	DAP 6-7.5	7.5	144	1400	694	706		81	+
CRS 6-25/9-7.5	DAP 6-7.5	7.5	144	1460	754	706		82	+
CRS 6-25/10-7.5	DAP 6-7.5	7.5	144	1500	794	706		84	+
CRS 6-25/11-9	DAP 6-9	9	144	1570	839	731		87	+
CRS 6-25/13-11	DAP 6-11	11	144	1750	984	766		93	+
CRS 6-25/14-11	DAP 6-11	11	144	1800	1034	766		94	
CRS 6-25/15-13	DAP 6-13	13	144	1870	1049	821		101	+
CRS 6-25/16-13	DAP 6-13	13	144	1920	1099	821		103	
CRS 6-25/17-15	DAP 6-15	15	144	2010	1149	861		108	+
CRS 6-25/18-15	DAP 6-15	15	144	2060	1199	861		110	
CRS 6-25/19-15	DAP 6-15	15	144	2110	1249	861		111	
CRS 6-25/20-18.5	DAP 6-18.5	18.5	144	2210	1304	906		117	+
CRS 6-25/21-18.5	DAP 6-18.5	18.5	144	2260	1354	906		119	
CRS 6-25/22-18.5	DAP 6-18.5	18.5	144	2310	1404	906		120	
CRS 6-25/23-18.5	DAP 6-18.5	18.5	144	2360	1454	906		121	

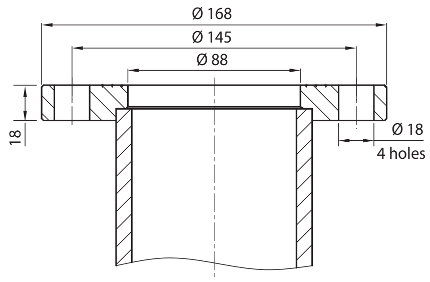


H (m)
250
200
150
100
50
CRS 6-25
6-25/23
6-25/22
6-25/21
6-25/20
6-25/19
6-25/18
6-25/17
6-25/16
6-25/15
6-25/14
6-25/13
6-25/11
6-25/10
6-25/9
6-25/8
6-25/6
6-25/5
6-25/4
6-25/3
6-25/2
0 5 10 15 20 25 30 Q (m³/h) 35
0 1 2 3 4 5 6 7 8 Q (l/s) 10
η (%)
P2 (kW)
80 70 60 50 40 30 20 10
0.90 0.85 0.80 0.75 0.70 0.65 0.60 0.55 0.50
η
P2
0 5 10 15 20 25 30 Q (m³/h) 35
0 1 2 3 4 5 6 7 8 Q (l/s) 10

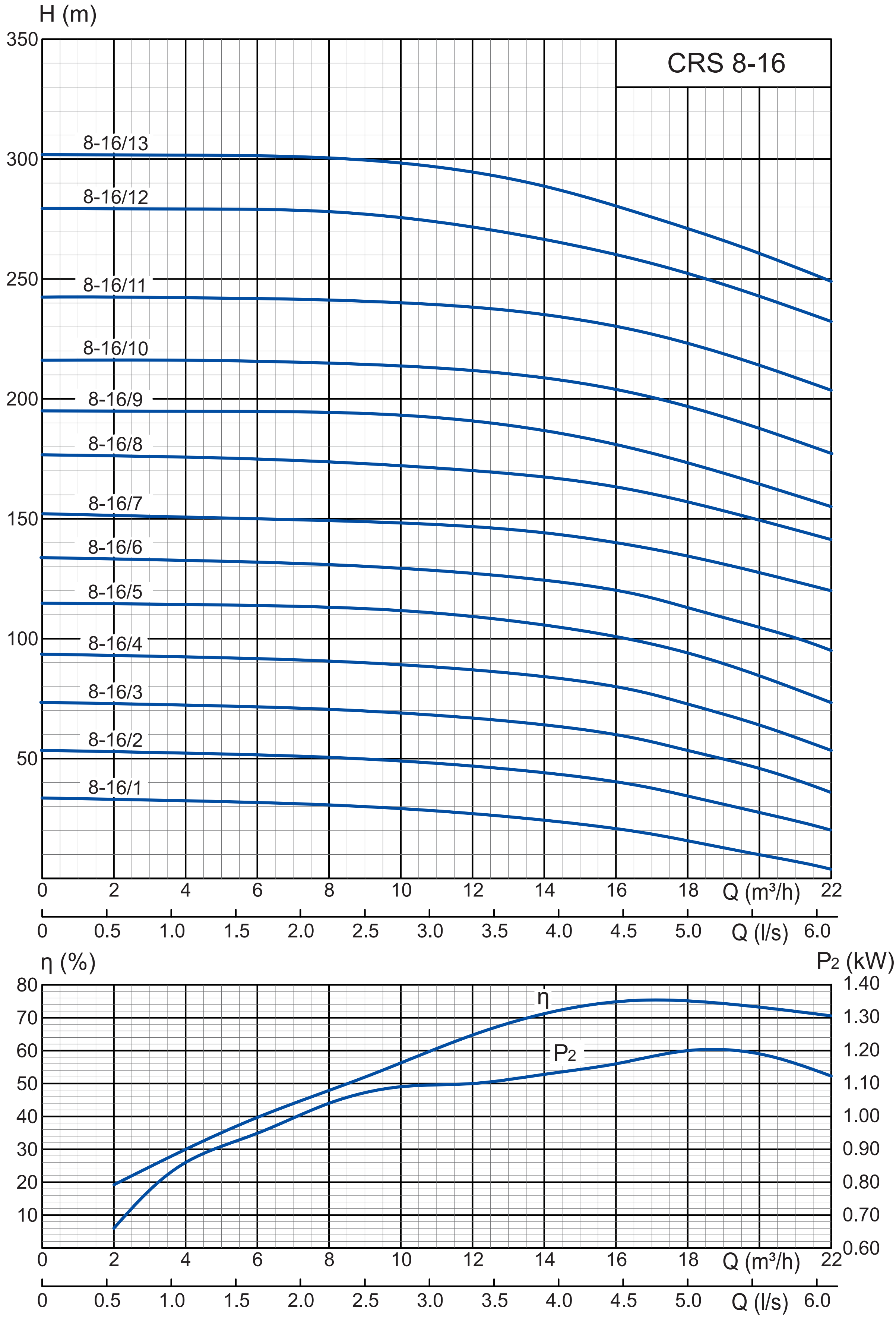
HMS CIRIS 8–16

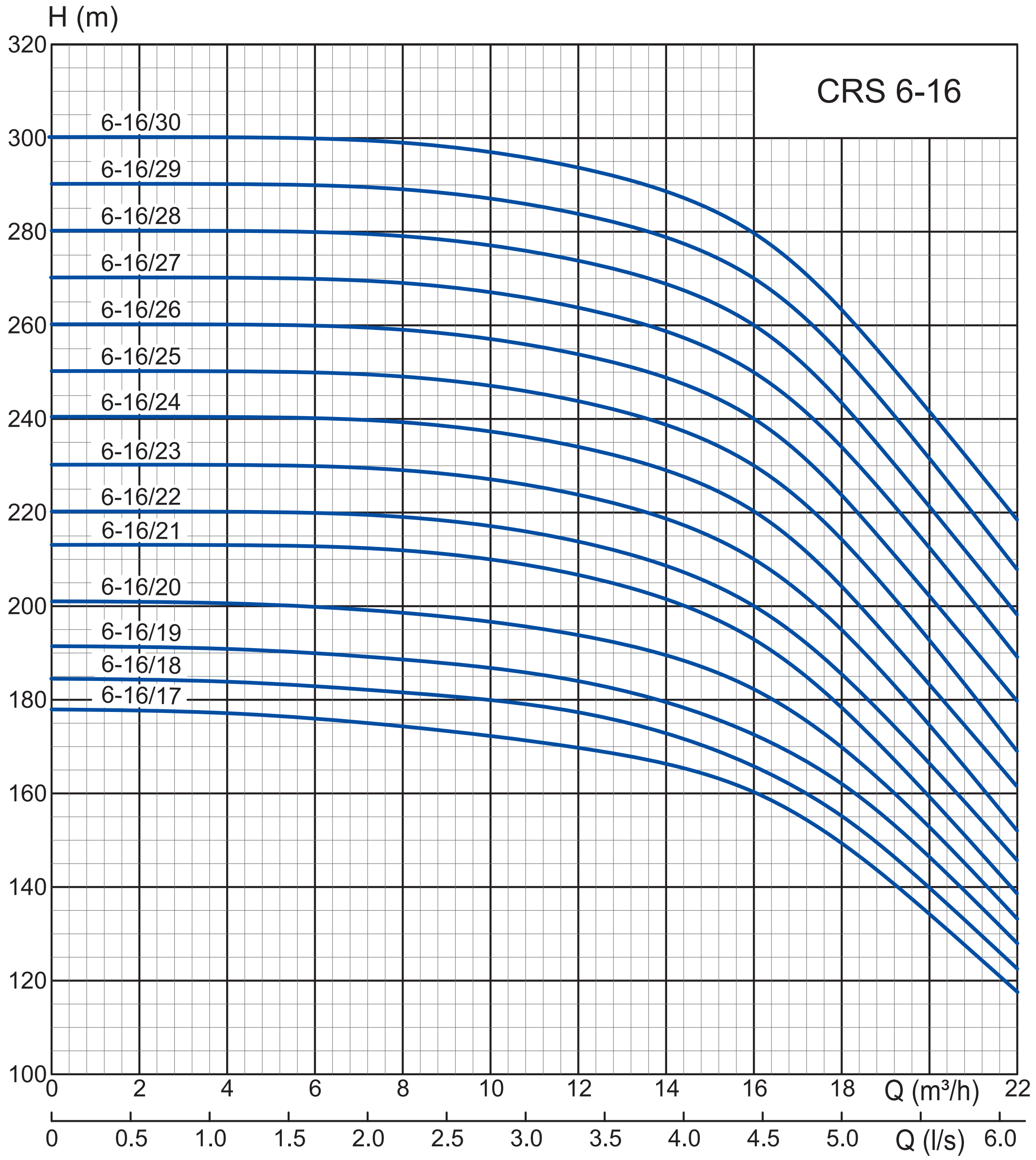


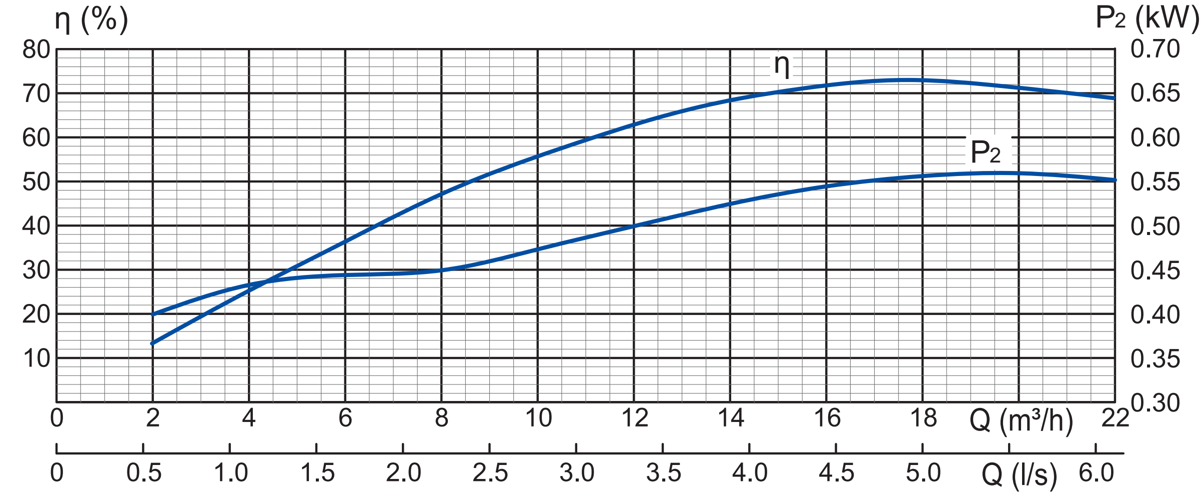
Flanged Connection (option)
DN80



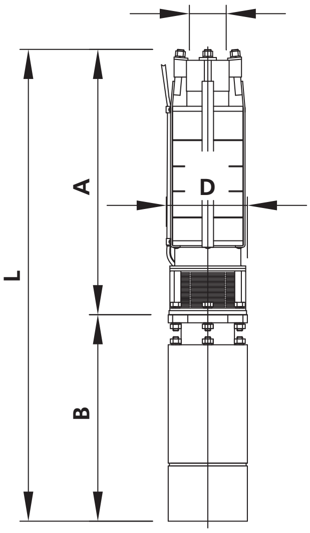
Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 8-16/1-3	DAP 6-3	3	189	890	293	597	G 3 " – B GOST 6357 standard	92	
CRS 8-16/2-3	DAP 6-3	3	189	950	353	597		94	
CRS 8-16/3-4	DAP 6-4	4	189	1025	404	621		98	
CRS 8-16/4-5.5	DAP 6-5.5	5.5	189	1095	454	641		102	
CRS 8-16/5-7.5	DAP 6-7.5	7.5	189	1220	514	706		111	+
CRS 8-16/6-9	DAP 6-9	9	189	1290	559	731		115	
CRS 8-16/7-13	DAP 6-13	13	189	1450	629	821		126	
	DAP 8-13			1385	629	756		147	+
CRS 8-16/8-13	DAP 6-13	13	189	1550	729	821		128	
	DAP 8-13			1485	729	756		149	+
CRS 8-16/9-15	DAP 6-15	15	189	1600	739	861		134	
	DAP 8-15			1520	739	781		156	+
CRS 8-16/10-15	DAP 6-15	15	189	1675	814	861		136	
	DAP 8-15			1600	819	781		158	+
CRS 8-16/11-18.5	DAP 6-18.5	18.5	189	1780	874	906		143	
	DAP 8-18.5			1670	874	796		163	+
CRS 8-16/12-18.5	DAP 6-18.5	18.5	189	1835	929	906		145	
	DAP 8-18.5			1725	929	796		165	+
CRS 8-16/13-22	DAP 8-22	22	189	1860	984	876		184	
CRS 8-16/14-22	DAP 8-22	22	189	1920	1044	876		186	
CRS 8-16/15-26	DAP 8-26	26	189	2010	1099	911		196	
CRS 8-16/16-26	DAP 8-26	26	189	2065	1154	911		198	
CRS 8-16/17-30	DAP 8-30	30	189	2160	1214	946		207	
CRS 8-16/18-30	DAP 8-30	30	189	2215	1269	946		209	
CRS 8-16/19-37	DAP 8-37	37	189	2345	1324	1021		231	
CRS 8-16/20-37	DAP 8-37	37	189	2400	1379	1021		233	
CRS 8-16/21-37	DAP 8-37	37	189	2455	1434	1021		235	
CRS 8-16/22-37	DAP 8-37	37	189	2515	1494	1021		237	
CRS 8-16/23-45	DAP 8-45	45	189	2685	1549	1136		262	
CRS 8-16/24-45	DAP 8-45	45	189	2740	1604	1136		264	
CRS 8-16/25-45	DAP 8-45	45	189	2800	1664	1136		266	
CRS 8-16/26-45	DAP 8-45	45	189	2855	1719	1136		268	
CRS 8-16/27-45	DAP 8-45	45	189	2910	1774	1136		270	


CRS 8-16
H (m)
350
300
250
200
150
100
50
8-16/13
8-16/12
8-16/11
8-16/10
8-16/9
8-16/8
8-16/7
8-16/6
8-16/5
8-16/4
8-16/3
8-16/2
8-16/1
0 2 4 6 8 10 12 14 16 18 22
Q (m³/h)
0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 6.0
Q (l/s)
η (%)
80 70 60 50 40 30 20 10
P2 (kW)
1.40 1.30 1.20 1.10 1.00 0.90 0.80 0.70 0.60
η
P2
0 2 4 6 8 10 12 14 16 18 22
Q (m³/h)
0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 6.0
Q (l/s)

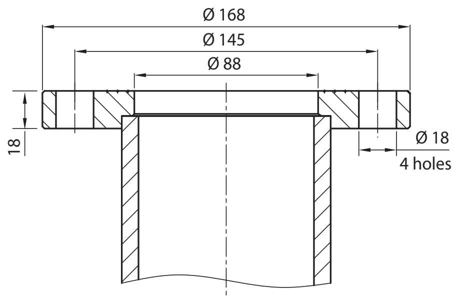

H (m)
CRS 6-16
6-16/30
6-16/29
6-16/28
6-16/27
6-16/26
6-16/25
6-16/24
6-16/23
6-16/22
6-16/21
6-16/20
6-16/19
6-16/18
6-16/17
320
300
280
260
240
220
200
180
160
140
120
100
0
2
4
6
8
10
12
14
16
18
Q (m³/h)
22
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Q (l/s)
6.0


η (%)
P2 (kW)
η
P2
80
70
60
50
40
30
20
10
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0
2
4
6
8
10
12
14
16
18
Q (m³/h)
22
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Q (l/s)
6.0

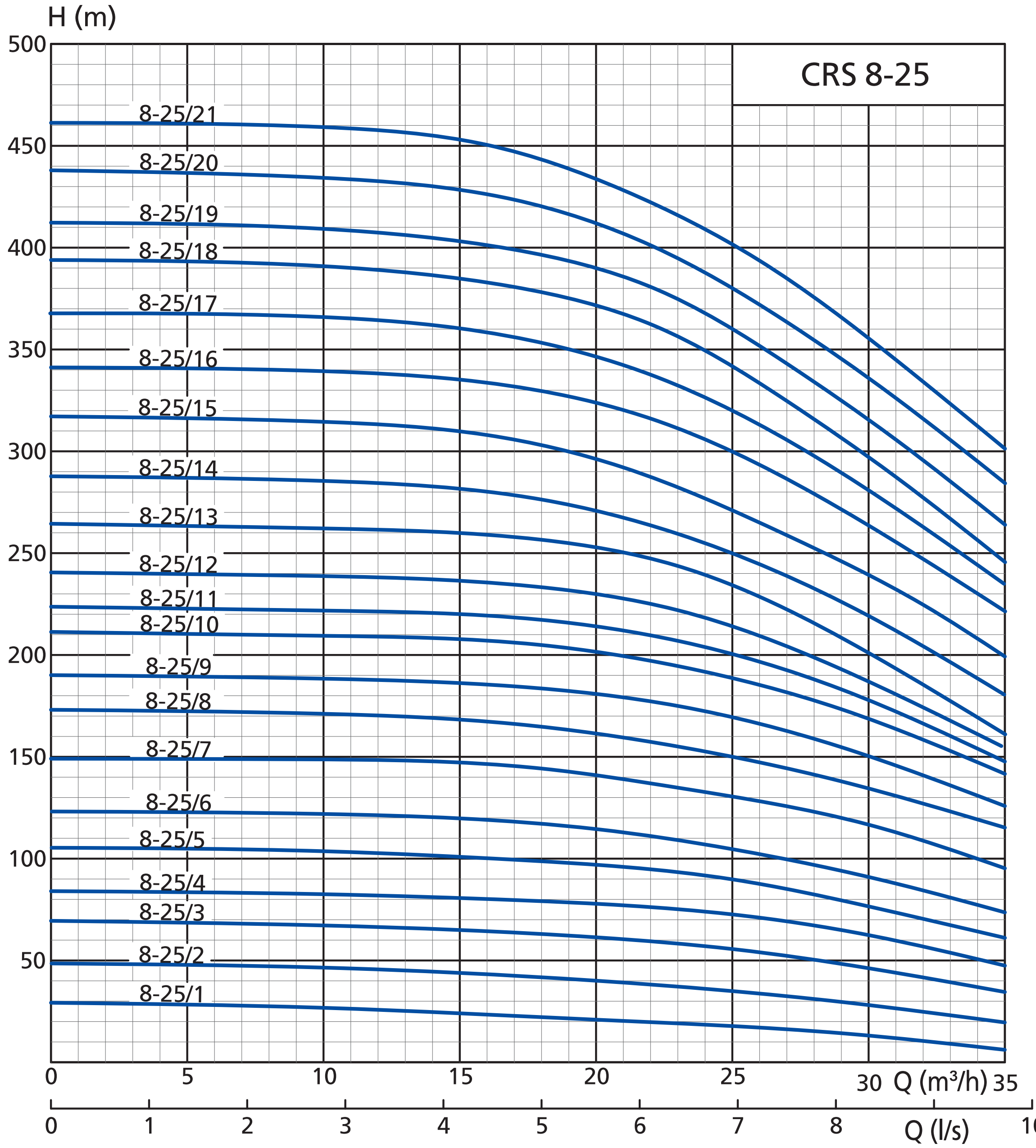
HMS CIRIS 8–25

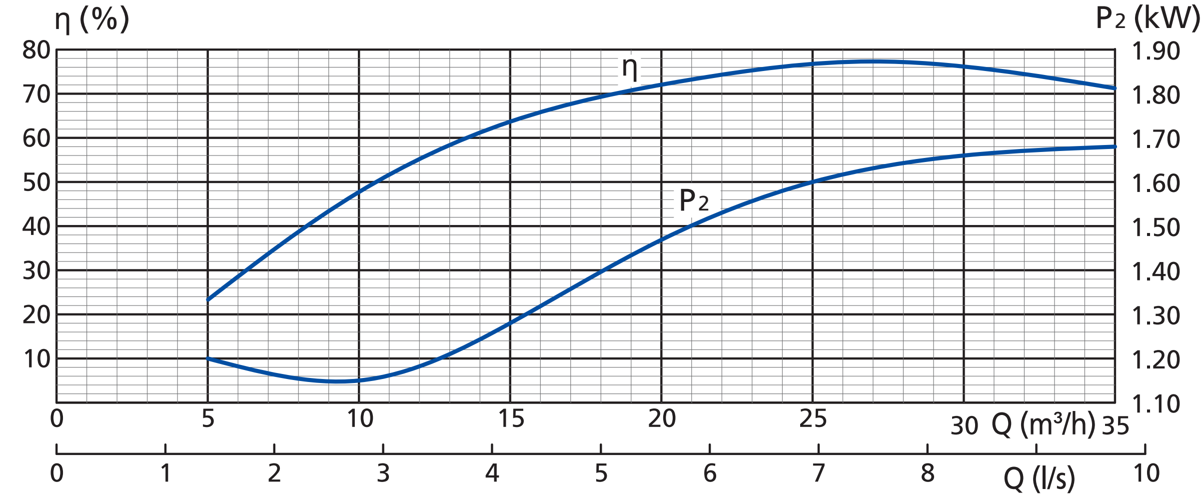


Flanged Connection (option)
DN80

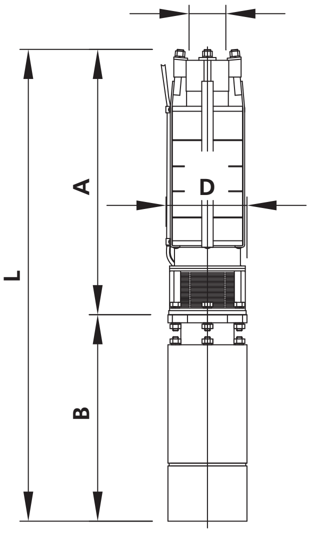


Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 8-25/1-3	DAP 6-3	3	189	915	318	597	G 3 ″ – B GOST 6357 standard	90	
CRS 8-25/2-4	DAP 6-4	4	189	995	374	621		94	
CRS 8-25/3-5.5	DAP 6-5.5	5.5	189	1070	429	641		98	+
CRS 8-25/4-7.5	DAP 6-7.5	7.5	189	1190	484	706		107	+
CRS 8-25/5-9	DAP 6-9	9	189	1270	539	731		111	
CRS 8-25/6-11	DAP 6-11	11	189	1360	594	766		117	+
CRS 8-25/7-13	DAP 6-13	13	189	1481	660	821		124	+
CRS 8-25/8-15	DAP 6-15	15	189	1570	709	861		130	
	DAP 8-15			1490	709	781		152	+
CRS 8-25/9-18.5	DAP 6-18.5	18.5	189	1680	774	906		137	
	DAP 8-18.5			1570	774	796		157	
CRS 8-25/10-18.5	DAP 6-18.5	18.5	189	1730	824	906		139	
	DAP 8-18.5			1620	824	796		159	+
CRS 8-25/11-22	DAP 8-22	22	189	1760	884	876		178	
CRS 8-25/12-22	DAP 8-22	22	189	1820	944	876		180	
CRS 8-25/13-22	DAP 8-22	22	189	1895	989	876		182	+
CRS 8-25/14-30	DAP 8-30	30	189	2140	1194	946		199	
CRS 8-25/15-30	DAP 8-30	30	189	2195	1249	946		201	
CRS 8-25/16-30	DAP 8-30	30	189	2245	1299	946		203	+
CRS 8-25/17-37	DAP 8-37	37	189	2245	1224	1021		225	
CRS 8-25/18-37	DAP 8-37	37	189	2295	1274	1021		227	+
CRS 8-25/19-37	DAP 8-37	37	189	2365	1344	1021		229	
CRS 8-25/20-45	DAP 8-45	45	189	2550	1414	1136		254	
CRS 8-25/21-45	DAP 8-45	45	189	2620	1484	1136		256	+

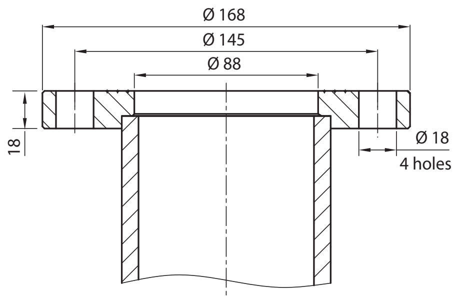

H (m)
500
450
400
350
300
250
200
150
100
50
CRS 8-25
8-25/21
8-25/20
8-25/19
8-25/18
8-25/17
8-25/16
8-25/15
8-25/14
8-25/13
8-25/12
8-25/11
8-25/10
8-25/9
8-25/8
8-25/7
8-25/6
8-25/5
8-25/4
8-25/3
8-25/2
8-25/1
0 5 10 15 20 25 30 Q (m³/h) 35
0 1 2 3 4 5 6 7 8 Q (l/s) 10


η (%)
P2 (kW)
80 70 60 50 40 30 20 10
1.90 1.80 1.70 1.60 1.50 1.40 1.30 1.20 1.10
η
P2
0 5 10 15 20 25 30 Q (m³/h) 35
0 1 2 3 4 5 6 7 8 Q (l/s) 10

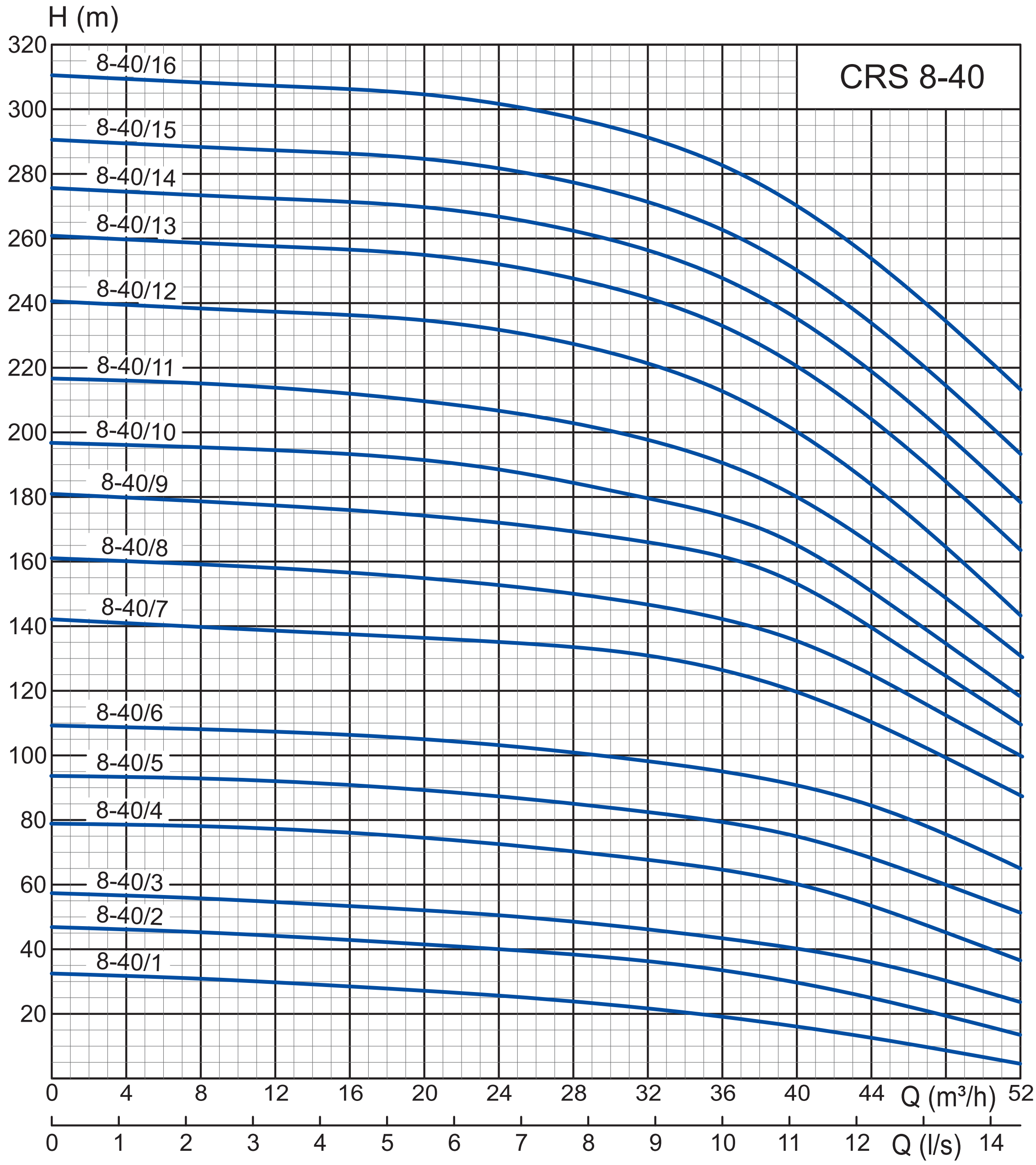
HMS CIRIS 8–40

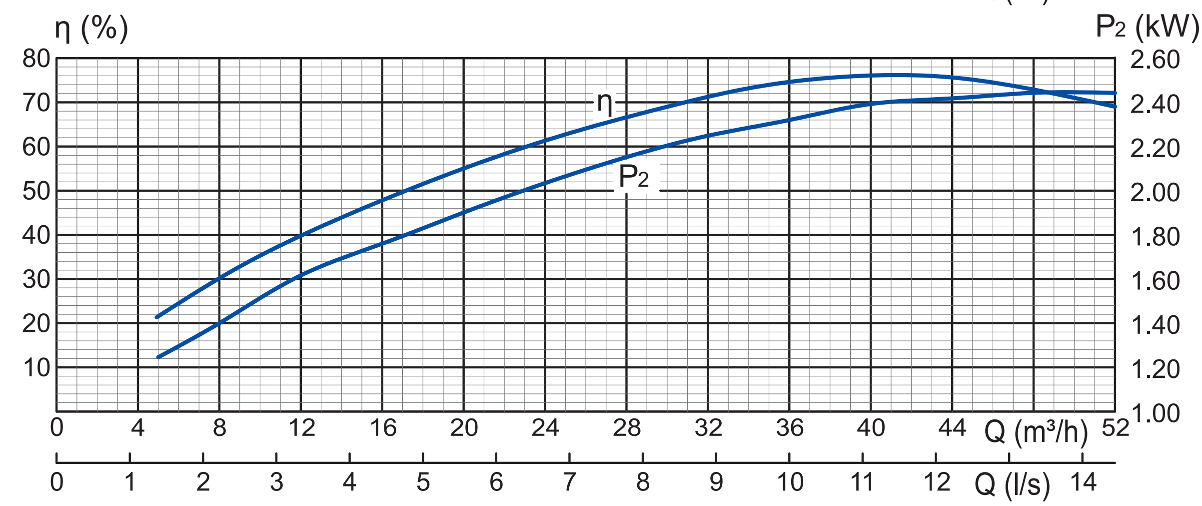


Flanged Connection (option)
DN80

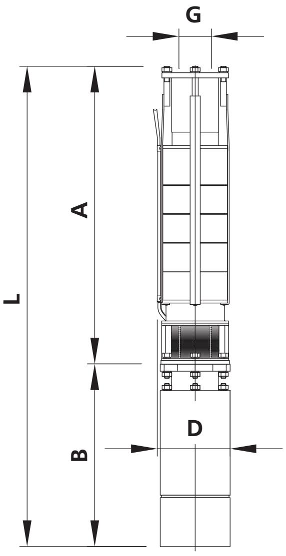


Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 8-40/1-3	DAP 6-3	3	189	970	373	597	G 3 ″ – B GOST 6357 standard	60/62	
CRS 8-40/2-5.5	DAP 6-5.5	5.5	189	1075	434	641		67/69	
CRS 8-40/3-7.5	DAP 6-7.5	7.5	189	1200	494	706		76/78	+
CRS 8-40/4-11	DAP 6-11	11	189	1310	544	766		85/88	+
CRS 8-40/5-13	DAP 6-13	13	189	1425	604	821		93/96	
CRS 8-40/6-15	DAP 6-15	15	189	1440	579	861		100/103	
	DAP 8-15			1360	579	781		122/128	+
CRS 8-40/7-22	DAP 8-22	22	189	1650	774	876		146/152	+
CRS 8-40/8-22	DAP 8-22	22	189	1670	794	876		149/155	
CRS 8-40/9-30	DAP 8-30	30	189	1790	844	946		168/174	+
CRS 8-40/10-30	DAP 8-30	30	189	1850	904	946		171/177	
CRS 8-40/11-30	DAP 8-30	30	189	1920	974	946		174/180	+
CRS 8-40/12-37	DAP 8-37	37	189	2055	1034	1021		197/204	+
CRS 8-40/13-37	DAP 8-37	37	189	2115	1094	1021		201/208	
CRS 8-40/14-45	DAP 8-45	45	189	2290	1154	1136		227/235	
CRS 8-40/15-45	DAP 8-45	45	189	2350	1214	1136		230/238	
CRS 8-40/16-45	DAP 8-45	45	189	2410	1274	1136		233/242	

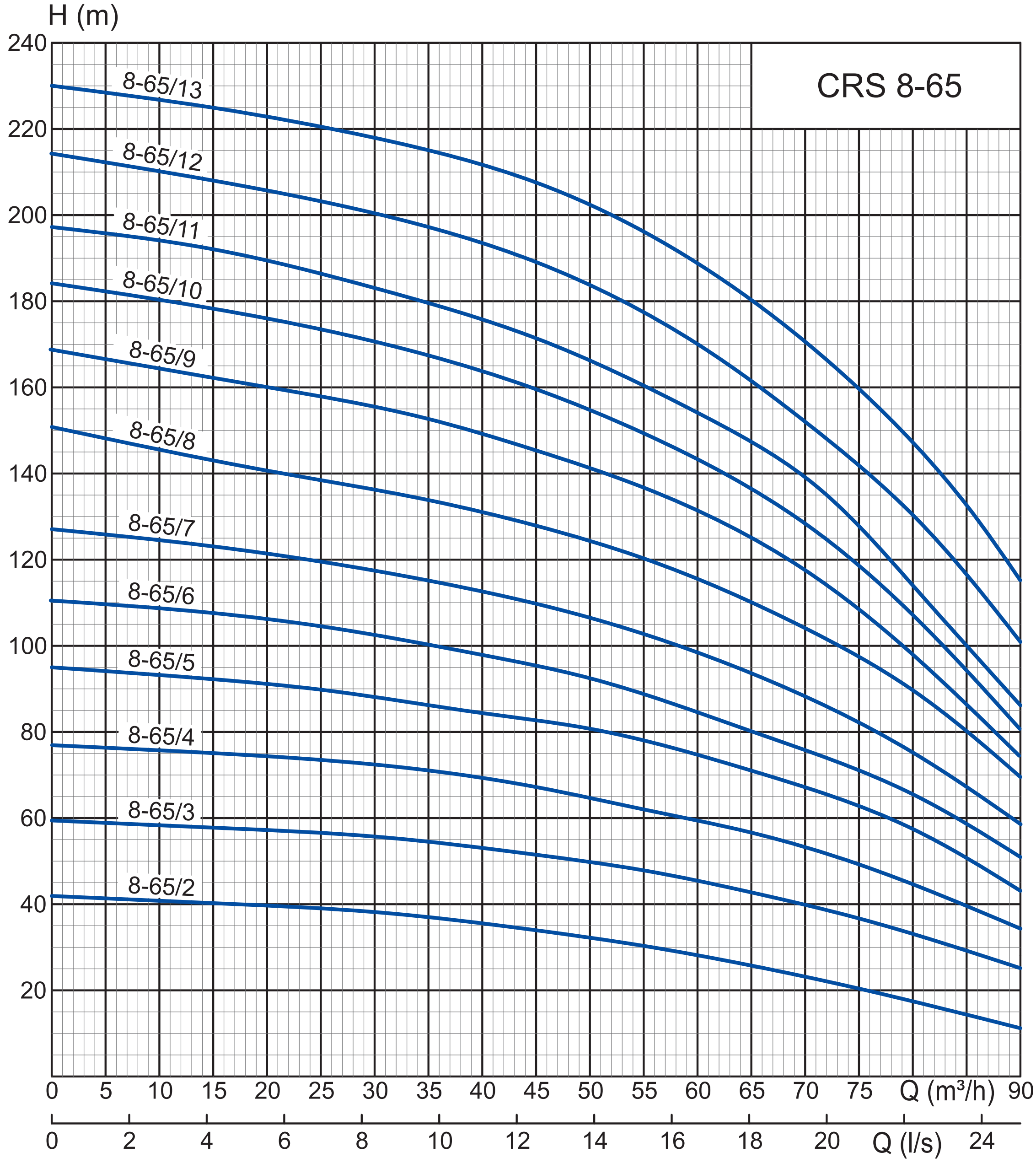

H (m)
CRS 8-40
8-40/16
8-40/15
8-40/14
8-40/13
8-40/12
8-40/11
8-40/10
8-40/9
8-40/8
8-40/7
8-40/6
8-40/5
8-40/4
8-40/3
8-40/2
8-40/1
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0 4 8 12 16 20 24 28 32 36 40 44 Q (m³/h) 52
0 1 2 3 4 5 6 7 8 9 10 11 12 Q (l/s) 14

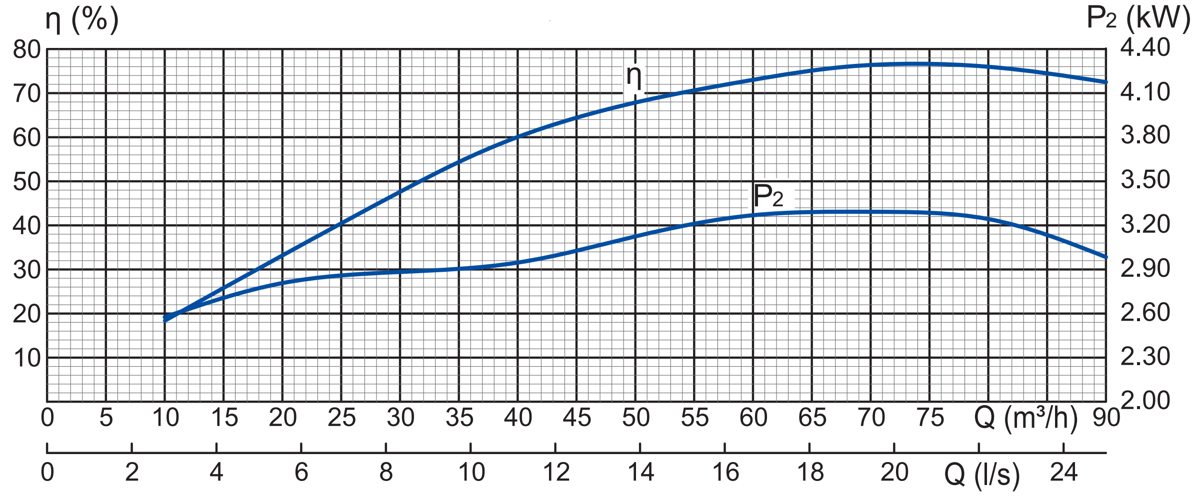

η (%)
P2 (kW)
η
P2
80
70
60
50
40
30
20
10
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0 4 8 12 16 20 24 28 32 36 40 44 Q (m³/h) 52
0 1 2 3 4 5 6 7 8 9 10 11 12 Q (l/s) 14

HMS CIRIS 8–65

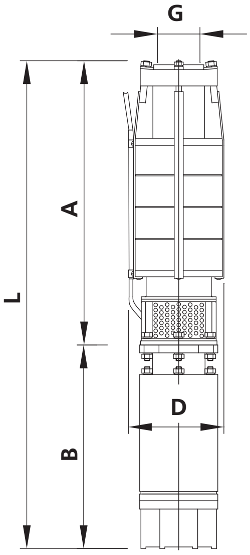


Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 8-65/2-7.5	DAP 6-7.5	7.5	189	1165	459	706	SP-114-D GOST 633 standard - see adaptors p.p. 57-58	90	
CRS 8-65/3-18.5	DAP 6-18.5	18.5	189	1440	534	906		114	
	DAP 8-18.5			1330	534	796		134	+
CRS 8-65/4-18.5	DAP 6-18.5	18.5	189	1520	614	906		118	
	DAP 8-18.5			1410	614	796		138	
CRS 8-65/5-22	DAP 8-22	22	189	1680	804	876		159	+
CRS 8-65/6-22	DAP 8-22	22	189	1755	879	876		163	
CRS 8-65/7-30	DAP 8-30	30	189	1960	1014	946		182	+
CRS 8-65/8-37	DAP 8-37	37	189	2165	1144	1021		206	+
CRS 8-65/9-37	DAP 8-37	37	189	2235	1214	1021		210	
CRS 8-65/10-37	DAP 8-37	37	189	2315	1294	1021		214	
CRS 8-65/11-37	DAP 8-37	37	189	2390	1369	1021		218	+
CRS 8-65/12-45	DAP 8-45	45	189	2585	1449	1136		245	
CRS 8-65/13-45	DAP 8-45	45	189	2665	1529	1136		249	+


H (m)
CRS 8-65
8-65/13
8-65/12
8-65/11
8-65/10
8-65/9
8-65/8
8-65/7
8-65/6
8-65/5
8-65/4
8-65/3
8-65/2
240
220
200
180
160
140
120
100
80
60
40
20
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Q (m³/h)
90
0
2
4
6
8
10
12
14
16
18
20
Q (l/s)
24

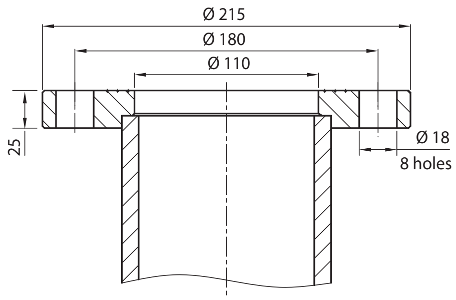

η (%)
P2 (kW)
η
P2
80
70
60
50
40
30
20
10
4.40
4.10
3.80
3.50
3.20
2.90
2.60
2.30
2.00
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Q (m³/h)
90
0
2
4
6
8
10
12
14
16
18
20
Q (l/s)
24

HMS CIRIS 10–65

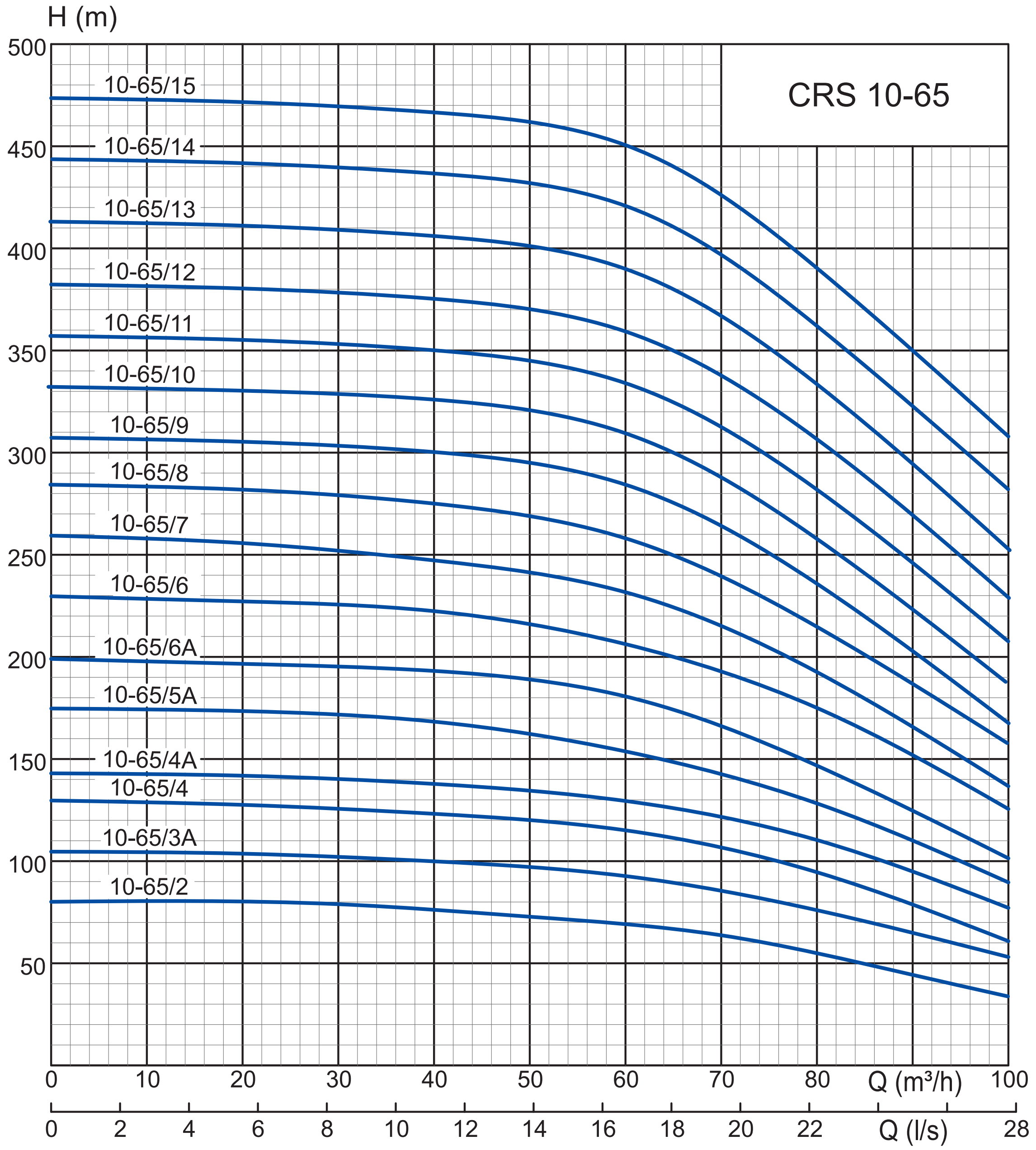


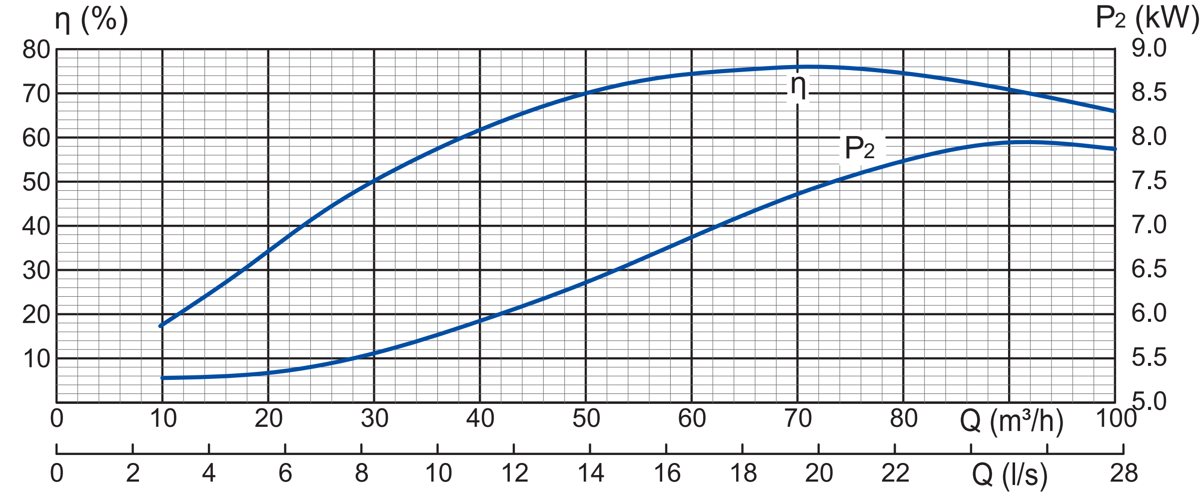
Flanged Connection (option)

DN100

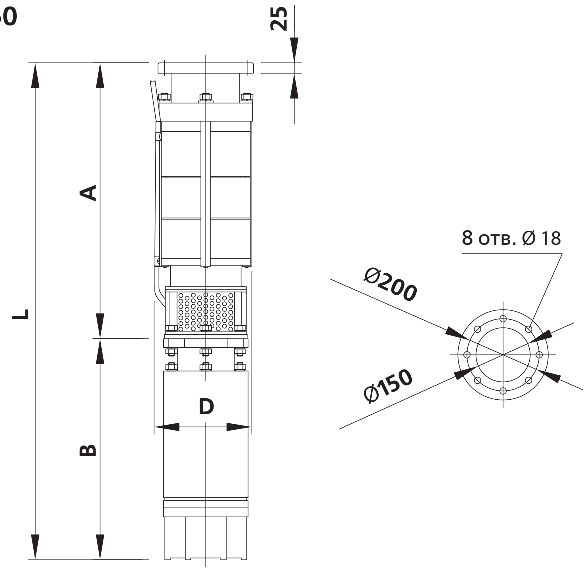


Pump	Electric motor		Dimensions, mm					Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B	G		
CRS 10-65/2-22	DAP 8-22	22	235	1410	534	876	SP-114-D GOST 633 standard - see adaptors p.p. 57-58	154	+
CRS 10-65/3A-26	DAP 8-26	26	235	1530	619	911		164	+
CRS 10-65/4A-30	DAP 10-30	30	235	1570	693	877		210	+
	DAP 8-30		235	1640	694	946		187	
CRS 10-65/4-37	DAP 10-37	37	235	1660	758	902		220	+
	DAP 8-37		235	1780	759	1021		209	
CRS 10-65/5A-45	DAP 10-45	45	235	1730	763	967		245	+
	DAP 8-45		235	1900	764	1136		240	
CRS 10-65/6A-45	DAP 10-45	45	235	1820	853	967		254	+
	DAP 8-45		235	1990	854	1136		249	
CRS 10-65/6-55	DAP 10-55	55	235	1875	858	1017		266	+
CRS 10-65/7-55	DAP 10-55	55	235	1950	933	1017		273	+
CRS 10-65/8-65	DAP 10-65	65	235	2100	1018	1082		302	+
CRS 10-65/9-75	DAP 10-75	75	235	2255	1098	1157		333	+
CRS 10-65/10-90	DAP 10-90	90	235	2455	1178	1277		379	
CRS 10-65/11-90	DAP 10-90	90	235	2535	1258	1277		388	
CRS 10-65/12-110	DAP 10-110	110	235	2655	1338	1317		408	
CRS 10-65/13-110	DAP 10-110	110	235	2740	1423	1317		417	
CRS 10-65/14-130	DAP 10-130	130	235	3040	1503	1537		493	
CRS 10-65/15-130	DAP 10-130	130	235	3120	1583	1537		502	

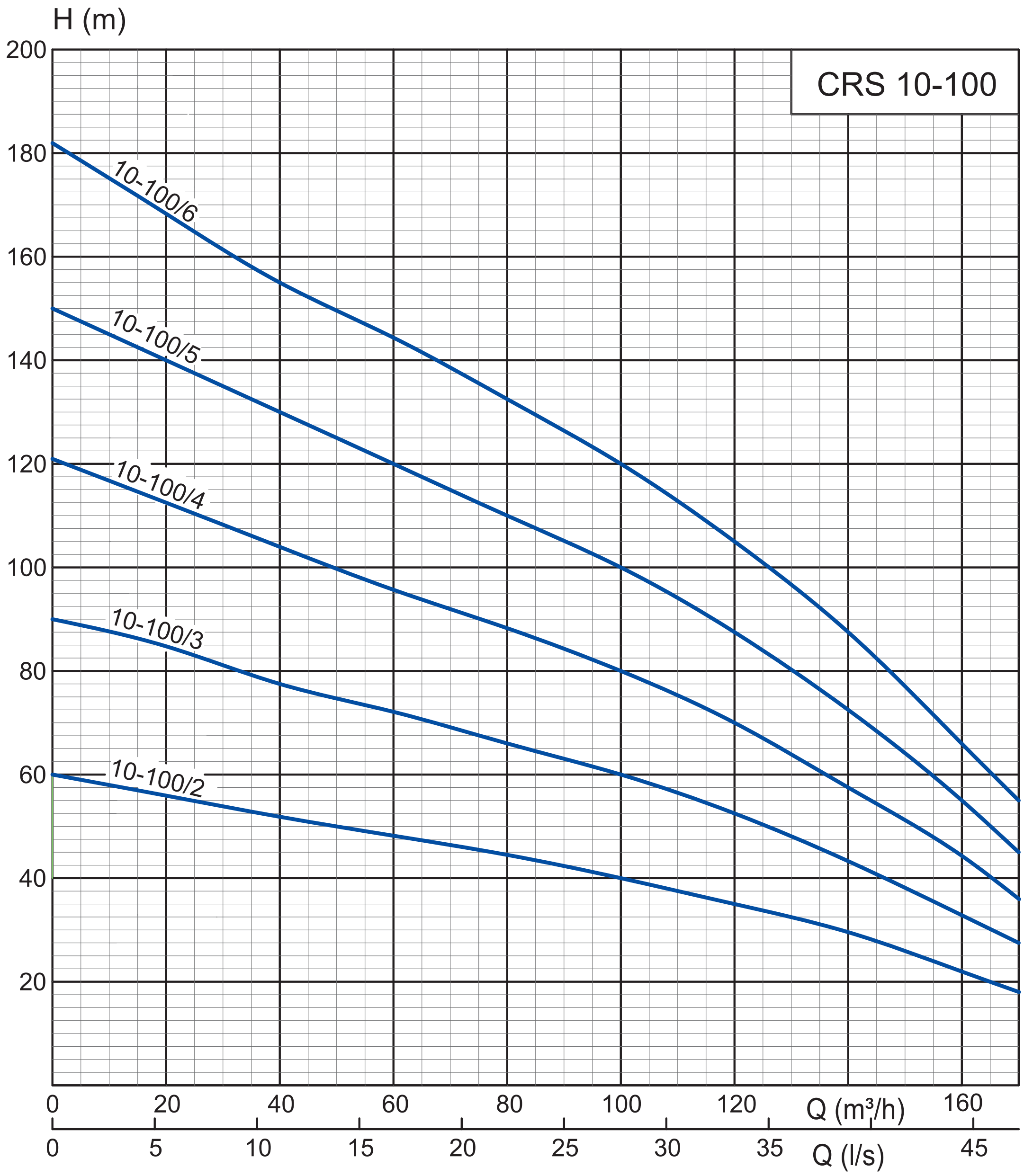

H (m)
CRS 10-65
10-65/15
10-65/14
10-65/13
10-65/12
10-65/11
10-65/10
10-65/9
10-65/8
10-65/7
10-65/6
10-65/6A
10-65/5A
10-65/4A
10-65/4
10-65/3A
10-65/2
500
450
400
350
300
250
200
150
100
50
0
10
20
30
40
50
60
70
80
Q (m³/h)
100
0
2
4
6
8
10
12
14
16
18
20
22
Q (l/s)
28

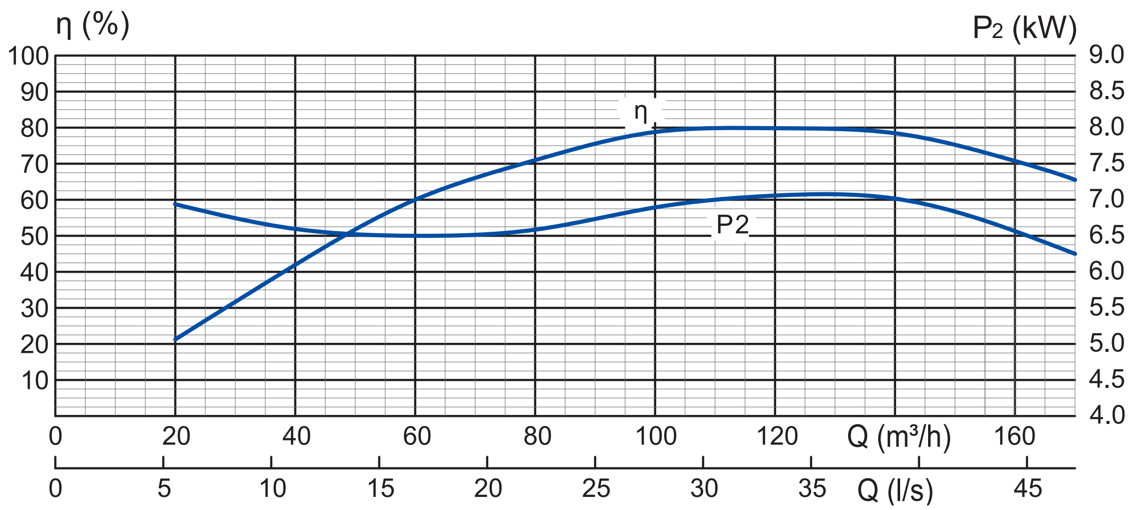

η (%)
P2 (kW)
η
P2
80
70
60
50
40
30
20
10
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
0
10
20
30
40
50
60
70
80
Q (m³/h)
100
0
2
4
6
8
10
12
14
16
18
20
22
Q (l/s)
28

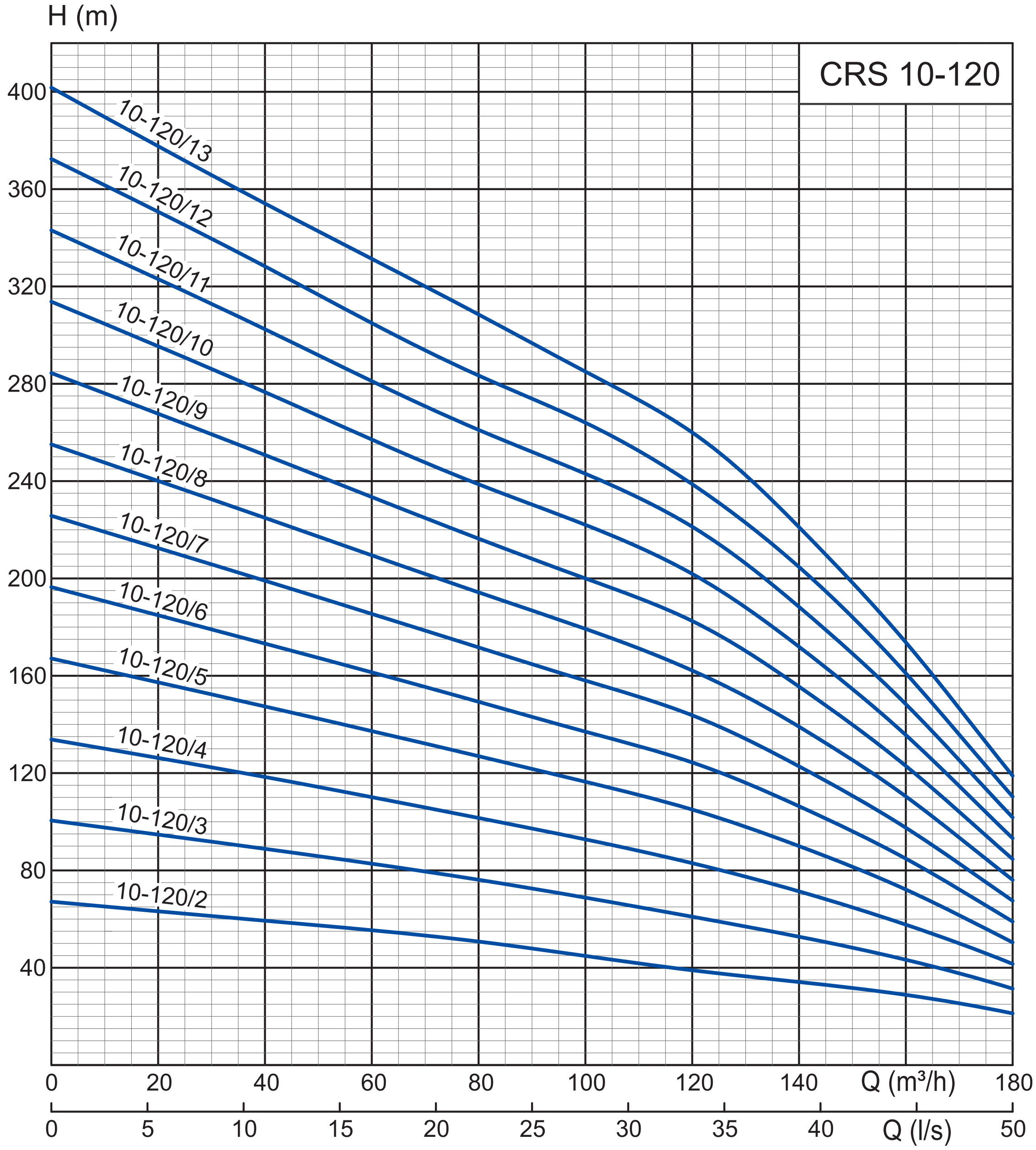
HMS CIRIS 10–120, HMS CIRIS 10–160

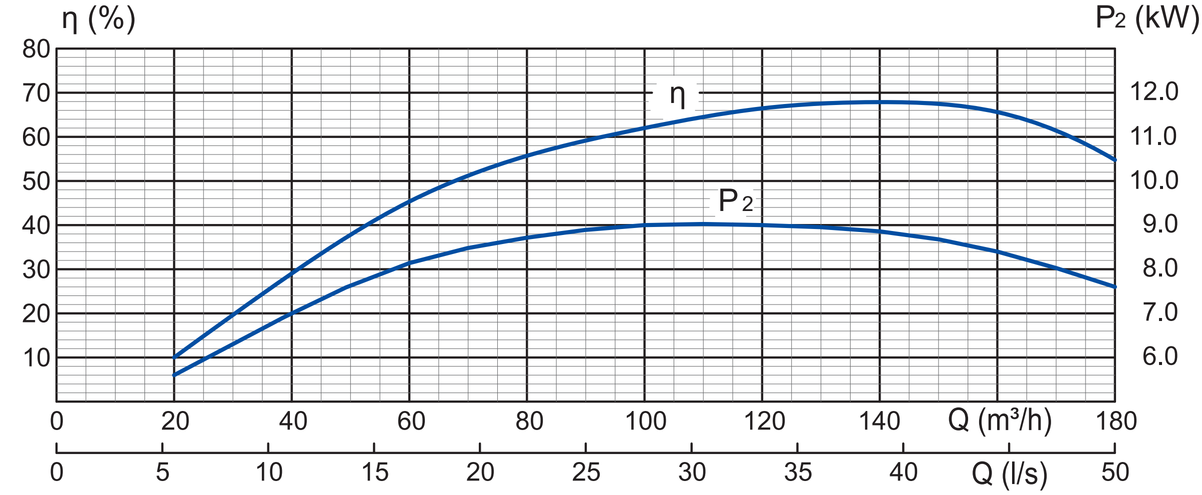


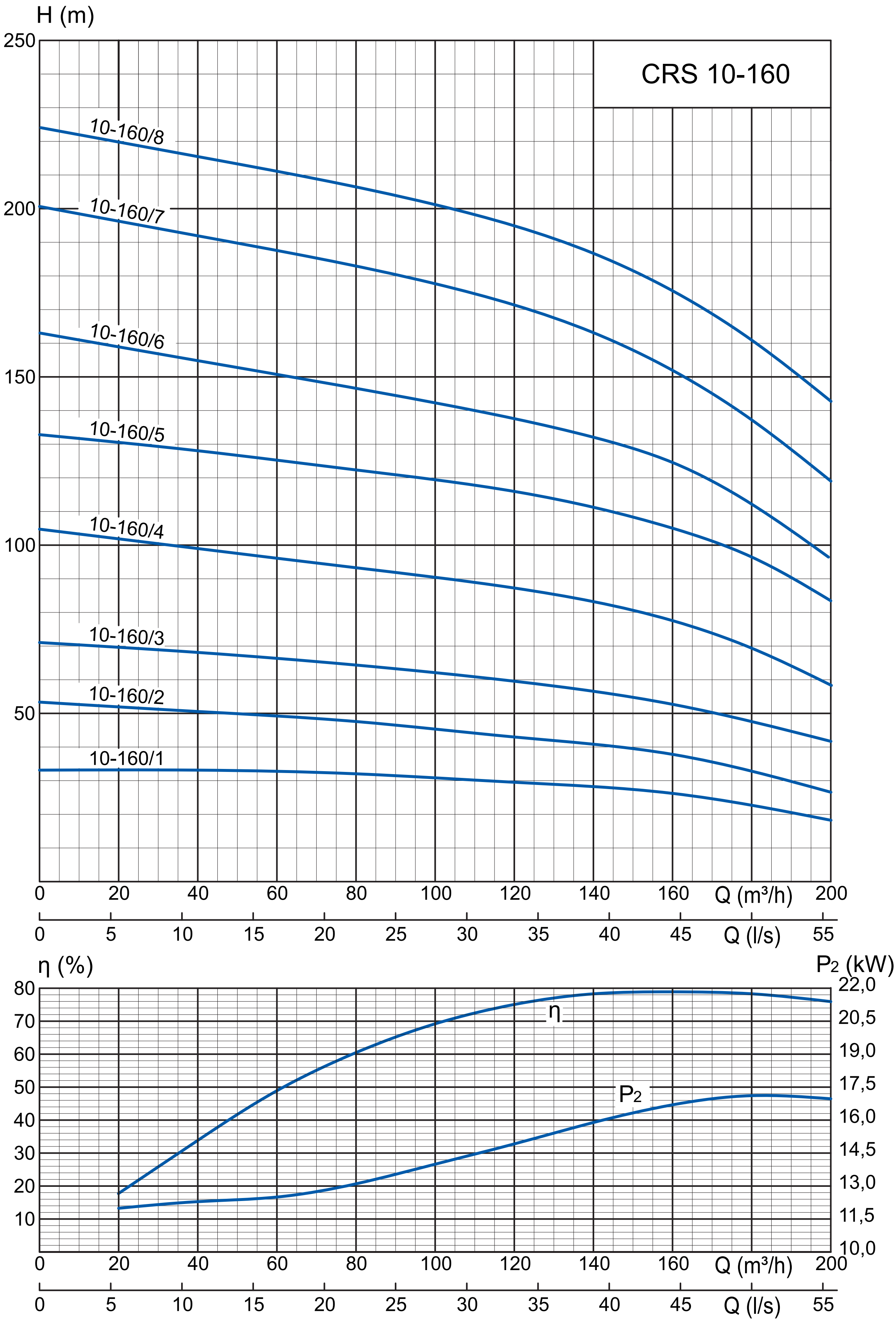
Pump	Electric motor		Dimensions, mm				Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B		
CRS 10-100/2-18,5	DAP 8-18,5	18	235	1490	721	769	127	+
CRS 10-100/3-22	DAP 8-22	22	235	1765	889	876	161	
CRS 10-100/3T*-26	DAP 8-26	26	235	1800	889	911	169	+
CRS 10-100/4-26	DAP 8-26	26	235	1970	1059	911	182	
CRS 10-100/4T*-30	DAP 10-30	30	235	1936	1059	877	212	+
CRS 10-100/5-37	DAP 10-37	37	235	2125	1223	902	243	
CRS 10-100/5T*-45	DAP 10-45	45	235	2190	1223	967	260	+
CRS 10-100/6-45	DAP 10-45	45	235	2360	1393	967	277	
CRS 10-100/6T*-55	DAP 10-55	55	235	2410	1393	1017	290	+
CRS 10-120/2-22	DAP 8-22	22	235	1430	554	876	162	+
CRS 10-120/3-30	DAP 10-30	30	235	1515	638	877	215	+
	DAP 8-30		235	1585	639	946	192	
CRS 10-120/4-37	DAP 10-37	37	235	1650	748	902	232	+
	DAP 8-37		235	1770	749	1021	221	
CRS 10-120/5-45	DAP 10-45	45	235	1815	848	967	260	+
	DAP 8-45		235	1985	849	1136	255	
CRS 10-120/6-55	DAP 10-55	55	235	1960	943	1017	279	+
CRS 10-120/7-75	DAP 10-75	75	235	2205	1048	1157	328	+
CRS 10-120/8-75	DAP 10-75	75	235	2295	1138	1157	338	+
CRS 10-120/9-90	DAP 10-90	90	235	2505	1228	1277	384	
CRS 10-120/10-110	DAP 10-110	110	235	2635	1318	1317	406	
CRS 10-120/11-110	DAP 10-110	110	235	2725	1408	1317	415	
CRS 10-120/12-130	DAP 10-130	130	235	3035	1498	1537	493	
CRS 10-120/13-130	DAP 10-130	130	235	3125	1588	1537	502	
CRS 10-160/1-18,5	DAP 8-18,5	18,5	235	1330	534	796	135	+
CRS 10-160/2-37	DAP 10-37	37	235	1590	688	902	229	+
	DAP 8-37		235	1710	689	1021	218	
CRS 10-160/3-45	DAP 10-45	45	235	1820	853	967	262	+
	DAP 8-45		235	1990	854	1136	257	
CRS 10-160/4-65	DAP 10-65	65	235	2100	1018	1082	310	+
CRS 10-160/5-75	DAP 10-75	75	235	2350	1193	1157	349	+
CRS 10-160/6-90	DAP 10-90	90	235	2640	1363	1277	401	+
CRS 10-160/7-110	DAP 10-110	110	235	2850	1533	1317	429	
CRS 10-160/8-130	DAP 10-130	130	235	3240	1703	1537	512	


H (m)
CRS 10-100
10-100/6
10-100/5
10-100/4
10-100/3
10-100/2
200
180
160
140
120
100
80
60
40
20
0
20
40
60
80
100
120
Q (m³/h)
160
0
5
10
15
20
25
30
35
Q (l/s)
45

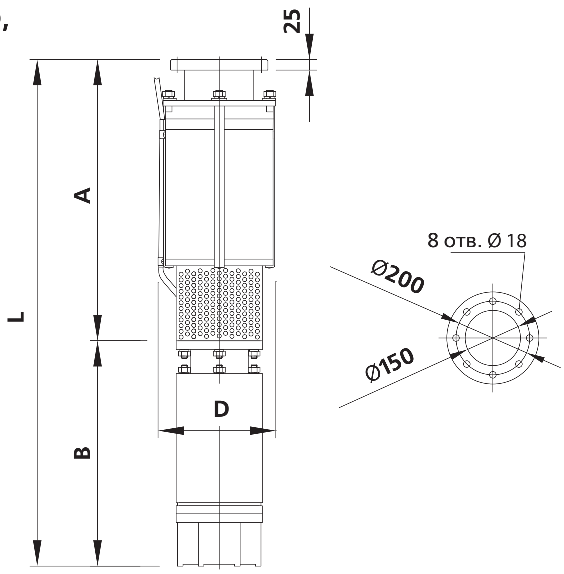

η (%)
P2 (kW)
η
P2
100
90
80
70
60
50
40
30
20
10
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
0
20
40
60
80
100
120
Q (m³/h)
160
0
5
10
15
20
25
30
35
Q (l/s)
45


H (m)
CRS 10-120
400
360
320
280
240
200
160
120
80
40
10-120/13
10-120/12
10-120/11
10-120/10
10-120/9
10-120/8
10-120/7
10-120/6
10-120/5
10-120/4
10-120/3
10-120/2
0 20 40 60 80 100 120 140 Q (m³/h) 180
0 5 10 15 20 25 30 35 40 Q (l/s) 50

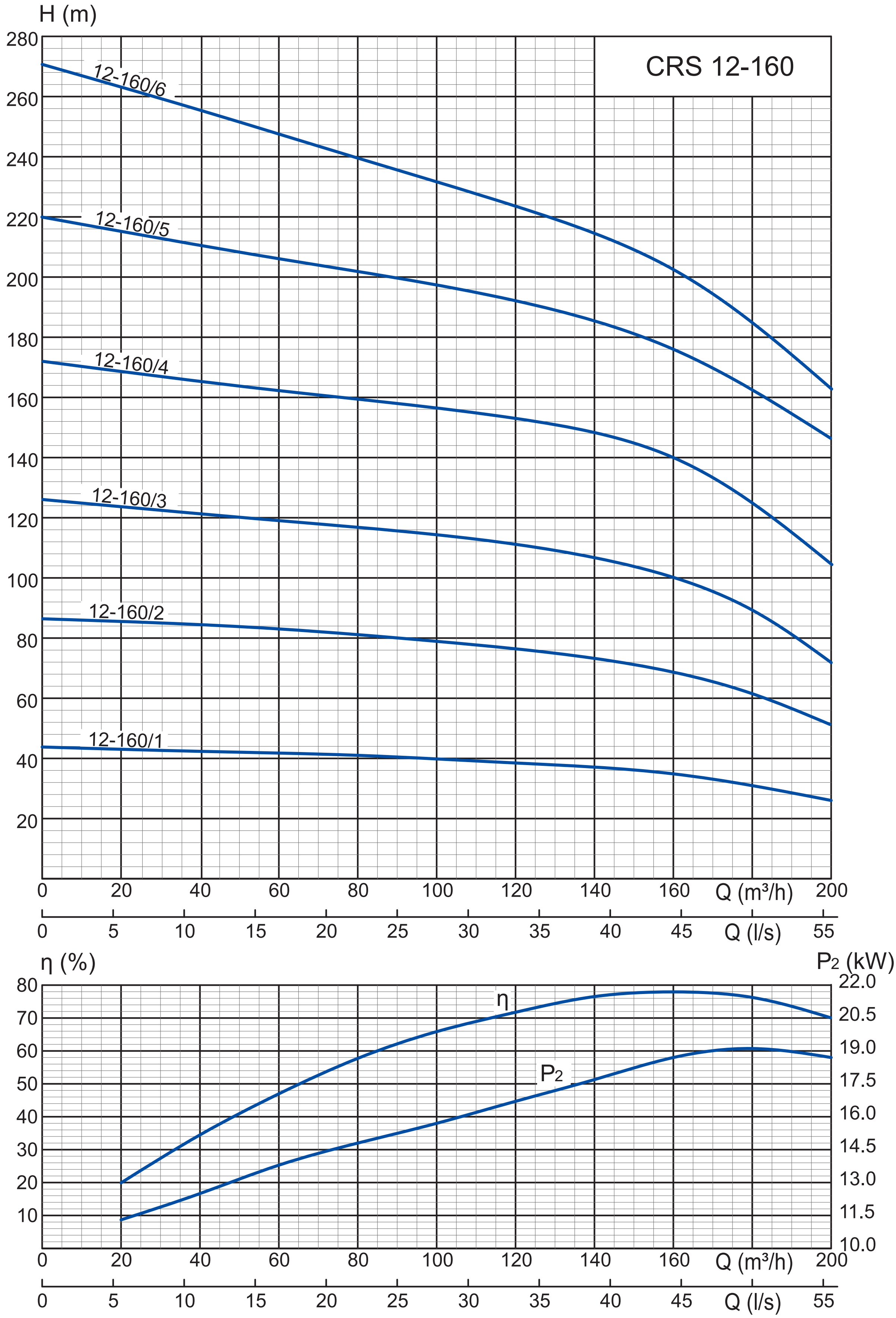

η (%)
P2 (kW)
80
70
60
50
40
30
20
10
12.0
11.0
10.0
9.0
8.0
7.0
6.0
η
P2
0 20 40 60 80 100 120 140 Q (m³/h) 180
0 5 10 15 20 25 30 35 40 Q (l/s) 50

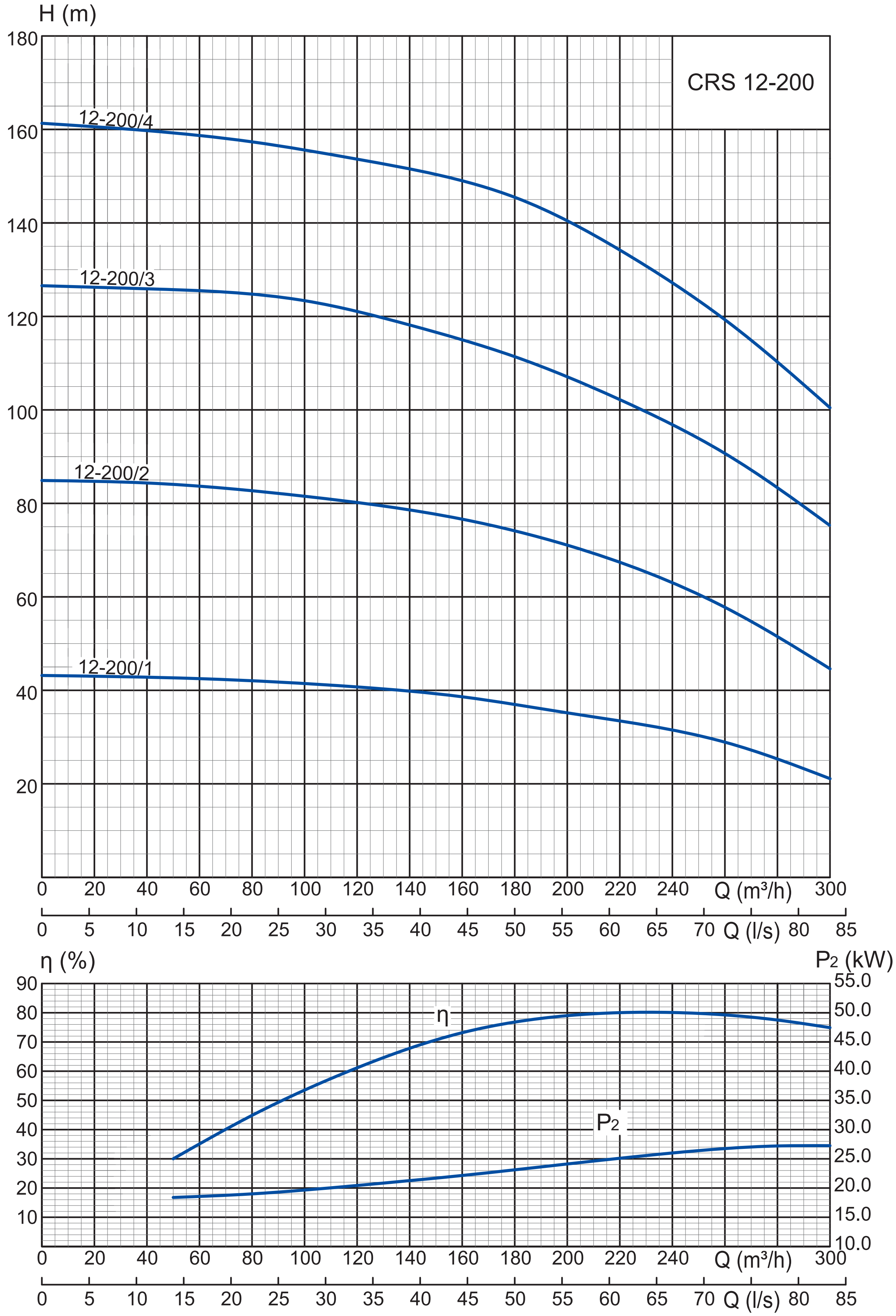

H (m)
CRS 10-160
10-160/8
10-160/7
10-160/6
10-160/5
10-160/4
10-160/3
10-160/2
10-160/1
250
200
150
100
50
0 20 40 60 80 100 120 140 160 Q (m³/h) 200
0 5 10 15 20 25 30 35 40 45 Q (l/s) 55
η (%)
P2 (kW)
80 70 60 50 40 30 20 10
22,0 20,5 19,0 17,5 16,0 14,5 13,0 11,5 10,0
η
P2
0 20 40 60 80 100 120 140 160 Q (m³/h) 200
0 5 10 15 20 25 30 35 40 45 Q (l/s) 55

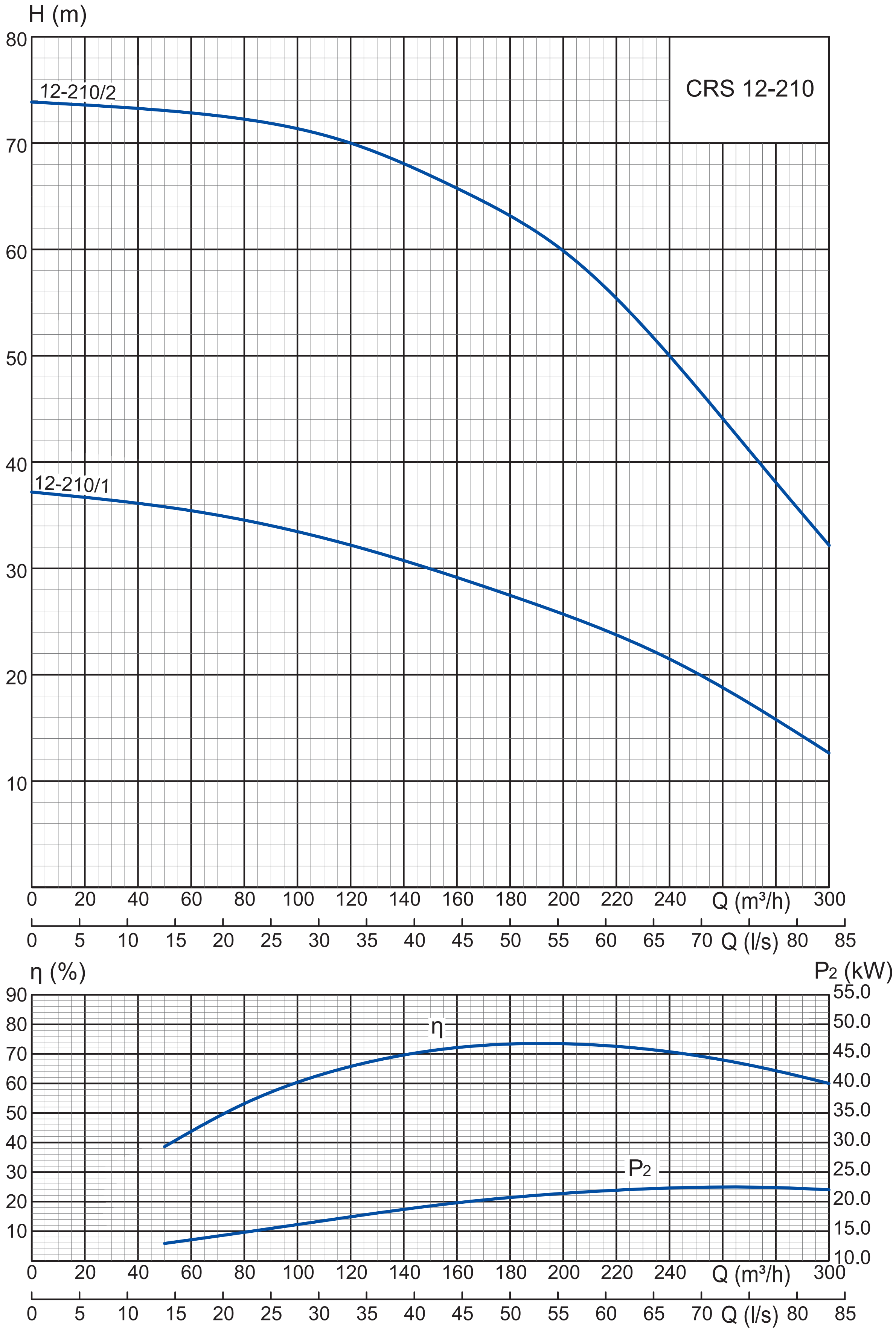
HMS CIRIS 12-160, HMS CIRIS 12-200, HMS CIRIS 12-210, HMS CIRIS 12-250

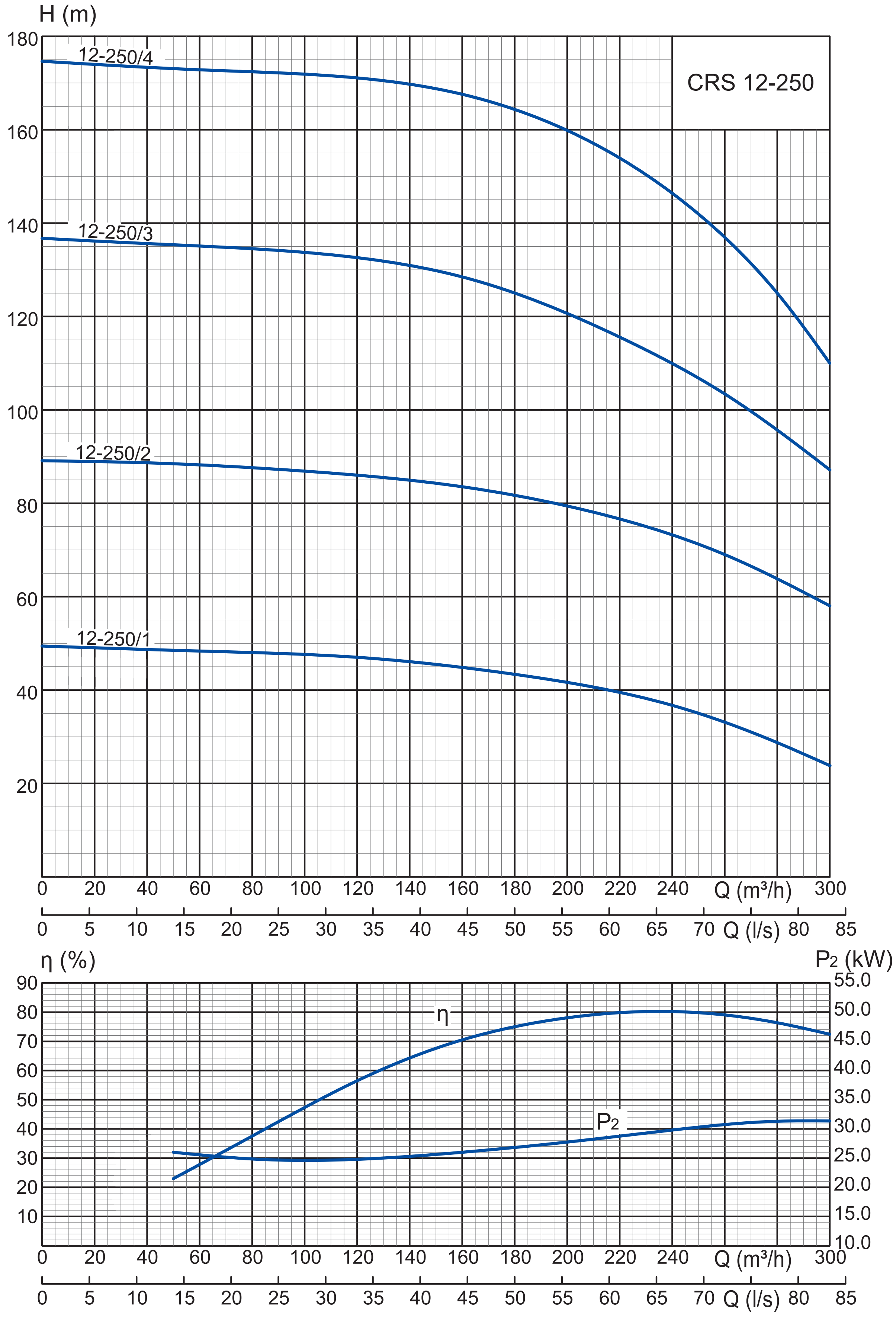


Pump	Electric motor		Dimensions, mm				Weight, kg	Delivery status
	Type	Power, kW	D	L	A	B		
CRS 12-160/1-30	DAP 10-30	30	281	1325	448	877	209	
CRS 12-160/2-45	DAP 10-45	45	281	1500	533	967	250	+
CRS 12-160/3-65	DAP 10-65	65	281	1700	618	1082	299	+
CRS 12-160/4-90	DAP 10-90	90	281	1980	703	1277	365	+
CRS 12-160/5-110	DAP 10-110	110	281	2105	788	1317	389	+
CRS 12-160/6-130	DAP 10-130	130	281	2410	873	1537	468	+
CRS 12-200/1-30	DAP 10-30	30	281	1510	633	877	225	+
CRS 12-200/2-65	DAP 10-65	65	281	1940	858	1082	315	+
CRS 12-200/3-90	DAP 10-90	90	281	2390	1113	1277	460	+
CRS 12-200/4-110	DAP 10-110	110	281	2900	1583	1317	510	+
CRS 12-210/1-30	DAP 10-30	30	281	1500	623	877	224	+
CRS 12-210/2-45	DAP 10-45	45	281	1850	883	967	280	+
CRS 12-250/1-37	DAP 10-37	37	281	1570	668	902	235	+
CRS 12-250/2-75	DAP 10-75	75	281	2024	867	1157	334	+
CRS 12-250/3-110	DAP 10-110	110	281	2650	1333	1317	472	+
CRS 12-250/4-130	DAP 10-130	130	281	2900	1363	1537	585	+


H (m)
CRS 12-160
12-160/6
12-160/5
12-160/4
12-160/3
12-160/2
12-160/1
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
20
40
60
80
100
120
140
160
Q (m³/h)
200
0
5
10
15
20
25
30
35
40
45
Q (l/s)
55
η (%)
P2 (kW)
η
P2
80
70
60
50
40
30
20
10
22.0
20.5
19.0
17.5
16.0
14.5
13.0
11.5
10.0


H (m)
CRS 12-200
12-200/4
12-200/3
12-200/2
12-200/1
180
160
140
120
100
80
60
40
20
0 20 40 60 80 100 120 140 160 180 200 220 240 Q (m³/h) 300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 Q (l/s) 80 85
η (%)
P2 (kW)
90
80
70
60
50
40
30
20
10
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
η
P2
0 20 40 60 80 100 120 140 160 180 200 220 240 Q (m³/h) 300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 Q (l/s) 80 85

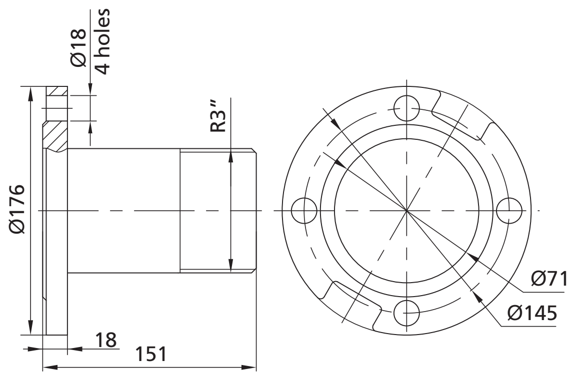

H (m)
CRS 12-210
12-210/2
12-210/1
80
70
60
50
40
30
20
10
0
20
40
60
80
100
120
140
160
180
200
220
240
Q (m³/h)
300
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Q (l/s)
80
85
η (%)
P2 (kW)
90
80
70
60
50
40
30
20
10
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
η
P2


H (m)
CRS 12-250
12-250/4
12-250/3
12-250/2
12-250/1
180
160
140
120
100
80
60
40
20
0 20 40 60 80 100 120 140 160 180 200 220 240 Q (m³/h) 300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 Q (l/s) 80 85
η (%)
P2 (kW)
η
P2
90 80 70 60 50 40 30 20 10
55.0 50.0 45.0 40.0 35.0 30.0 25.0 20.0 15.0 10.0
0 20 40 60 80 100 120 140 160 180 200 220 240 Q (m³/h) 300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 Q (l/s) 80 85

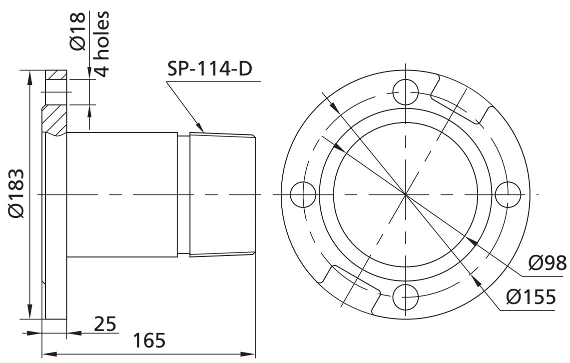
ACCESSORIES
PIPE ADAPTERS

ADAPTER THREAD – FLANGE

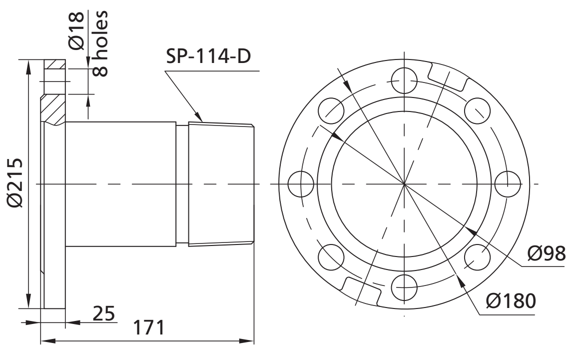
AMT6.411.021
DN 80. Models: CRS 8-16, CRS 8-25, CRS 8-40



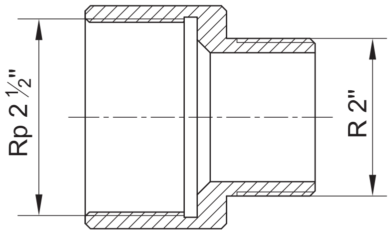
AMT6.411.022–01
DN 100. Models: CRS 8-65



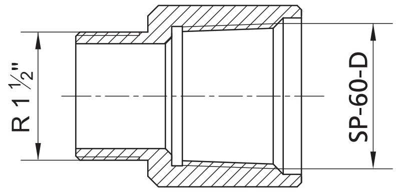
AMT6.411.022
DN 100. Models: CRS 10-65



ACCESSORIES
THREAD ADAPTERS



AMT8.229.023



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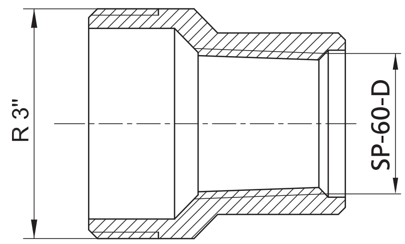

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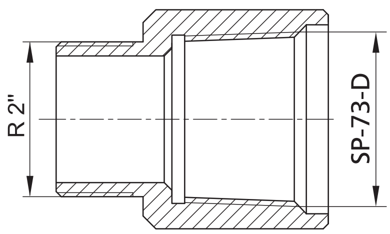
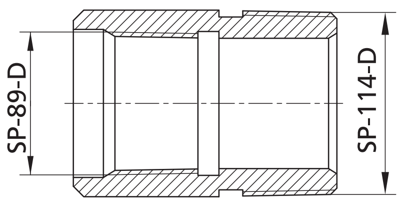


AMT8.229.030



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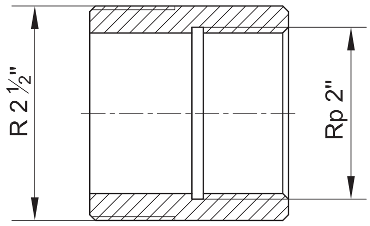

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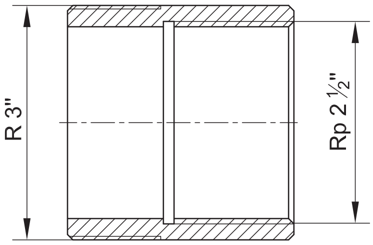

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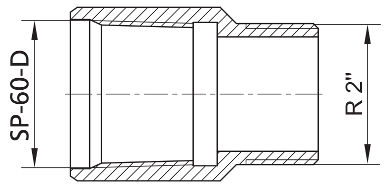
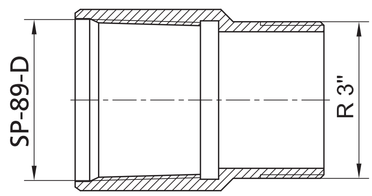
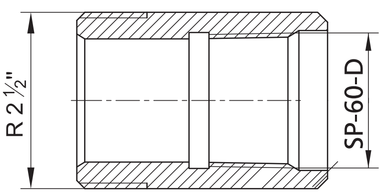


AMT8.229.019



AMT8.229.020

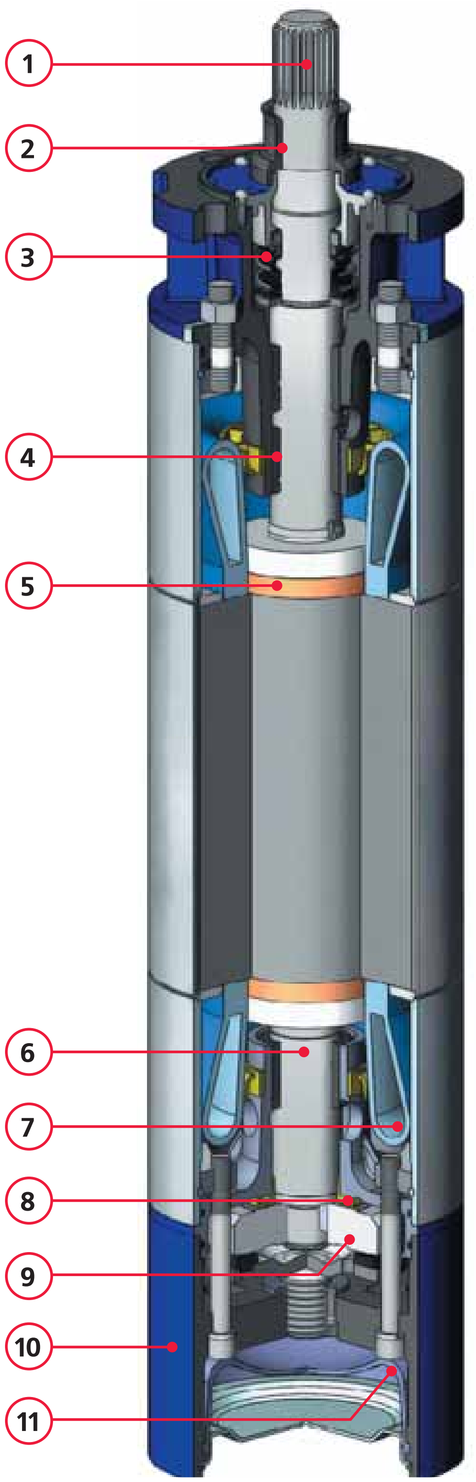


AMT8.229.025

REWINDABLE SUBMERSIBLE MOTORS DAP SERIES

FEATURES AND ADVANTAGES

- Motor is filled with a liquid allowing contact with potable water.
- Motor storage temperature: -30…+60 °C (-22…140 F)
- Lack of the liquid can be refilled with clean water (at storage temperature above +4 °C)
- Vertical and horizontal installation are equally possible (e.g. booster modules)
- Flanges and shafts are made in accordance with appropriate NEMA standards
- Resistance to unstable voltage
- Casing made of AISI 316 stainless steel
- Sand guard for mechanical seal protection from the solid particles
- Rotor's «squirrel cage» is made of copper for increased efficiency
- High-temperature rewindable winding with PE2 insulation (up to 100 °C); temperature sensor is optionally available for overheating protection
- Radial bearings of composite materials with spiral grooves for better lubrication
- Heavy duty self-aligning water lubricated thrust bearing
- Counter thrust bearing for the rotor upward movement prevention
- Reliable mechanical seal the world's leading manufacturers
- Rubber diaphragm for the liquid expansion compensation



1. NEMA shaft connection
2. Sand guard
3. Mechanical seal
4. Radial bearing
5. Squirrel cage made of copper
6. Rotor shaft made of AISI 409 stainless steel
7. High-temperature PE2 winding
8. Counter thrust bearing
9. Self-aligning thrust bearing
10. Cast Iron bottom part
11. Rubber diaphragm

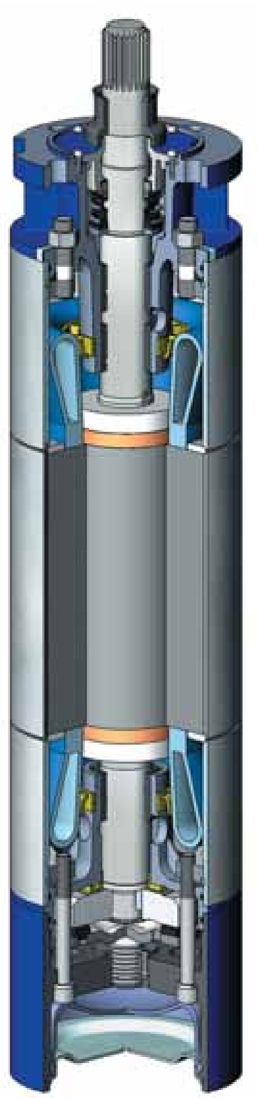
DAP 6 SERIES

- Max Diameter: D=144 mm
- Protection: IP68
- Starts per hour: ≤6
- Water temperature: up to +30 °C (86 °F)
- Voltage: 50Hz, 3 x 400V
- Voltage tolerance: -15 … +10%
- PE2 winding insulation, up to 100 °C temperature resistance
- Synchronous rotation speed: 3000 rpm

DAP 8 SERIES

- Max Diameter: D=189 mm
- Protection: IP68
- Starts per hour: ≤6
- Water temperature: up to +30 °C (86 °F)
- Voltage: 50Hz, 3 x 400V
- Voltage tolerance: -15 … +10%
- PE2 winding insulation, up to 100 °C temperature resistance
- Synchronous rotation speed: 3000 rpm

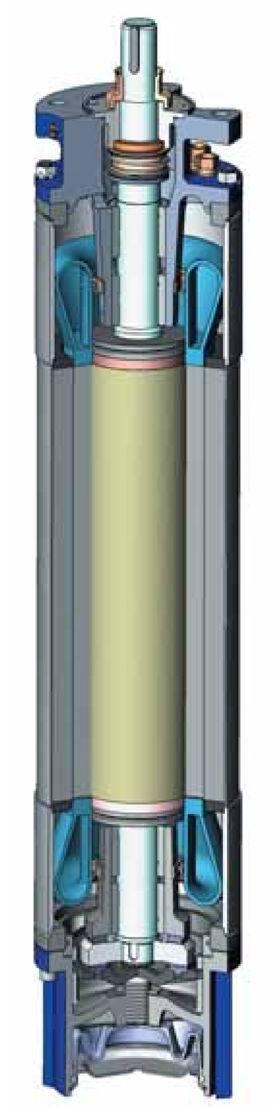
DAP 6

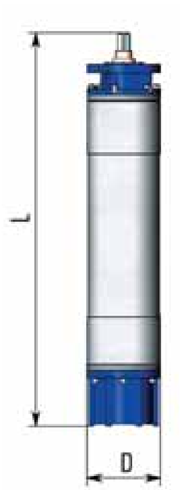


DAP 8

DAP 10 SERIES

- Max Diameter: D=235 mm
- Protection: IP68
- Starts per hour: ≤6
- Water temperature: up to +30 °C (86 °F)
- Voltage: 50Hz, 3 x 400V
- Voltage tolerance: -15 … +10%
- PE2 winding insulation, up to 100 °C temperature resistance
- Synchronous rotation speed: 3000 rpm

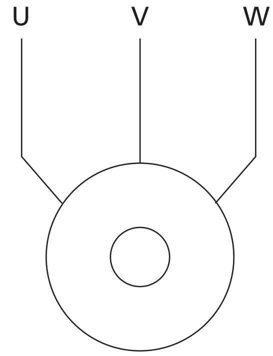




DAP 10

POWER SUPPLY CONNECTION

DOL (Direct On-Line)



DAP MOTOR TYPE KEY

DAP X - XX

- DAP series motor
- Motor size (inches)
- Rated power, kW

TABLE № 6. OPERATING PARAMETERS
DAP submersible motors

Model	Power P2		F	I_n	I_{st}/I_{nom}	Eff.	cosϕ	n_n	T_{nom}	T_{st}/T_{nom}	Motor length	Weight	Leads
	kW	HP	kN	A	A	%		rpm	N·m	N·m	L, mm	kg	mm^2
DAP 6-3	3	4	10	7	5.4	77	0.82	2900	10	1.5	597	38	4
DAP 6-4	4	5.5	10	9	5.4	78	0.82	2900	13	1.5	621	40	4
DAP 6-5.5	5.5	7.5	10	12	5.7	79	0.82	2900	18	1.6	641	42	4
DAP 6-7.5	7.5	10	10	17	5.6	80	0.82	2900	25	1.7	706	49	4
DAP 6-9	9	12	10	20	5.6	81	0.82	2900	30	1.6	731	51	4
DAP 6-11	11	15	10	24	6.3	81	0.82	2900	36	1.8	766	55	4
DAP 6-13	13	17.5	10	28	6	81	0.82	2900	43	1.7	821	60	4
DAP 6-15	15	20	10	32	5.9	82	0.82	2900	49	1.8	861	64	4
DAP 6-18.5	18.5	25	10	40	5.8	82	0.82	2900	61	1.8	906	69	4
DAP 8-11	11	15	15	22	4.7	83	0.86	2870	37	1.1	726	78	10
DAP 8-13	13	17.5	15	27	4.7	83	0.84	2870	43	1.1	756	81	10
DAP 8-15	15	20	15	31	4.7	83	0.84	2870	50	1.2	781	86	10
DAP 8-18.5	18.5	25	15	38	4.7	83	0.84	2870	62	1.2	769	89	10
DAP 8-22	22	30	15	44	5.1	85	0.85	2870	73	1.2	876	106	10
DAP 8-26	26	35	20	52	5.1	85	0.85	2870	87	1.2	911	114	10
DAP 8-30	30	40	20	60	5.1	85	0.85	2870	100	1.1	946	121	10
DAP 8-37	37	50	20	73	5.4	85	0.86	2870	123	1.4	1021	141	10
DAP 8-45	45	60	20	89	5.5	86	0.85	2870	150	1.5	1136	164	10
DAP 10-30	30	40	20	60	4.9	85	0.85	2900	99	1.1	877	144	25
DAP 10-37	37	50	20	72	5.4	86	0.86	2900	122	1.4	902	152	25
DAP 10-45	45	60	30	87	5.5	87	0.86	2900	148	1.5	967	169	25
DAP 10-55	55	74	30	106	5.4	87	0.86	2900	181	1.5	1017	182	25
DAP 10-65	65	87	30	125	5.3	87	0.86	2900	214	1.4	1082	202	25
DAP 10-75	75	100	30	145	4.9	88	0.85	2900	247	1.2	1157	225	25
DAP 10-90	90	121	45	174	5.2	88	0.85	2900	296	1.2	1277	262	35
DAP 10-110	110	161	45	212	5.2	88	0.85	2920	360	1.2	1317	274	50
DAP 10-130	130	174	45	251	5.8	88	0.85	2920	425	1.2	1537	342	50

PUMP CONTROL PANELS
HMS Control L3 series

HMS Control L3 panels are intended to control and protect the submersible pumps.

CONTROL MODES

— Manual
— Automatic
— Remote

APPLICATION

— Level control in tanks
— Pressure control
— Electric motor protection

FEATURES AND FUNCTIONS

— Dry running protection
— Water level control
— Mains voltage control
— Insulation resistance check before start
— Level sensor fault detection
— Pump shutdown in case of external accident
— Operation with float and electrode sensors
— Display of condition for station and sensors
— Display of pump parameters: input current, voltage, running time and number of starts
— History of accidents
— Dispatching signals: «Accident», «Station is on», «Pump is on», sensors
— Programmable on/off regime for pumps
— Group mode for several panels

OPTIONS

— Overvoltage protection
— Surge (lightning) protection
— Temperature sensor for motor winding

INTERFACE

— Sensor condition
— Current consumption
— Voltage on each phase
— Hours of operation
— Number of starts
— List of recent failures

TECHNICAL DATA

Voltage	**3x400 V (+10%, –15%), 50 Hz**
Current range	**1..300A**
Motor power	**up to 132 kW**
Method of motor starting	**DOL or soft start**
Ambient temperature	**–40 .. +40 °C**
Humidity	**up to 100 %**
Casing protection	**IP 24 or IP 54**
Sensors and input signals	**— Dry running — Level sensor — Input «External error» — Pressure sensor — Input «External control» — PT100/PTC temperature sensor**

DESIGNATION

Examples

1. HMS Control L3-80-IP54
2. HMS Control L3-120-S-M.T-IP54

HMS Control L3 - XXX - X - X.X - IPXX

Model

Maximum current, A

Start method: DOL / Soft start

Additional functions

H - High voltage protection

M - Lightning protection

C - Remote control by Modbus RTU

T - Temperature sensor

Protection: IP21; IP54

PANEL SELECTION

Control panels with DOL and Soft Start		Rated current, A	Motor power *, kW
HMS Control L3–25-IP21	HMS Control L3–25-IP54	1…25	1.1…9
HMS Control L3–40-IP21	HMS Control L3–40-IP54	20…40	11...17
HMS Control L3–60-IP21	HMS Control L3–60-IP54	35…60	18.5…22
HMS Control L3–80-IP21	HMS Control L3–80-IP54	55…80	27...37
HMS Control L3–100-IP21	HMS Control L3–100-IP54	75…100	45
HMS Control L3–120-IP21	HMS Control L3–120-IP54	95…120	50, 55
HMS Control L3–160-IP21	HMS Control L3–160-IP54	115…160	65, 75
HMS Control L3–200-IP21	HMS Control L3–200-IP54	155…200	90
HMS Control L3–250-IP21	HMS Control L3–250-IP54	195…250	110
HMS Control L3–300-IP21	HMS Control L3–300-IP54	245…300	132

Available options:

N - overvoltage protection; panel is turned off to prevent the equipment failure

M - (lighting and switching) surge voltage protection

P - emergency main switch with handle on the door

C - Modbus interface support - remote monitoring and control: pump start/stop, operation/failure

T - motor winding temperature sensor

* Here and below approximate values are given. Some pump units may have different nominal current values at given power. Please look for more details in References.

RECOMMENDATIONS

How to select a control panel

Selection is made in accordance with the motor's rated current. Please look for motor data in the relevant section, pump unit manual, name plate or contact the manufacturer.

For instance, nominal current for HMS Ciris 10-110 pump is 12A, therefore HMS Control L3-25 shall be selected for that pump.

In case you are unable to select pump or panel range presented in the catalog does not provide all requirements please fill out RFQ on page 67.

Control panels with soft start are recommended for pumps with 7.5 kW power and higher.

Soft start provides:

- pump operational life increase
- no current and torque peaks and negligible voltage dip during startup
- water hammer elimination in pipes and valves

How to select cable size to connect the pump

Cross-section is selected in accordance with ampacity ratings, max ambient temperature and max allowable voltage drop of 2% from nominal value. Please use the table on page 31.

Attention!

Different pump units with the same motor have different power consumption, therefore the cable length and cross-section are to be selected in accordance with nominal current value to avoid oversizing.

If operating current is 10% lower than nominal, the cable length shall be 10% longer than given in the table.

Example

Cable sizing for HMS CIRIS 8-25-125 pump with 13 kW power and 33 A nominal current and 160 m of required length.

In the table below, vertical column, in the corresponding row you would find 175 of cable length with 25 mm of cross section. Therefore, at the required cable length of 160 m the cable cross-section will be 25 mm.

Correct connection to power supply is determined by the pump rotation direction. At the closed valve the manometer shows two different pressure values. Higher value points to the correct rotation direction. For submersible pumps water lift, in the normal mode, should be indicated in 1-2 minutes after start.

Connection of any two-phase power wires has to be swapped around in case of wrong rotation direction.

CABLE SELECTION

Motor power, kW	Maximal nominal current, A	Cable cross-section, mm²														
		1.5	2.5	4	6	10	16	25	35	50	70	95	120	150	185	240
		Maximal cable length, subject to the 2% voltage drop														
1	4.2	119	198	315												
1.5	5.8	86	143	228	339											
2.2	8	62	104	165	246	403										
3	11	45	75	120	179	293	457									
4	12	38	64	102	153	251	391									
5.5	16	24	41	66	98	162	252	391								
6.3	18	22	36	58	87	144	224	347	474							
7.5	20		32	52	78	128	200	310	423							
11	25			41	61	101	158	245	336							
	30			34	51	84	131	204	280	386						
13	35				44	72	113	175	240	331	418					
15	37				41	68	105	164	225	311	392					
17	38				41	68	106	164	224	309	393					
18.5	45					56	87	136	186	257	325	444				
	49					51	80	125	171	236	299	408	491			
22	55						71	110	151	209	264	362	436			
	60						65	101	138	191	242	332	400	473		
30	67						58	90	124	171	216	297	358	424	492	
32	72						54	84	115	159	201	276	333	394	458	
37	83							72	99	137	173	239	288	342	398	474
45	108								77	106	134	184	222	263	305	363
55	120									95	119	165	199	236	275	328
65	130									88	111	153	184	218	253	301
	135									85	107	147	177	210	244	290
75	146										98	136	164	194	226	269
	155										92	128	154	183	213	253
90	165										87	120	145	172	200	238
	190											104	126	149	173	207
110	250												96	113	131	155
	270													105	121	143
130	285													99	115	136
Allowable continuous current, A		19	25	35	42	55	75	95	120	145	180	220	260	305	350	-

The HMS Group

HMS GROUP is the leading in Russia and CIS manufacturer of the pumping and compressor equipment and integrated solutions provider for oil & gas, nuclear & thermal energy, water & utilities.

Key Facts and Figures

- HMS Group foundation – 1993
- Manufacturing facilities in Russia, Ukraine, Belarus and Germany
- Over 17 000 employees
- Representative offices in Italy, UAE, Iraq, Turkmenistan and Uzbekistan

Main Business Activities

Pumps

- Oil & gas industry applications (including API 610 11th ed. pumps)
- Termal & nuclear energy applications
- Water supply & sewage disposal
- Steel, mining and other industries

Compressors

- Centrifugal compressors
- Screw compressors
- Turbo-compressor packages
- Refrigerating machines

Oil & Gas equipment

- Modular and skid-mounted units
- Mobile & stationary cement storages
- Downhole equipment
- Tanks, pressure vessels, heat exchangers
- Flow meters

Integrated Client Support

Project Audit

- Technical audit
- Scope of works definition
- Project scheduling and budgeting

Engineering, Procurement, Manufacture, Testing

- Design and engineering dossier
- Manufacturing of main process equipment (pumps, compressors, pressure vessels, heat exchangers)
- Outsourcing of auxiliaries
- Factory assembly
- Factory Acceptance Test

Supply and Site Services

- Shipment
- Site installation
- Pre-commissioning
- Site Performance Tests
- Site Supervision and on-the-job training
- After sales servicing and counseling

Quality

HMS Group Quality Management System complies with ISO 9001:2008. The equipment is manufactured in accordance with internationally recognized ISO, ANSI, DIN, ASME, ATEX and API standards and in accordance with the customer specifications as well.

Global Presence

The HMS Group references list includes the international projects in Russia and the CIS, Western and Eastern Europe, Iraq, Indonesia, India, China, the USA and other countries.

REQUEST FOR QUOTATION (ORDER FORM)

The order form shall be completed in full to be accepted for consideration by the HMS Group

1. Customer: ____________________

Address: ____________________

Phone: ____________ Fax: ____________ E-mail: ____________

Pump type: ____________ Quantity: ________ Estimated annual q-ty required: ____________

Similar to model: ____________ by (manufacturer): ____________

Filled in by (Name): ____________ Position: ____________ Date: ____________

2. Pump installation data

Installed in a new well ☐ Installed into a well in operation ☐

Well #: ______ Well diameter: ______m Well depth: ______m Pump installation dept: ______m

Static level: ______m Dynamic level: ______m Lowering: ______m Output: ______ m^3/h

Relative output: ______ m^3/h

3. Pumped liquid parameters

Temperature: ______°C Turbidity: ______mg/L Total dissolved solids: ______mg/L pH: ______

Alkalinity: ______mg/L Hardness (total): ______mg/L Iron (total): ______mg/L

4. Operation

Water supplies to (select one of two values): Tank ☐ Water supply system ☐

Pump switch-on pressure: ______kgf/cm^2 Pump switch-off pressure: ______kgf/cm^2

Capacity: ______m^3 Well head pressure: ______kgf/cm^2

5. Power and control panel

Control panel required ☐ Control type: ☐ By pressure ☐ By water level

Motor protection options:
- ☐ By min/max voltage
- ☐ By number of starts limit
- ☐ By current
- ☐ Phase rotation
- ☐ Phase failure
- ☐ Phase imbalance
- ☐ Level sensor
- ☐ Soft start required
- ☐ Variable frequency drive required

Other requirements (point if any): ____________________

____

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