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BORANA
Stainless Steel Submersible Pumps
HAPPY PUMPING

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60 Hz

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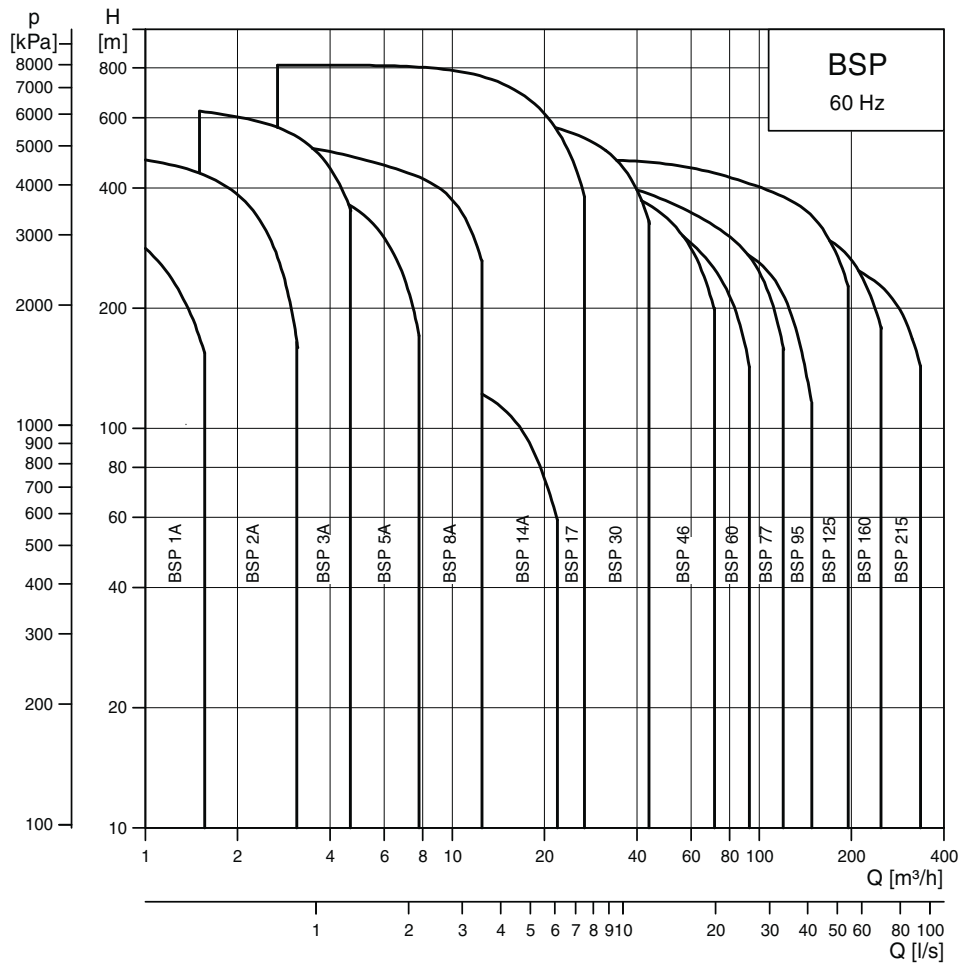
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1.1 Performance range



Efficiency and MEI index for BSP pumps

Pump type	Pump size	Efficiency [%]	MEI
BSP 1A-9	4"	39	≥ 0.80
BSP 2A-9	4"	50	≥ 0.80
BSP 3A-9	4"	58	≥ 0.80
BSP 5A-12	4"	60	≥ 0.56
BSP 8A-10	4"	61	≥ 0.14
BSP 11A-9	4"	60	≥ 0.10
BSP 14A-10	4"	61	≥ 0.10
BSP 17-9	6"	74	≥ 0.76
BSP 30-9	6"	75	≥ 0.50
BSP 46-9	6"	76	≥ 0.50
BSP 60-9	6"	77	≥ 0.60
BSP 77-9	8"	78	≥ 0.44
BSP 95-9	8"	79	≥ 0.50
BSP 125-9	10"	79	≥ 0.37
BSP 160-9	10"	80	≥ 0.39
BSP 215-9	10"	83	≥ 0.46

1.2 Applications

The BSP A and BSP pumps are suitable for the following applications:

- Raw-water supply
- Groundwater lowering
- Fountain applications
- Off-shore applications.
- Irrigation
- Pressure boosting
- Mining applications

1.3 Type key

Example	BSP	95	-	5	-	A	B	N
Type range (BSP A, BSP)								
Rated flow rate in m ³ /h								
Number of impellers								
First reduced-diameter impeller (A, B or C)								
Second reduced-diameter impeller (A, B or C)								
Stainless-steel parts of material = AISI 304 N = AISI 316 R = AISI 904L								

1.4 Pumped liquids

Clean, thin, non-aggressive liquids without solid particles or fibres.

The special BSP A-N and BSP-N versions made of stainless steel to AISI 316 and BSP A-R and BSP-R versions made of stainless steel to AISI 904L are available for applications involving aggressive liquids.

1.5 Operating conditions

Maximum liquid temperature

Borana motor	Flow velocity past motor [m/s]	Max. liquid temperature [°C]
BM 4"	0.15	40
BSF 6" with PVC in the windings	0.15	25
	0.50	30
BMC1 8", 10" rewindable with PVC in the windings	0.15	25
	0.50	30

Operating pressure

Motor	Maximum operating pressure
BM 4" and 6"	6 MPa (60 bar)
BM 6" to 10" rewindable	

1.6 Curve conditions

The conditions below apply to the curves on pages 7 to 63:

General conditions

- Curve tolerances according to ISO 9906, 2012 Grade 3B.
- The performance curves show pump performance at actual speed, cf. standard motor range.
Approximate motor speeds:
4" motors: $n = 3470 \text{ min}^{-1}$
6" motors: $n = 3460 \text{ min}^{-1}$
8" to 10" motors: $n = 3525 \text{ min}^{-1}$.
- The measurements were made with airless water at a temperature of 20°C. The curves apply to a kinematic viscosity of 1 mm²/s (1 cSt). When pumping liquids with a density higher than that of water, use motors with correspondingly higher outputs.
- The bold curves indicate the recommended performance range.
- The performance curves are inclusive of possible losses such as non-return valve loss.

BSP A, BSP curves

- **Q/H:** The curves are inclusive of valve and inlet losses at the actual speed.
Operation without non-return valve will increase the actual head at rated performance by 0.5 to 1.0 m.
- **NPSH:** The curve is inclusive of pressure loss in the suction interconnector and shows required inlet pressure.
- **Power curve:** Power Curve shows the pump power input of each stage for the individual pump size when the pump is running at the rated speed.
- **Efficiency curve:** Efficiency curve shows pump stage efficiency. If Efficiency curve for the actual pump size is needed, please consult www.boranapumps.com.

1.7 Pump range

Type	BSP1A	BSP2A	BSP3A	BSP5A	BSP8A	BSP14A	BSP17A	BSP30A	BSP46A	BSP60A	BSP77A	BSP95A	BSP125A	BSP160A	BSP215A
Steel: AISI 304	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Steel: (N) AISI 316			•	•	•	•	•	•	•	•	•	•	•	•	•
Steel: (R) AISI 904L				•	•		•	•	•	•	•	•	•	•	•
Connection*	Rp	1 1/4	1 1/4 (R 1 1/4)	1 1/4	1 1/2 (R 1 1/2)	2 (R 2)	2	2 1/2 (R 3)	3 (R 3)	3 4 (R 4)	3 4	5	5	6	6
	NPT	1"	1 1/4"	1 1/4"	1 1/2"	2"	2"	3" (3")	3" (3")	3" 4" (4")	3" 4"	5"	5"	6"	6"
Flange connection: Borana flange												5"	5"	6"	6"

*Figures in brackets () indicate connection for pumps with sleeve.

2.1 Features and benefits

A wide pump range

Borana offers energy-efficient submersible pumps ranging from 1 to 335 m³/h. The pump range consists of many pump sizes, and each pump size is available with an optional number of stages to match any duty point.

High pump efficiency

Often pump efficiency is a neglected factor compared to the price. However, the observant user will notice that price variations are without importance to water supply economics compared to the importance of pump and motor efficiencies.

Material and pumped liquids

Borana offers a complete range of pumps and motors which, as standard, are made completely of stainless steel to AISI 304. This ensures good wear resistance and a reduced risk of corrosion when pumping ordinary cold water with a minor chloride content.

A pump range made of upgraded stainless steel is available for more aggressive liquids:

BSP N: AISI 316

BSP R: AISI 904L

For slightly polluted liquids containing for example oil, Borana offers a complete range of stainless-steel BSP NE pumps to AISI 316 with all rubber parts made of FKM.

Low installation costs

Stainless steel means low weight facilitating the handling of pumps and resulting in low equipment costs and reduced installation and service time.

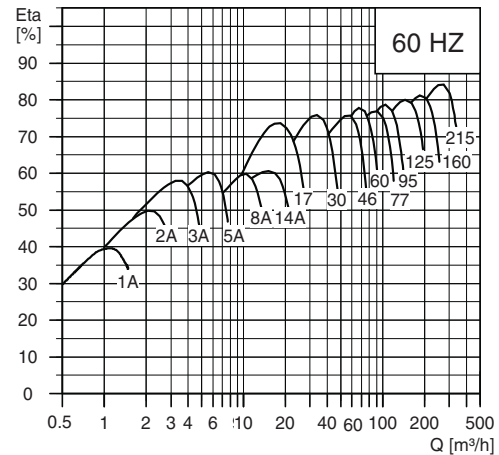


Fig. 1 Pump/motor efficiencies in relation to flow



Fig. 2 Various BSP pumps

Bearings with sand channels

All bearings are water-lubricated and have a squared shape enabling sand particles, if any, to leave the pump together with the pumped liquid.



Fig. 3 Bearing

Inlet strainer

The inlet strainer prevents particles over a certain size from entering the pump.



Fig. 4 Inlet strainer

Non-return valve

All pumps have a reliable non-return valve in the valve casing preventing backflow in connection with pump stoppage.

Furthermore, the short closing time of the non-return valve means that the risk of destructive water hammer is reduced to a minimum.

The valve casing is designed for optimum hydraulic properties to minimise the pressure loss across the valve and thus to contribute to the high efficiency of the pump.

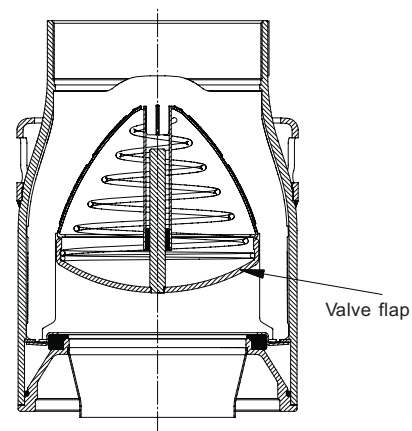


Fig. 5 Non-return valve

Priming screw

All Borana pumps with radial impellers are fitted with a priming screw. Consequently, dry running is prevented because the priming screw will ensure that the pump bearings are always lubricated.

BSP pumps with semi-axial impellers require no priming screw. The pumps are primed automatically.

It applies to all pump types, however, that neither pump nor motor will be protected against dry running if the water table is lowered to a level below the pump inlet.

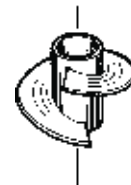


Fig. 6 Priming screw

Stop ring

The stop ring prevents damage to the pump during transport and in case of up-thrust in connection with start-up.

The stop ring, which is designed as a thrust bearing, limits axial movements of the pump shaft.

The stationary part of the stop ring (A) is secured in the upper chamber.

The rotating part (B) is fitted above the split cone (C).

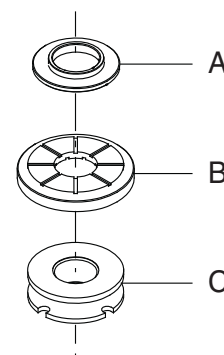


Fig. 7 Stop ring (rotating and stationary parts) and split cone

2.2 Material specification

Pos.	Component	Materials	Standard N-version R-version		
			EN/AISI		
1	Valve casing	Stainless steel	304	316	904L
1d	O-ring	NBR			
2	Valve cup	Stainless steel	304	316	904L
3	Valve seat	Standard/N-version: NBR R-version: FKM			
3a	Lower valve seat retainer	Stainless steel	304	316	1.4517
3b	Upper valve seat retainer	Stainless steel	304	316	904L
4	Top chamber	Stainless steel	304	316	904L
6	Upper bearing	Stainless steel/NBR	304	316	904L
7	Neck ring	NBR/PPS			
8	Bearing	NBR			
8a	Washer for stop ring	Carbon / graphite HY22 in PTFE mass			
8b	Stop ring	Stainless steel	316	316	904L
9	Chamber	Stainless steel	304	316	904L
11	Split cone nut	Stainless steel	304	316	904L
11c	Nut for stop ring	Stainless steel	316	316	904L
12	Split cone	Stainless steel	304	316	904L
13	Impeller	Stainless steel	304	316	904L
14	Suction interconnector	Stainless steel	304	316	1.4517
15	Strainer	Stainless steel	304	316	904L
16	Shaft complete	Stainless steel	431	329	904L
17	Strap	Stainless steel	304	316	904L
18	Cable guard	Stainless steel	304	316	904L
19	Nut for strap	Stainless steel	304	316	904L
39	Spring for valve cup	Stainless steel	304	316	1.4462/ SAF 2205
70	Valve guide	Stainless steel	304	316	904L
71	Washer	Stainless steel	316	316	904L
72	Wear ring	Stainless steel	304	316	904L

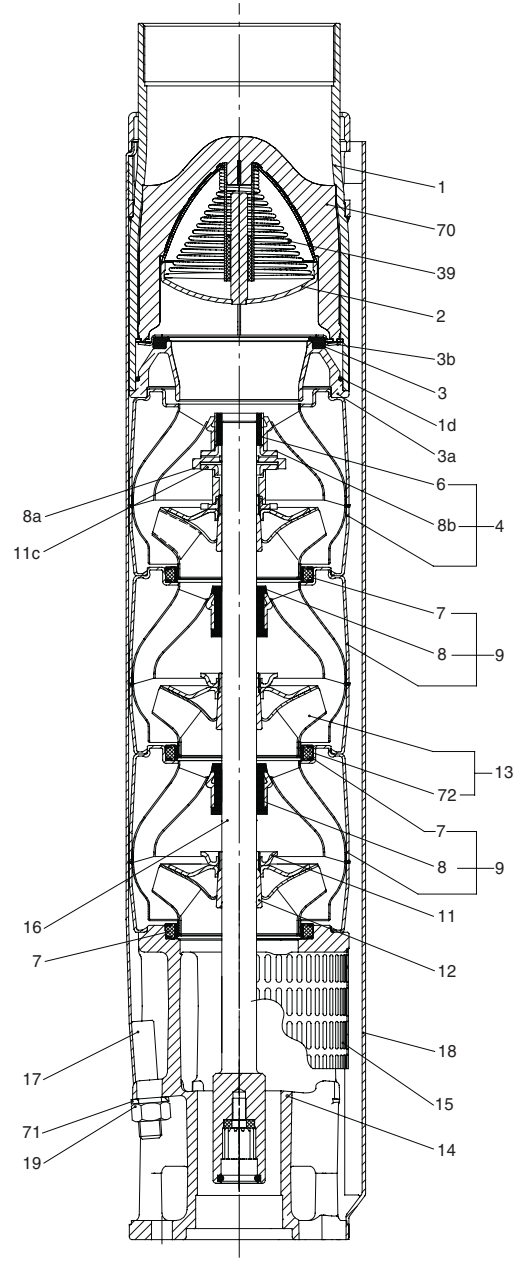
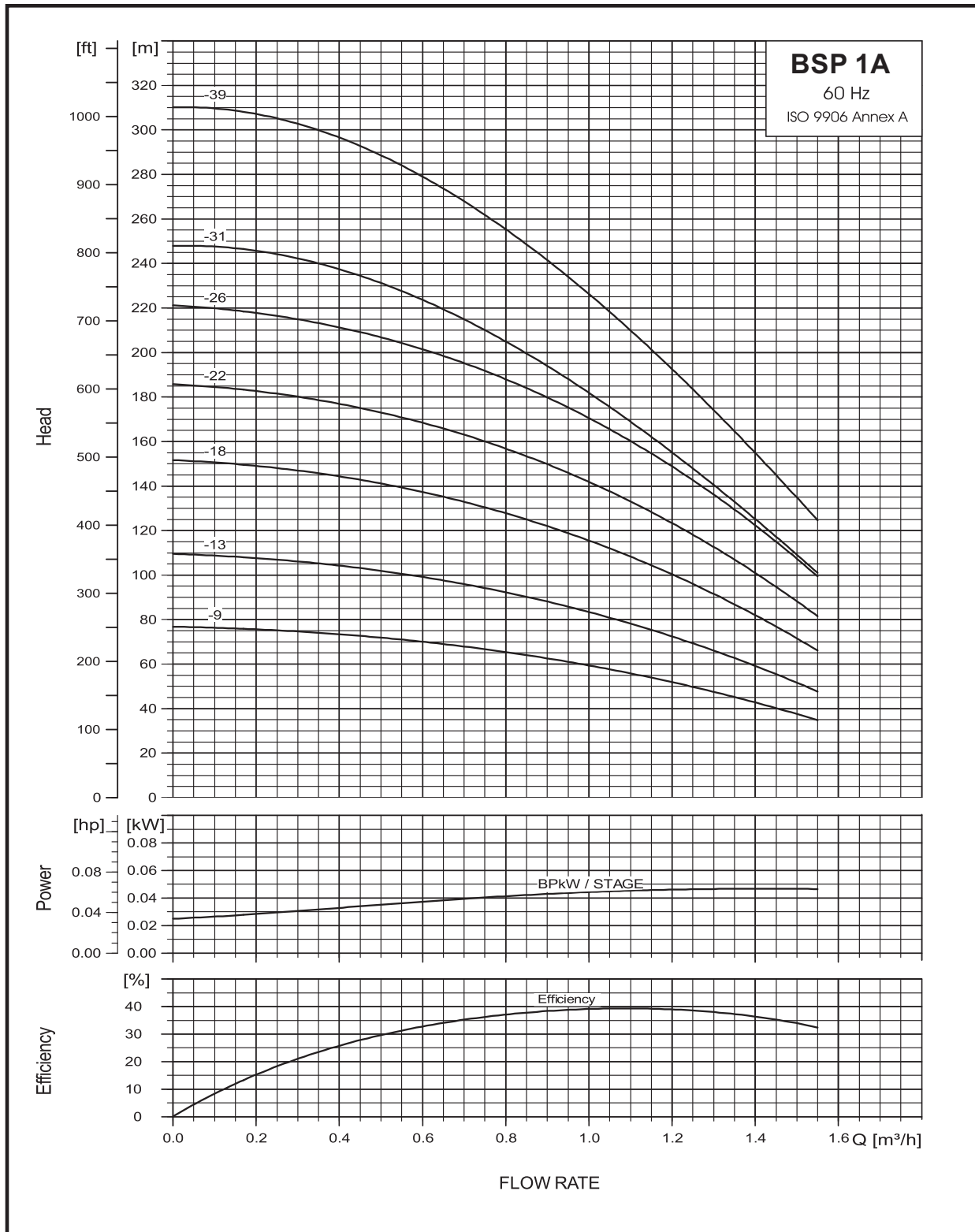


Fig. 8 SP 77

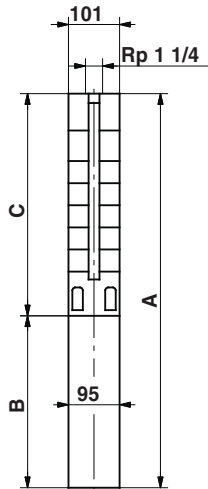
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3.1 BSP 1A - Performance curve



BSP 1A - Technical Data

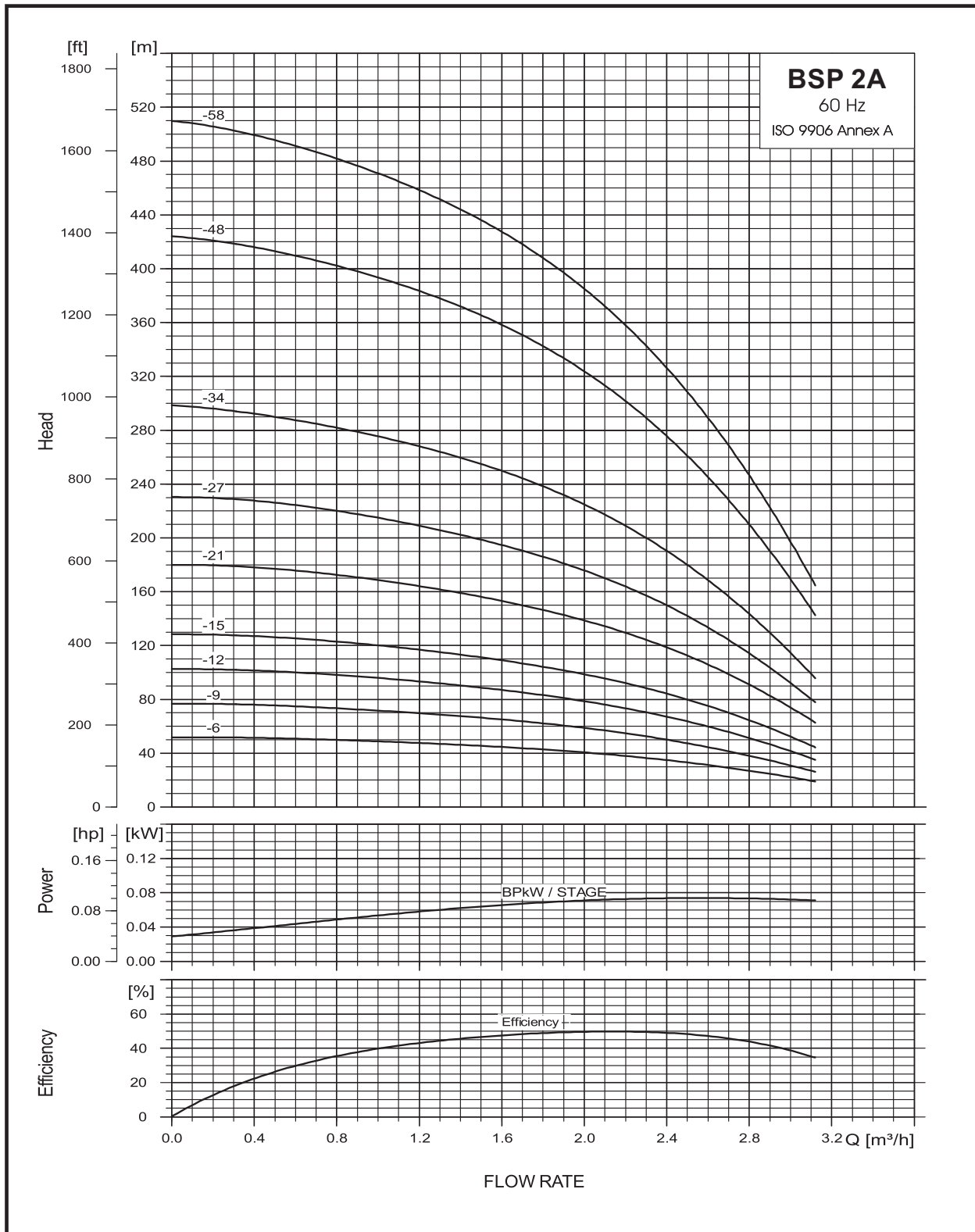
Dimensions and Weights



101 mm = Maximum diameter of pump inclusive of cable guard and motor.

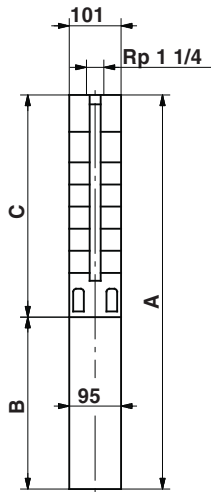
Pump type	Motor		Dimensions [mm]		Net weight [kg]	
	Type	Power [kW]	C	B		A
				3x220 V 3x380 V 3x460 V	3x220 V 3x380 V 3x460 V	3x220 V 3x380 V 3x460 V
BSP 1A-9	BM 4	0.37	344	226	570	9
BSP 1A-13	BM 4	0.37	428	226	654	10
BSP 1A-18	BM 4	0.55	533	241	774	12
BSP 1A-22	BM 4	0.75	617	276	893	14
BSP 1A-26	BM 4	1.1	701	306	1007	16
BSP 1A-31	BM 4	1.1	851	306	1157	22
BSP 1A-39	BM 4	1.5	1019	346	1365	26

3.2 BSP 2A - Performance curve



BSP 2A - Technical Data

Dimensions and Weights

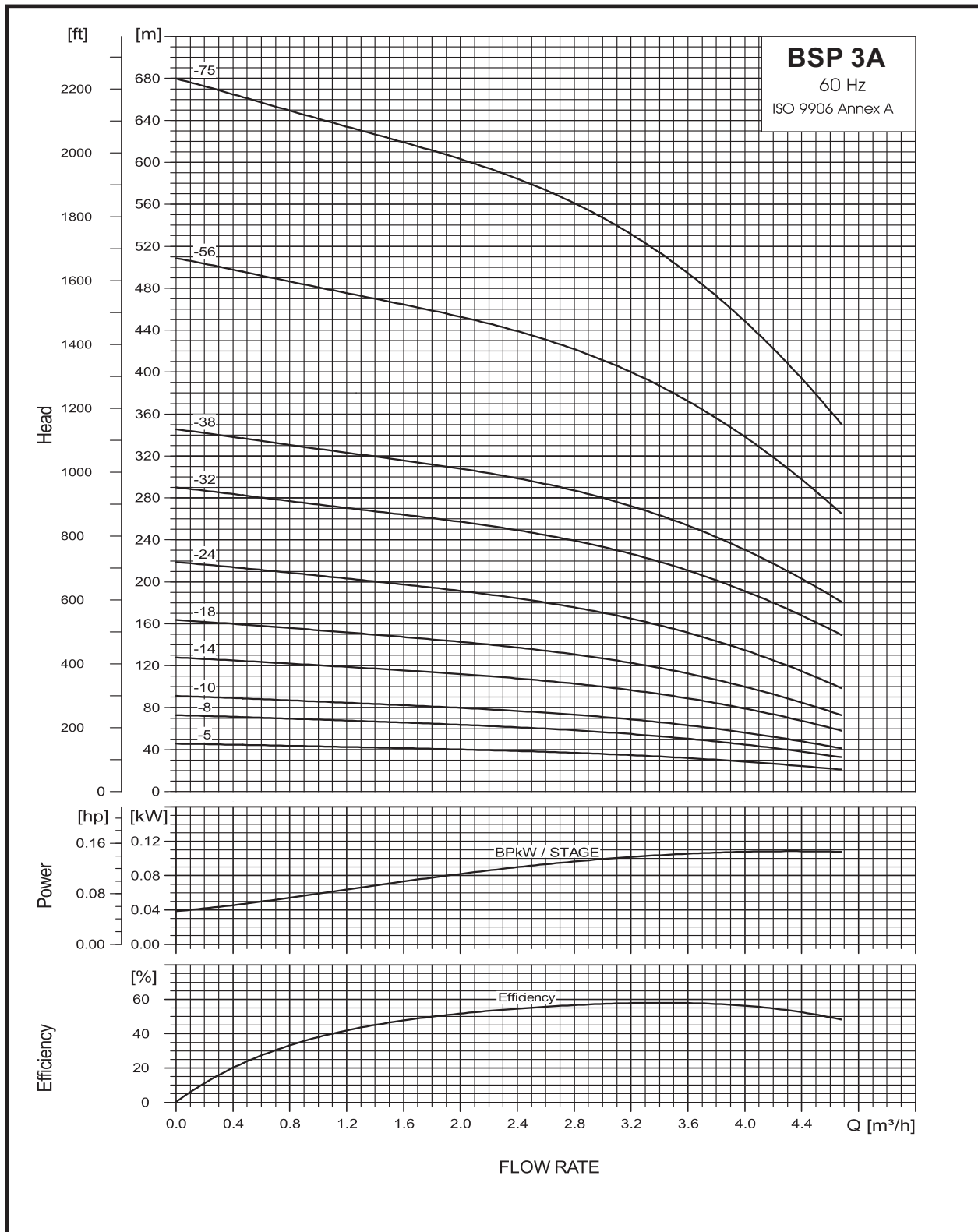


101 mm = Maximum diameter of pump inclusive of cable guard and motor.

BSP 2A-58 are mounted in sleeve for R 1 1/4 connection and with max. diameter 108 mm.

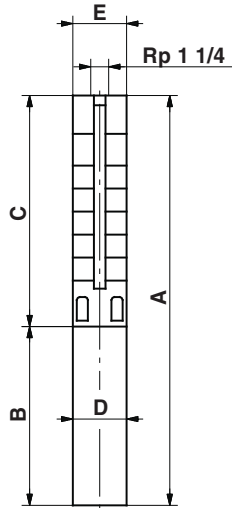
Pump type	Motor		Dimensions [mm]				Net weight [kg]		
	Type	Power [kW]	C	B		A		1x220 V	3x220 V 3x380 V 3x460 V
				1x220 V	3x220 V 3x380 V 3x460 V	1x220 V	3x220 V 3x380 V 3x460 V		
BSP 2A-6	BM 4	0.25	281	256		537	10		
BSP 2A-6	BM 4	0.37	281		226	507		9	
BSP 2A-9	BM 4	0.37	344	276	226	620	570	12	
BSP 2A-12	BM 4	0.55	407	291	241	698	648	13	
BSP 2A-15	BM 4	0.75	470	306	276	776	746	14	
BSP 2A-21	BM 4	1.1	596	346	306	942	902	17	
BSP 2A-27	BM 4	1.5	722		346		1068	18	
BSP 2A-34	BM 4	2.2	914		453		1367	30	
BSP 2A-48	BM 4	4.0	1208		573		1781	39	
BSP 2A-58	BM 4	4.0	1597		573		2170	50	

3.3 BSP 3A - Performance curve



BSP 3A - Technical Data

Dimensions and Weights



BSP 3A-56 and BSP 3A-75 are mounted in sleeve for R 1 1/4 connection.

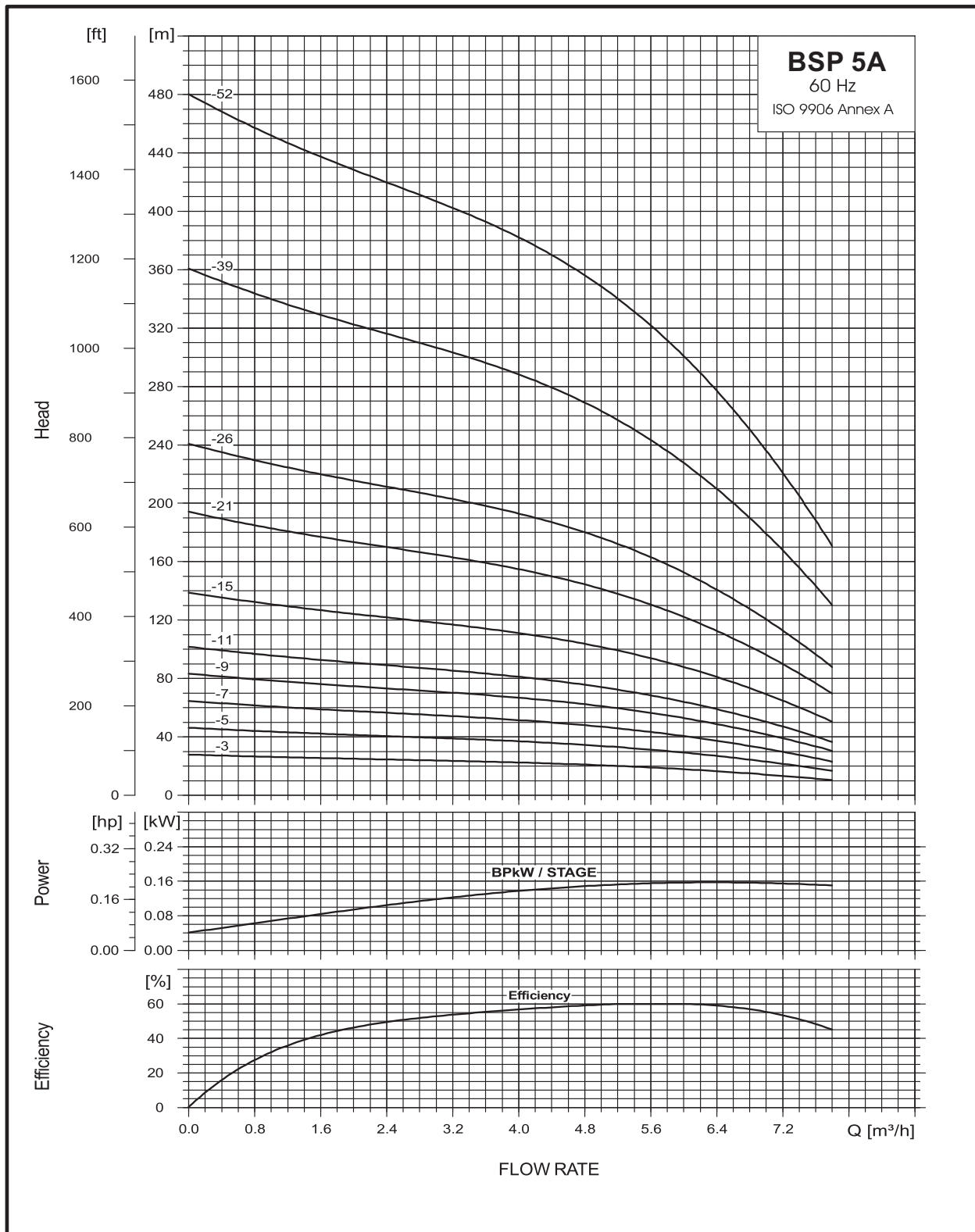
Pump type	Motor		Dimensions [mm]						Net weight [kg]		
	Type	Power [kW]	C	B		A		D	E	Net weight [kg]	
				1x220 V	3x220 V 3x380 V 3x460 V	1x220 V	3x220 V 3x380 V 3x460 V			1x220 V	3x220 V 3x380 V 3x460 V
BSP 3A-5*	BM 4	0.37	260	256	226	516	486	95	101	11	8
BSP 3A-5N	BM 4	0.75	305		398		703	95	101		17
BSP 3A-8*	BM 4	0.55	323	291	241	614	564	95	101	12	10
BSP 3A-8N	BM 4	0.75	368		398		766	95	101		18
BSP 3A-10*	BM 4	0.75	365	306	276	671	641	95	101	13	12
BSP 3A-10N	BM 4	0.75	410		398		808	95	101		19
BSP 3A-14*	BM 4	1.1	449	346	306	795	755	95	101	15	14
BSP 3A-14N	BM 4	1.1	494		413		907	95	101		21
BSP 3A-18*	BM 4	1.5	533		346		879	95	101		16
BSP 3A-18N	BM 4	1.5	578		413		991	95	101		23
BSP 3A-24*	BM 4	2.2	659		453		1112	95	101		23
BSP 3A-24N	BM 4	2.2	704		453		1157	95	101		27
BSP 3A-32	BM 4	3.0	872		493		1365	95	101		30
BSP 3A-38	BM 4	4.0	998		573		1571	95	101		36
BSP 3A-56	BM 4	5.5	1747		673		2420	95	101		65
BSP 3A-56	BSF 6	5.5	1747		541		2228	138	140		75
BSP 3A-75	BSF 6	7.5	2146		571		2717	138	140		86

E = Maximum diameter of pump inclusive of cable guard and motor.

*Pumps with spline shaft are only available in stainless steel EN 1.4301/AISI 304.

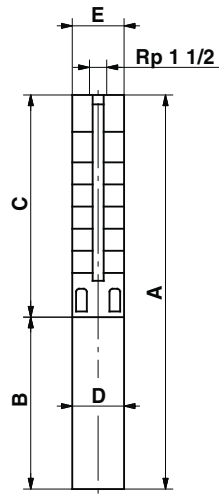
Note: All other pumps listed above are also available in N- and R-versions. See page 3.

3.4 BSP 5A - Performance curve



BSP 5A - Technical Data

Dimensions and Weights



BSP 5A-52 are mounted in sleeve for R 1 1/2 connection.

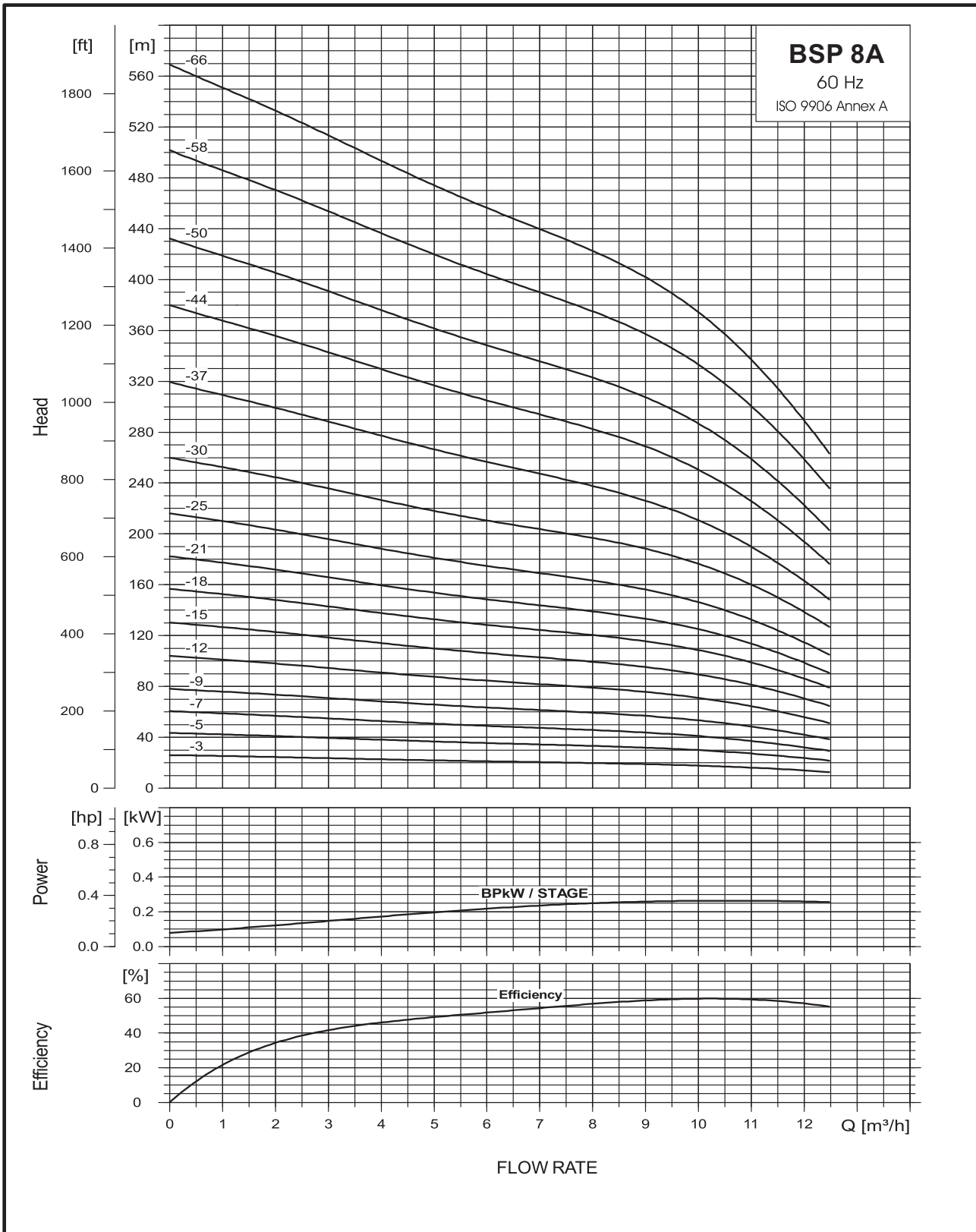
Pump type	Motor		Dimensions [mm]						Net weight [kg]		
	Type	Power [kW]	C	B		A		D	E	1x220 V	3x220 V 3x380 V 3x460 V
				1x220 V	3x220 V 3x380 V 3x460 V	1x220 V	3x220 V 3x380 V 3x460 V				
BSP 5A-3*	BM 4	0.37	219	276	226	495	445	95	101	10	8
BSP 5A-3N	BM 4	0.75	263		398		661	95	101		17
BSP 5A-5*	BM 4	0.55	261	291	241	552	502	95	101	11	9
BSP 5A-5N	BM 4	0.75	305		398		703	95	101		17
BSP 5A-7*	BM 4	0.75	303	306	276	609	579	95	101	12	11
BSP 5A-7N	BM 4	0.75	347		398		745	95	101		18
BSP 5A-9*	BM 4	1.1	345	346	306	691	651	95	101	14	13
BSP 5A-9N	BM 4	1.1	389		413		802	95	101		20
BSP 5A-11*	BM 4	1.5	387		346		733	95	101		15
BSP 5A-11N	BM 4	1.5	431		413		844	95	101		20
BSP 5A-15*	BM 4	2.2	471		453		924	95	101		21
BSP 5A-15N	BM 4	2.2	515		453		968	95	101		24
BSP 5A-21*	BM 4	3.0	597		493		1090	95	101		23
BSP 5A-21N	BM 4	3.0	641		493		1134	95	101		26
BSP 5A-26*	BM 4	4.0	702		573		1275	95	101		29
BSP 5A-26N	BM 4	4.0	746		573		1319	95	101		32
BSP 5A-39	BM 4	5.5	1019		673		1692	95	101		41
BSP 5A-39	BSF 6	5.5	1081		541		1622	138	138		55
BSP 5A-52	BSF 6	7.5	1663		571		2234	138	140		74

E = Maximum diameter of pump inclusive of cable guard and motor.

*Pumps with spline shaft are only available in stainless steel EN 1.4301/AISI 304.

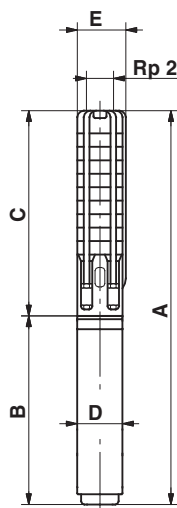
Note: All other pumps listed above are also available in N- and R-versions. See page 3.
Pumps mounted in sleeve are only available in standard and N-versions.

3.5 BSP 8A - Performance curve



BSP 8A - Technical Data

Dimensions and Weights



BSP 8A-58(N) to BSP 8A-66(N)
are mounted in sleeve
for R 2 connection.

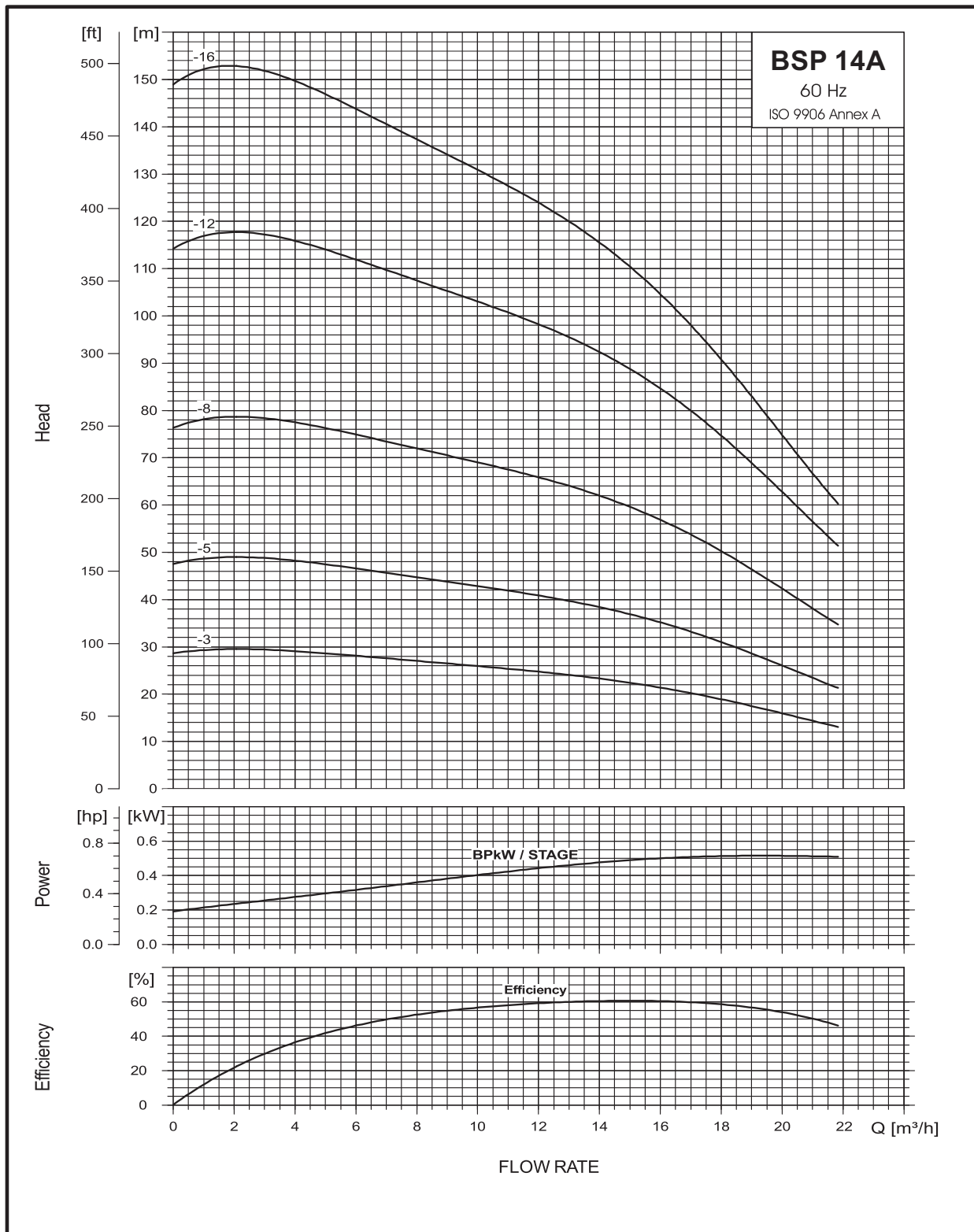
Pump type	Motor		Dimensions [mm]						Net weight [kg]		
	Type	Power [kW]	C	B		A		D	E	Net weight [kg]	
				1x220 V	3x220 V 3x380 V 3x460 V	1x220 V	3x220 V 3x380 V 3x460 V			1x220 V	3x220 V 3x380 V 3x460 V
BSP 8A-3	BM 4	0.55	325	291	241	616	566	95	101	13	11
BSP 8A-3	BM 4	0.75	325		398		723	95	101		18
BSP 8A-5	BM 4	1.1	409	346	306	755	715	95	101	16	15
BSP 8A-5	BM 4	1.1	409		413		822	95	101		20
BSP 8A-7	BM 4	1.5	493		346		839	95	101		17
BSP 8A-7	BM 4	1.5	493		413		906	95	101		21
BSP 8A-9	BM 4	2.2	577		453		1030	95	101		24
BSP 8A-12	BM 4	3.0	703		493		1196	95	101		26
BSP 8A-15	BM 4	4.0	829		573		1402	95	101		32
BSP 8A-18	BM 4	5.5	955		673		1628	95	101		38
BSP 8A-21	BM 4	5.5	1081		673		1754	95	101		40
BSP 8A-25	BM 4	5.5	1249		673		1922	95	101		42
BSP 8A-30	BM 4	7.5	1459		773		2232	95	101		50
BSP 8A-18	BSF 6	5.5	1017		541		1558	138	138		50
BSP 8A-21	BSF 6	5.5	1143		541		1684	138	138		51
BSP 8A-25	BSF 6	5.5	1311		541		1852	138	138		53
BSP 8A-30	BSF 6	7.5	1521		571		2092	138	138		59
BSP 8A-37	BSF 6	9.2	1815		601		2416	138	138		69
BSP 8A-44	BSF 6	11	2109		631		2740	138	138		75
BSP 8A-50	BSF 6	13	2677		661		3338	138	140		103
BSP 8A-58	BSF 6	15	3013		696		3709	138	140		114

E = Maximum diameter of pump inclusive of cable guard and motor.

Note: The pump types listed are also available in N- and R-versions. See page 3.

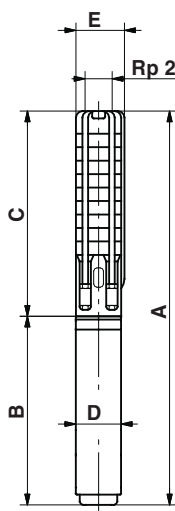
Pumps mounted in sleeve are only available in standard and N-versions.

3.6 BSP 14A - Performance curve



BSP 14A - Technical Data

Dimensions and Weights

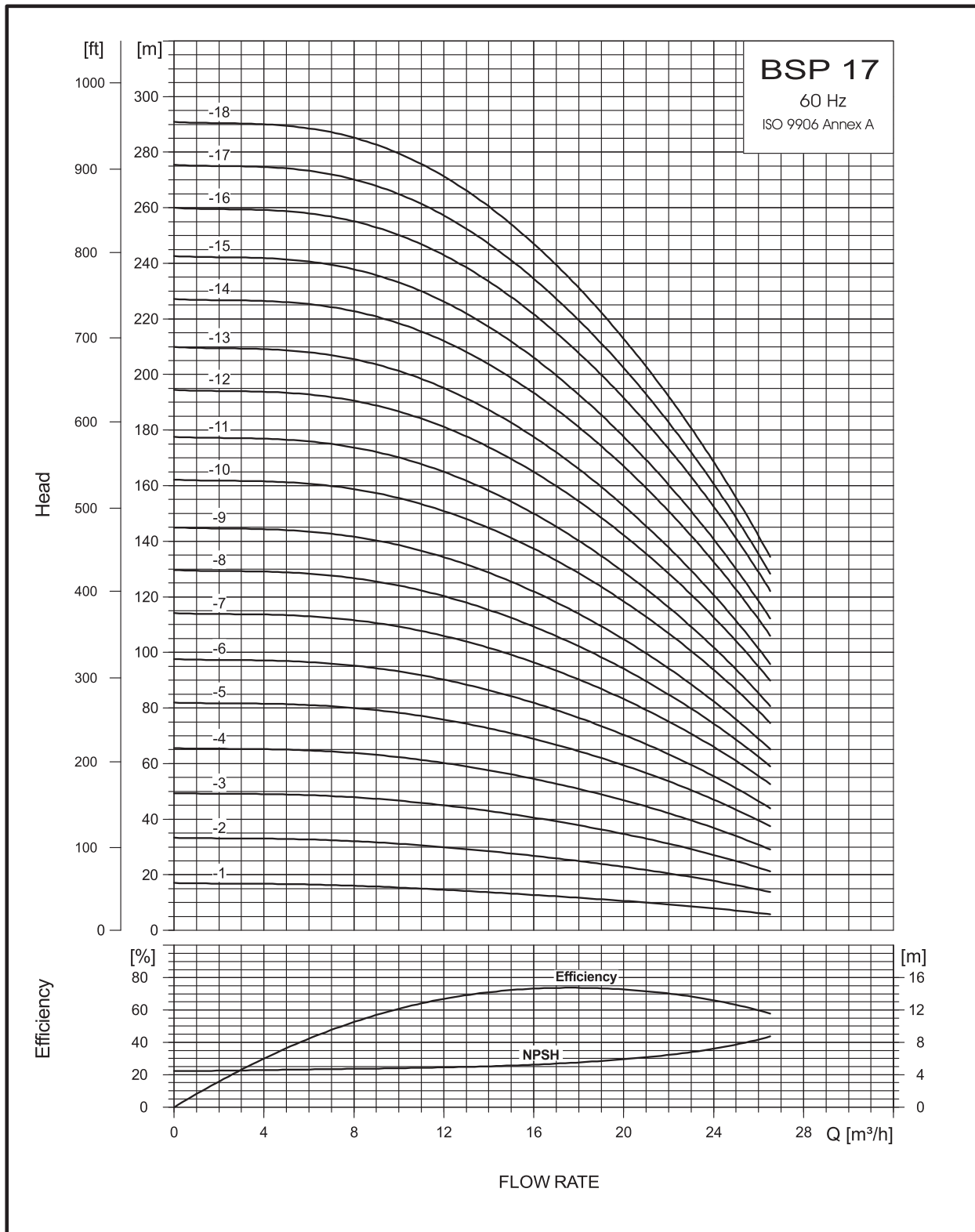


Pump type	Motor		Dimensions [mm]					Net weight [kg]
	Type	Power [kW]	C	B		D	E	3x220 V 3x380 V 3x460 V
				3x220 V 3x380 V 3x460 V	3x220 V 3x380 V 3x460 V			
BSP 14A-3	BM 4	1.5	380	346	726	95	101	16
BSP 14A-5	BM 4	2.2	510	453	963	95	101	23
BSP 14A-8	BM 4	4.0	705	573	1278	95	101	30
BSP 14A-12	BM 4	5.5	965	673	1638	95	101	37
BSP 14A-16	BM 4	7.5	1225	773	1998	95	101	50
BSP 14A-12	BSF 6	5.5	1027	541	1568	138	138	48
BSP 14A-16	BSF 6	7.5	1287	571	1858	138	138	54

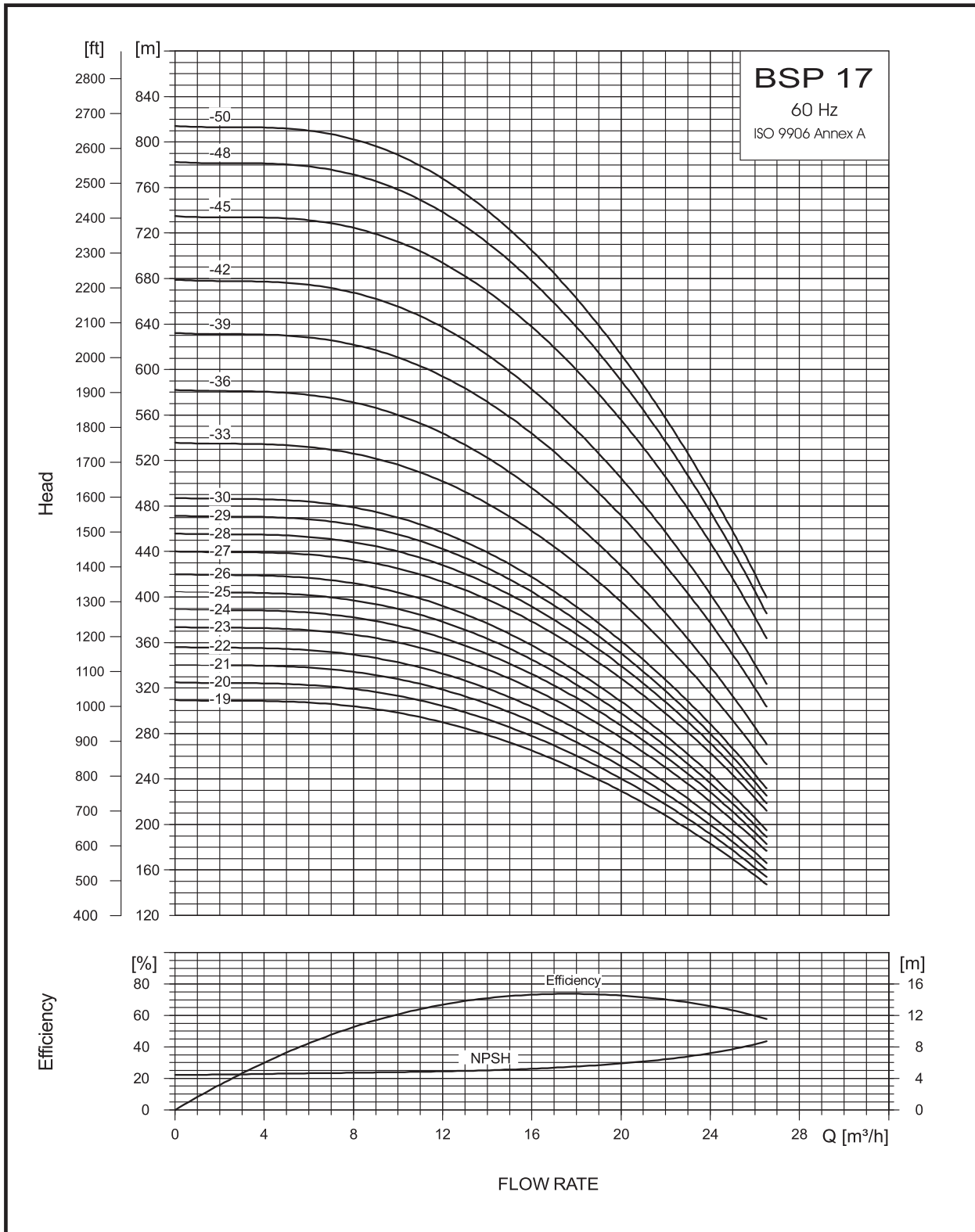
E = Maximum diameter of pump inclusive of cable guard and motor.

Note: The pump types listed above are also available in N-version. See page 3.

3.7 BSP 17 - Performance curve

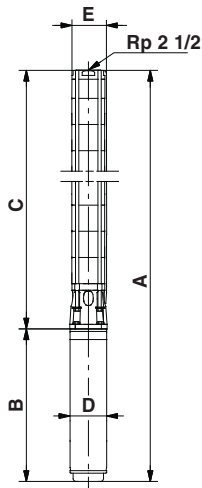


BSP 17 - Performance Curve



BSP 17 - Technical Data

Dimensions and Weights



BSP 17-33 to BSP 17-50 are mounted in sleeve for R 3 connection.

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	C	B	A	D	E*	E**	
BSP 17-1	BM 4	1.1	341	417	758	95	134		19
BSP 17-2	BM 4	2.2	402	457	859	95	134		22
BSP 17-3	BM 4	3	462	497	959	95	134		24
BSP 17-4	BM 4	4	523	577	1100	95	134		30
BSP 17-5	BM 4	5.5	583	677	1260	95	134		36
BSP 17-6	BM 4	5.5	644	677	1321	95	134		37
BSP 17-7	BM 4	7.5	704	777	1481	95	134		44
BSP 17-8	BM 4	7.5	765	777	1542	95	134		45
BSP 17-9	BM 4	7.5	825	777	1602	95	134		47
BSP 17-5	BSF 6	5.5	583	544	1127	143	142	144	45
BSP 17-6	BSF 6	5.5	644	544	1188	143	142	144	46
BSP 17-7	BSF 6	7.5	704	574	1278	143	142	144	51
BSP 17-8	BSF 6	7.5	765	574	1339	143	142	144	52
BSP 17-9	BSF 6	7.5	825	574	1399	143	142	144	54
BSP 17-10	BSF 6	9.2	886	604	1490	143	142	144	61
BSP 17-11	BSF 6	9.2	946	604	1550	143	142	144	62
BSP 17-12	BSF 6	11	1007	634	1641	143	142	144	66
BSP 17-13	BSF 6	11	1067	634	1701	143	142	144	68
BSP 17-14	BSF 6	13	1128	664	1792	143	142	144	72
BSP 17-15	BSF 6	13	1188	664	1852	143	142	144	73
BSP 17-16	BSF 6	15	1249	699	1948	143	142	144	79
BSP 17-17	BSF 6	15	1309	699	2008	143	142	144	80
BSP 17-18	BSF 6	15	1370	699	2069	143	142	144	82
BSP 17-19	BSF 6	18.5	1430	754	2184	143	142	144	88
BSP 17-20	BSF 6	18.5	1491	754	2245	143	142	144	90
BSP 17-21	BSF 6	18.5	1551	754	2305	143	142	144	91
BSP 17-22	BSF 6	18.5	1612	754	2366	143	142	144	92
BSP 17-23	BSF 6	22	1672	814	2486	143	142	144	100
BSP 17-24	BSF 6	22	1733	814	2547	143	142	144	101
BSP 17-25	BSF 6	22	1793	814	2607	143	142	144	103
BSP 17-26	BSF 6	22	1854	814	2668	143	142	144	104
BSP 17-27	BSF 6	26	1914	874	2788	143	142	144	111
BSP 17-28	BSF 6	26	1975	874	2849	143	142	144	112
BSP 17-29	BSF 6	26	2035	874	2909	143	142	144	114
BSP 17-30	BSF 6	26	2096	874	2970	143	142	144	115
BSP 17-33	BSF 6	30	2277	944	3221	143	175	181	156
BSP 17-36	BSF 6	30	2459	944	3403	143	175	181	161
BSP 17-39	BSF 6	37	2640	1312	3952	144	175	181	208
BSP 17-42	BMCI 8	37	2822	1312	4134	144	175	181	213
BSP 17-45	BMCI 8	37	3003	1270	4273	192	192	192	285
BSP 17-48	BMCI 8	37	3185	1270	4455	192	192	192	290
BSP 17-50	BMCI 8	37	3306	1270	4576	192	192	192	293

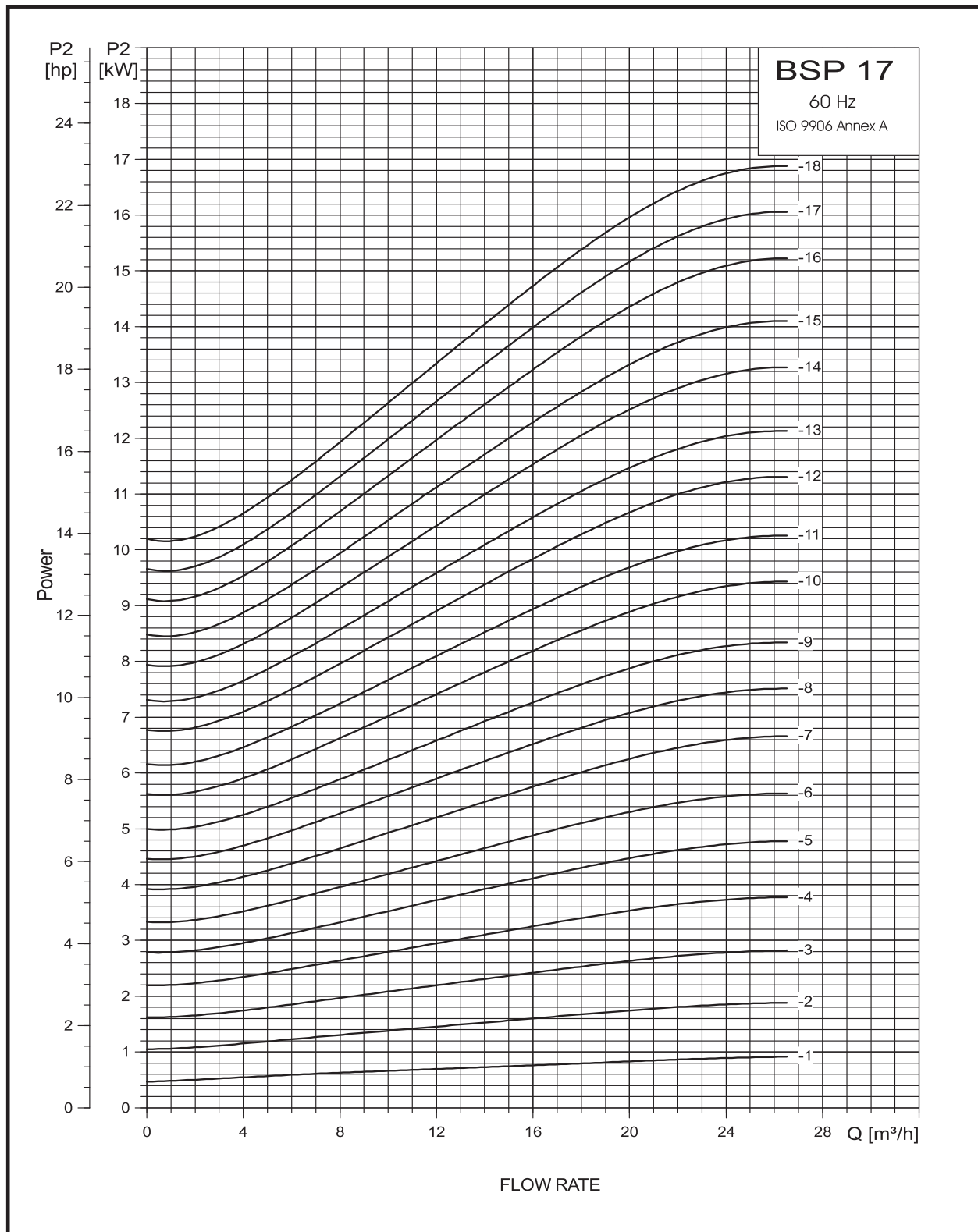
*Maximum diameter of pump with one motor cable.
 **Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions (R-versions up to and including BSP 17-30). See page 3 for further details.

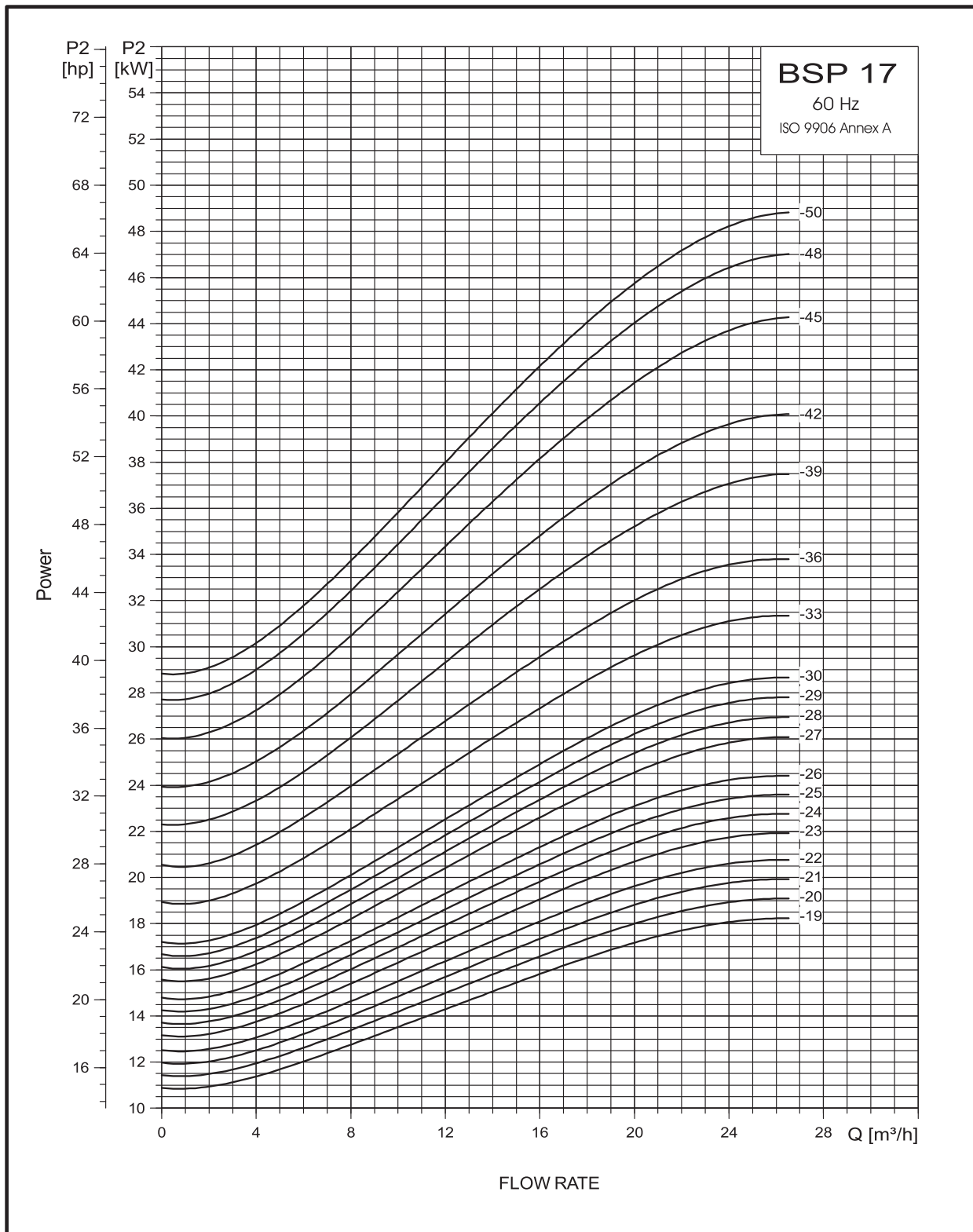
Pumps mounted in sleeve are only available in standard and N-versions.

Other types of connection are possible by means of connecting pieces.

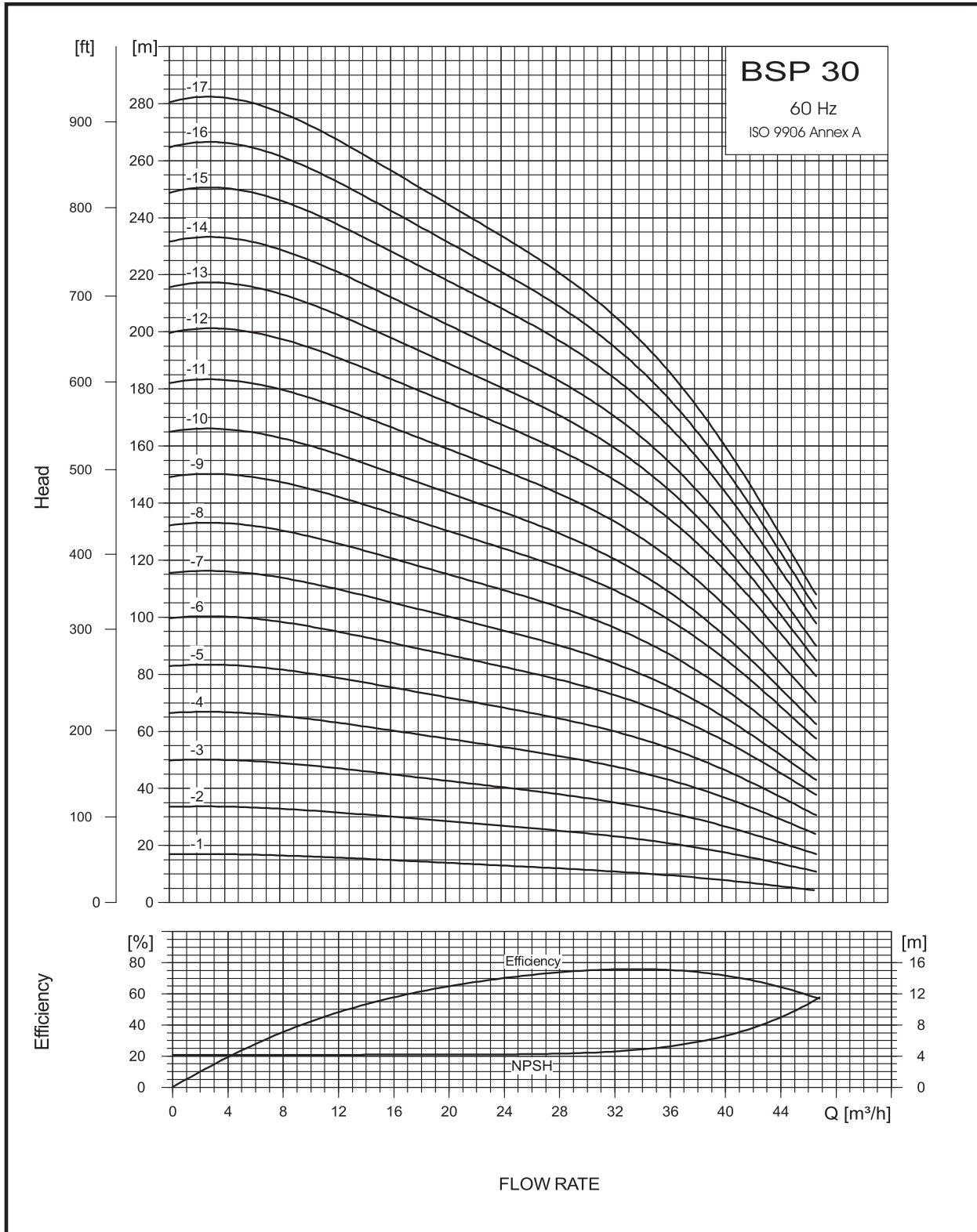
BSP 17 - Power Curve



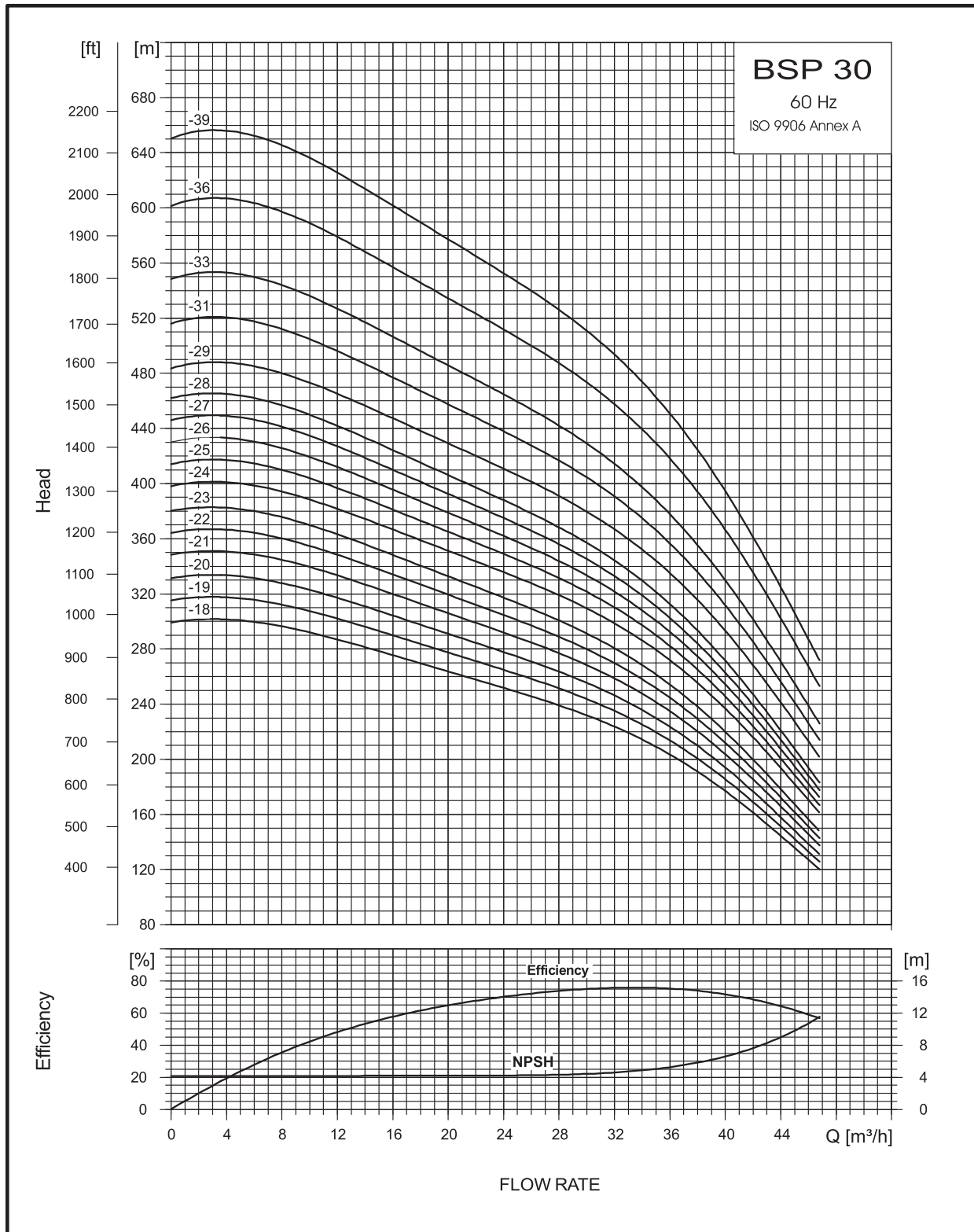
BSP 17 - Power Curve



3.8 BSP 30 - Performance Curve

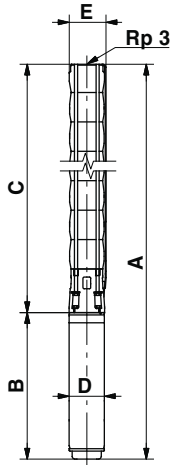


BSP 30 - Performance Curve



BSP 30 - Technical Data

Dimensions and Weights



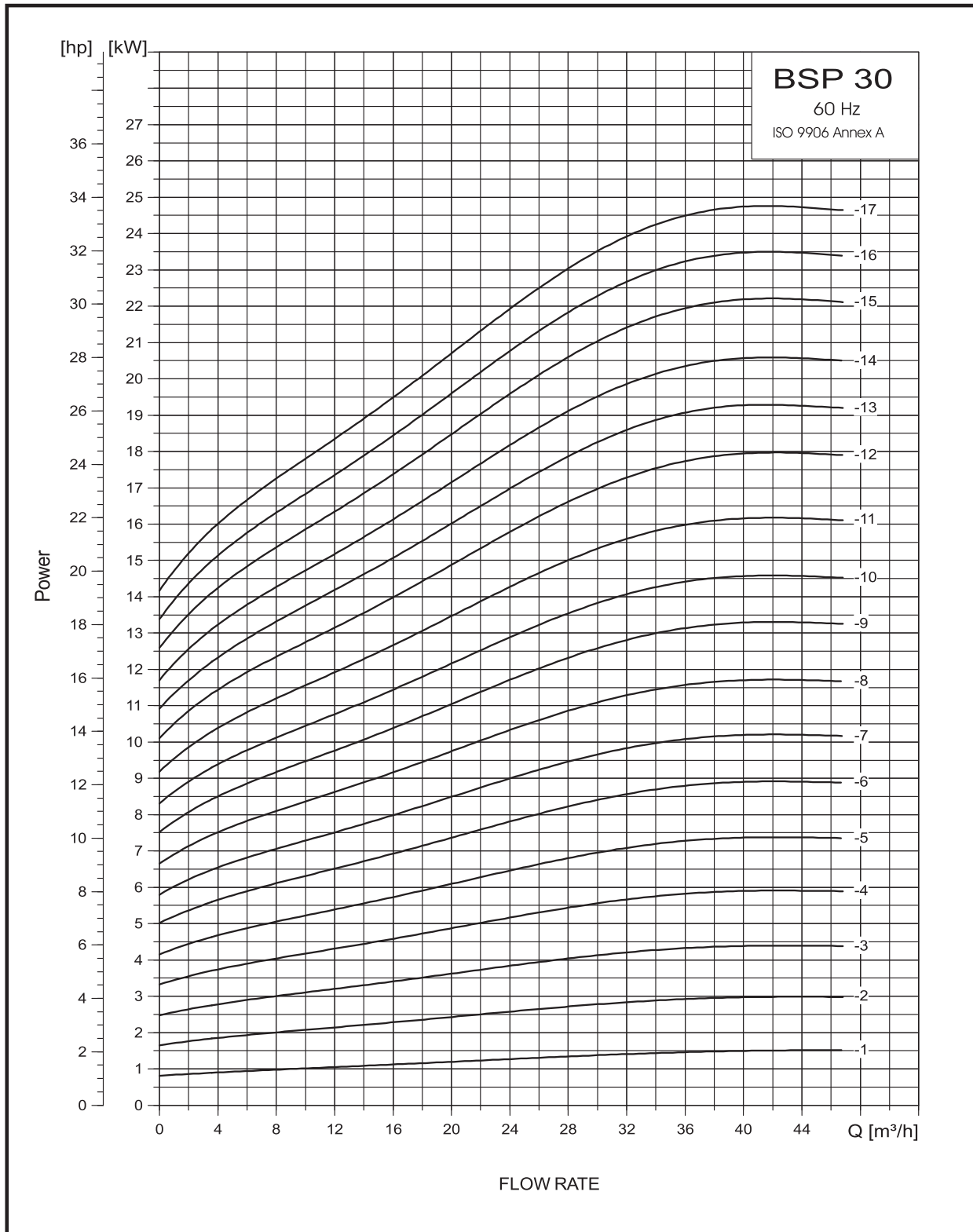
BSP 30-29 to BSP 30-39 are mounted in sleeve for R 3 connection.

Pump type	Motor		Dimensions [mm]					Net weight [kg]	
	Type	Power [kW]	C	B	A	D	E*		E**
BSP30-1	BM 4	1.5	373	417	790	95	134	20	
BSP30-2	BM 4	3	469	457	926	95	134	25	
BSP30-3	BM 4	4	565	577	1142	95	134	30	
BSP30-4	BM 4	5.5	661	677	1338	95	134	37	
BSP30-5	BM 4	7.5	757	777	1534	95	134	44	
BSP30-3	BSF 6	5.5	565	544	1109	143	142	144	43
BSP30-4	BSF 6	5.5	661	544	1205	143	142	144	45
BSP30-5	BSF 6	7.5	757	574	1331	143	142	144	51
BSP30-6	BSF 6	9.2	853	604	1457	143	142	144	58
BSP30-7	BSF 6	9.2	949	604	1553	143	142	144	60
BSP30-8	BSF 6	11	1045	634	1679	143	142	144	65
BSP30-9	BSF 6	13	1141	664	1805	143	142	144	70
BSP30-10	BSF 6	13	1237	664	1901	143	142	144	72
BSP30-11	BSF 6	15	1333	699	2032	143	142	144	78
BSP30-12	BSF 6	18.5	1429	754	2183	143	142	144	85
BSP30-13	BSF 6	18.5	1525	754	2279	143	142	144	87
BSP30-14	BSF 6	18.5	1621	754	2375	143	142	144	89
BSP30-15	BSF 6	22	1717	814	2531	143	142	144	97
BSP30-16	BSF 6	22	1813	814	2627	143	142	144	99
BSP30-17	BSF 6	22	1909	814	2723	143	142	144	101
BSP30-18	BSF 6	26	2005	874	2879	143	142	144	109
BSP30-19	BSF 6	26	2101	874	2975	143	142	144	110
BSP30-20	BSF 6	26	2197	874	3071	143	142	144	112
BSP30-21	BSF 6	30	2293	944	3237	143	142	144	122
BSP30-22	BSF 6	30	2389	944	3333	143	142	144	124
BSP30-23	BSF 6	30	2485	944	3429	143	142	144	126
BSP30-24	BSF 6	37	2581	1312	3893	144	145	147	171
BSP30-25	BSF 6	37	2677	1312	3989	144	145	147	173
BSP30-26	BSF 6	37	2773	1312	4085	144	145	147	175
BSP30-27	BSF 6	37	2869	1312	4181	144	145	147	176
BSP30-28	BSF 6	37	2965	1312	4277	144	145	147	178
BSP30-29	BMC I 8	45	3061	1270	4331	192	192	192	280
BSP30-31	BMC I 8	45	3253	1270	4523	192	192	192	286
BSP30-33	BMC I 8	45	3445	1270	4715	192	192	192	291
BSP30-36	BMC I 8	55	3733	1350	5083	192	192	192	314
BSP30-39	BMC I 8	55	4021	1350	5371	192	192	192	322

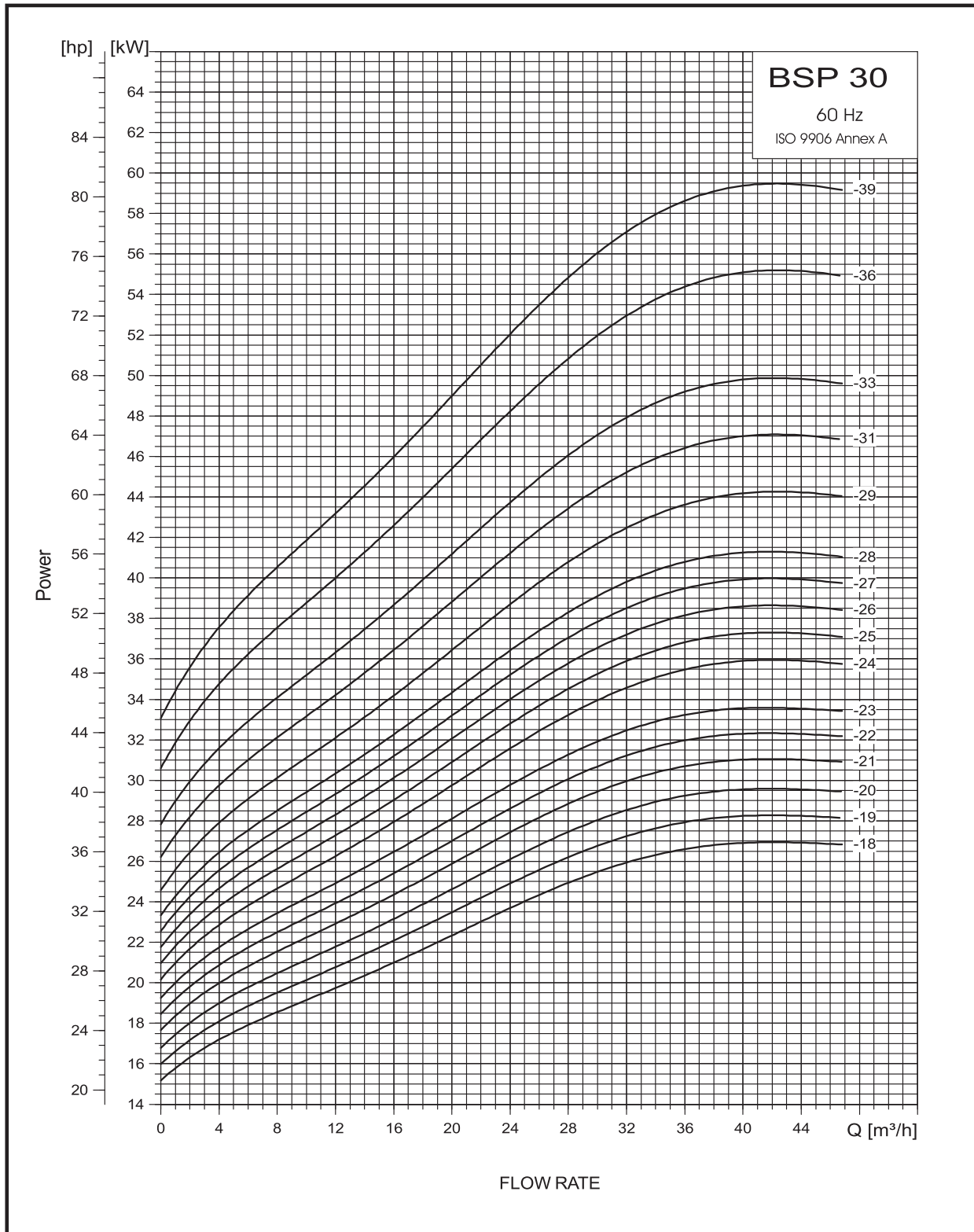
The pump types above are also available in N- and R-versions (R-versions up to and including BSP 30-28). See page 3 for further details.

Pumps mounted in sleeve are only available in standard and N-versions. Other types of connection are possible by means of connecting pieces.

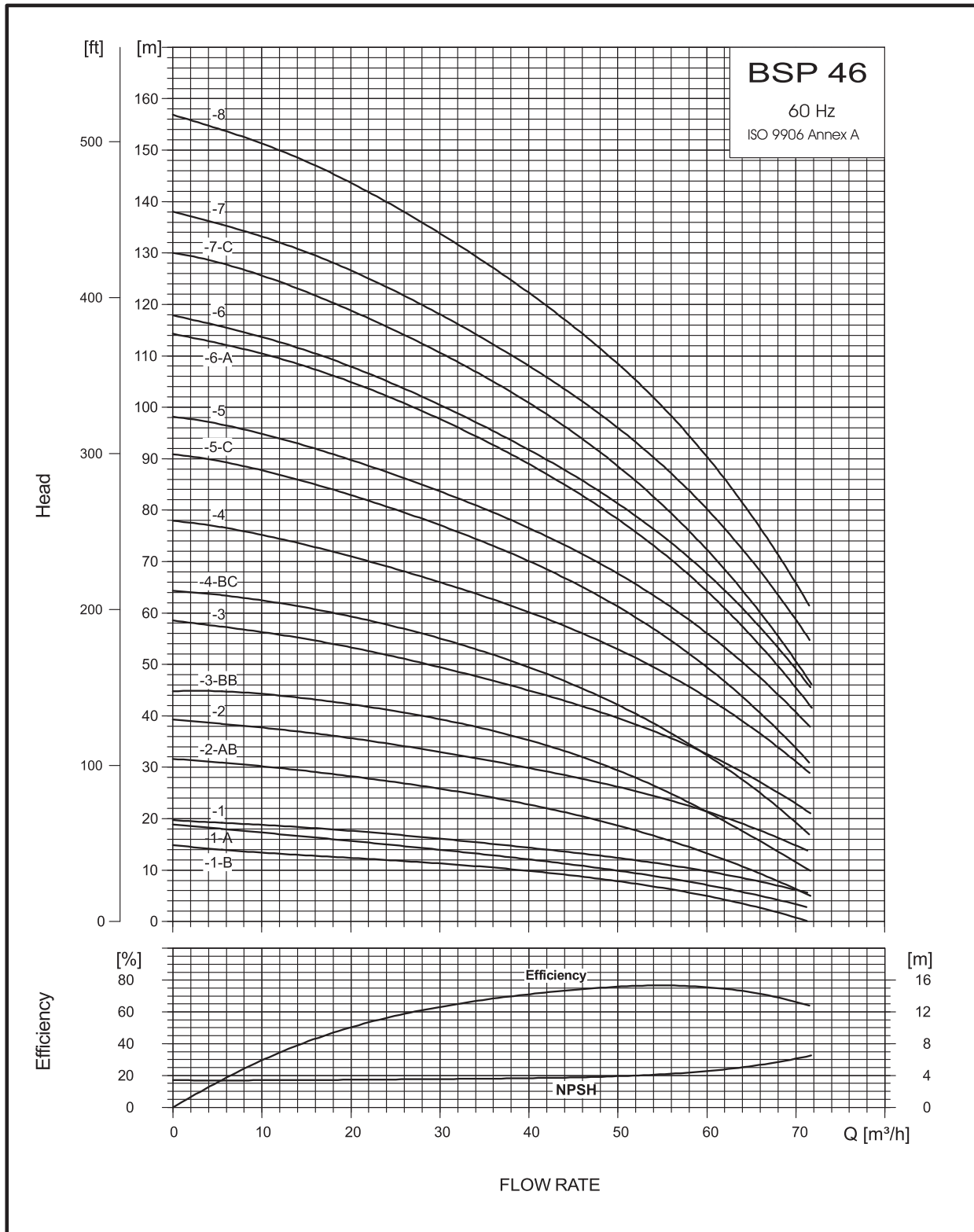
BSP 30 - Power Curve



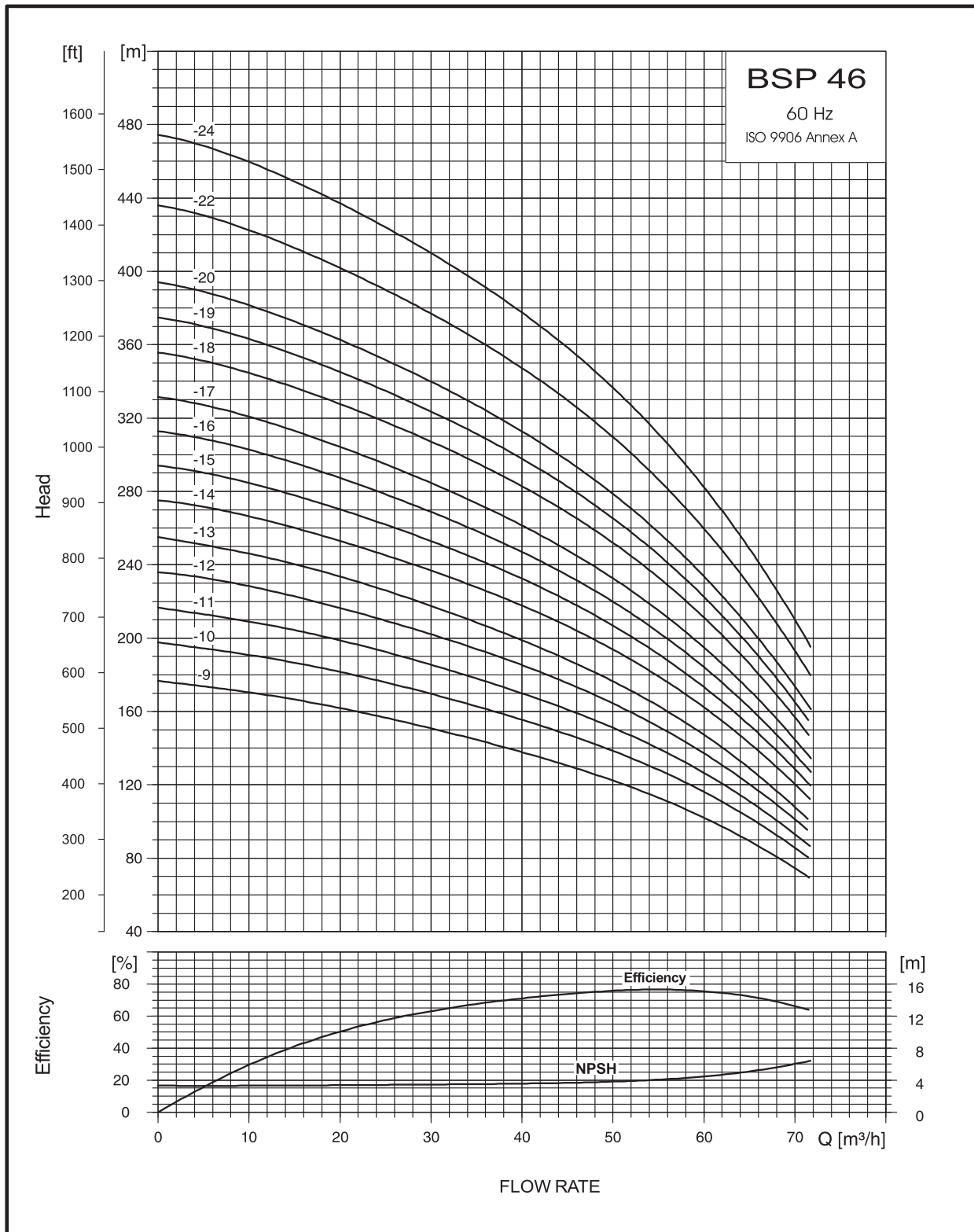
BSP 30 - Power Curve



3.9 BSP 46 - Performance Curve

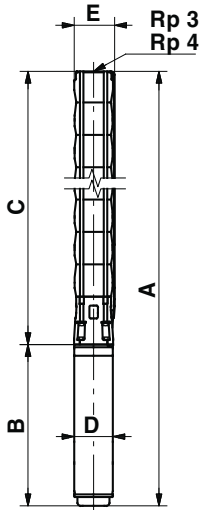


BSP 46 - Performance Curve



BSP 46 - Technical Data

Dimensions and Weights



BSP 46-20 to BSP 46-24 are mounted in sleeve for R 4 connection.

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	Rp 3/Rp 4 connection				B	D	
			A	C	E*	E**			
BSP 46-1-B	BM 4	1.5	816	399	146		417	95	21
BSP 46-1-A	BM 4	2.2	856	399	146		457	95	23
BSP 46-1	BM 4	3	896	399	146		497	95	24
BSP 46-2-AB	BM 4	4	1089	512	146		577	95	31
BSP 46-2	BM 4	5.5	1189	512	146		677	95	36
BSP 46-3-BB	BM 4	5.5	1302	625	146		677	95	38
BSP 46-3	BM 4	7.5	1402	625	146		777	95	43
BSP 46-4-BC	BM 4	7.5	1515	738	146		777	95	45
BSP 46-2	BSF 6	5.5	1056	512	148	151	544	143	46
BSP 46-3-BB	BSF 6	5.5	1169	625	148	151	544	143	48
BSP 46-3	BSF 6	7.5	1199	625	148	151	574	143	52
BSP 46-4-BC	BSF 6	7.5	1312	738	148	151	574	143	54
BSP 46-4	BSF 6	9.2	1342	738	148	151	604	143	60
BSP 46-5-C	BSF 6	11	1485	851	148	151	634	143	65
BSP 46-5	BSF 6	13	1515	851	148	151	664	143	68
BSP 46-6-A	BSF 6	13	1628	964	148	151	664	143	70
BSP 46-6	BSF 6	15	1663	964	148	151	699	143	74
BSP 46-7-C	BSF 6	15	1776	1077	148	151	699	143	77
BSP 46-7	BSF 6	18.5	1831	1077	148	151	754	143	82
BSP 46-8	BSF 6	18.5	1944	1190	148	151	754	143	85
BSP 46-9	BSF 6	22	2117	1303	148	151	814	143	93
BSP 46-10	BSF 6	22	2230	1416	148	151	814	143	96
BSP 46-11	BSF 6	26	2403	1529	148	151	874	143	103
BSP 46-12	BSF 6	30	2586	1642	148	151	944	143	114
BSP 46-13	BSF 6	30	2699	1755	148	151	944	143	117
BSP 46-14	BSF 6	37	3180	1868	150	153	1312	144	159
BSP 46-15	BSF 6	37	3293	1981	150	153	1312	144	162
BSP 46-16	BSF 6	37	3406	2094	150	153	1312	144	164
BSP 46-17	BSF 6	37	3519	2207	150	153	1312	144	167
BSP 46-18	BMCI 8	45	3590	2320	192	192	1270	192	230
BSP 46-19	BMCI 8	45	3703	2433	192	192	1270	192	232
BSP 46-20	BMCI 8	45	3816	2546	192	192	1270	192	261
BSP 46-22	BMCI 8	55	4122	2772	192	192	1350	192	282
BSP 46-24	BMCI 8	55	4348	2998	192	192	1350	192	288

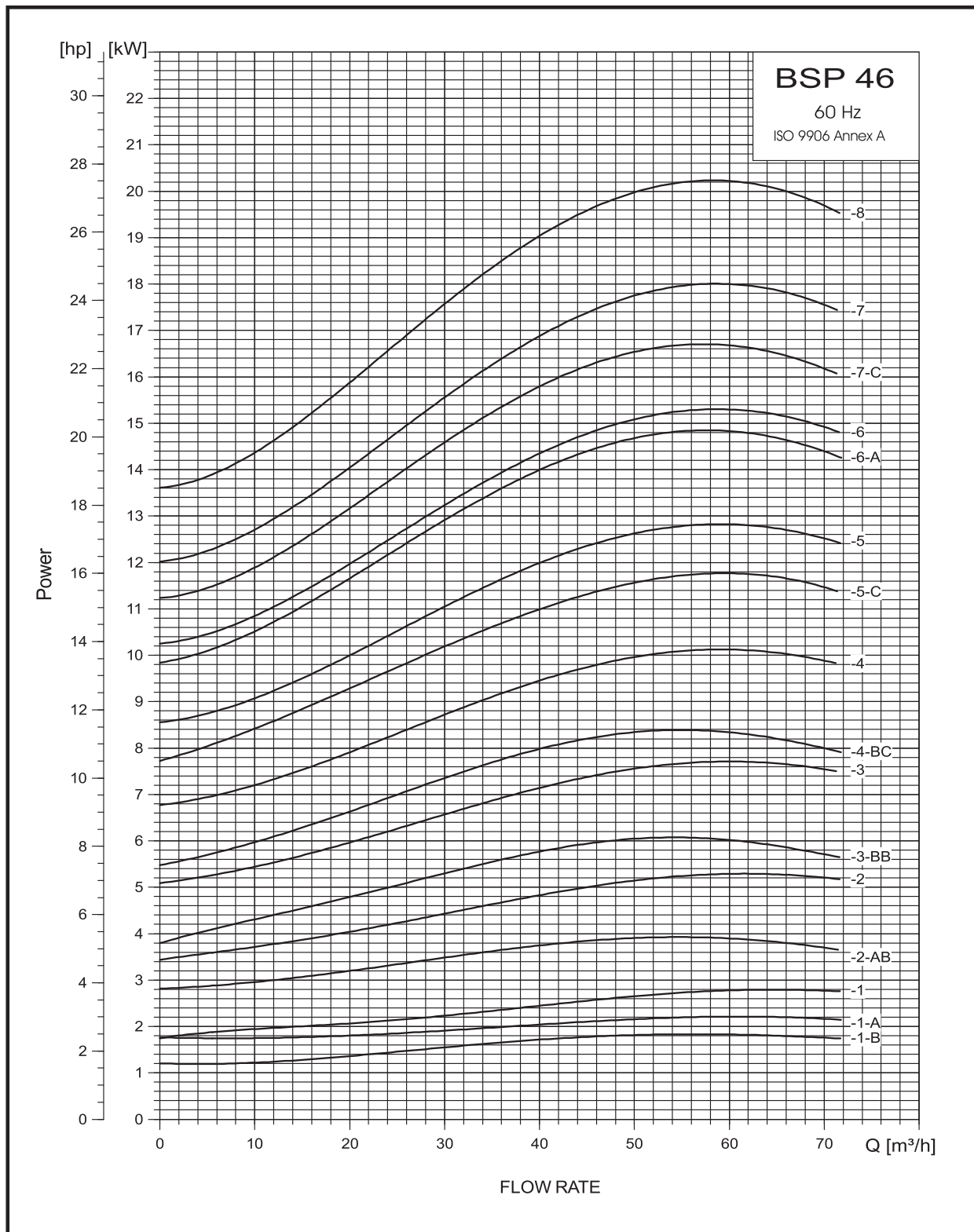
* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

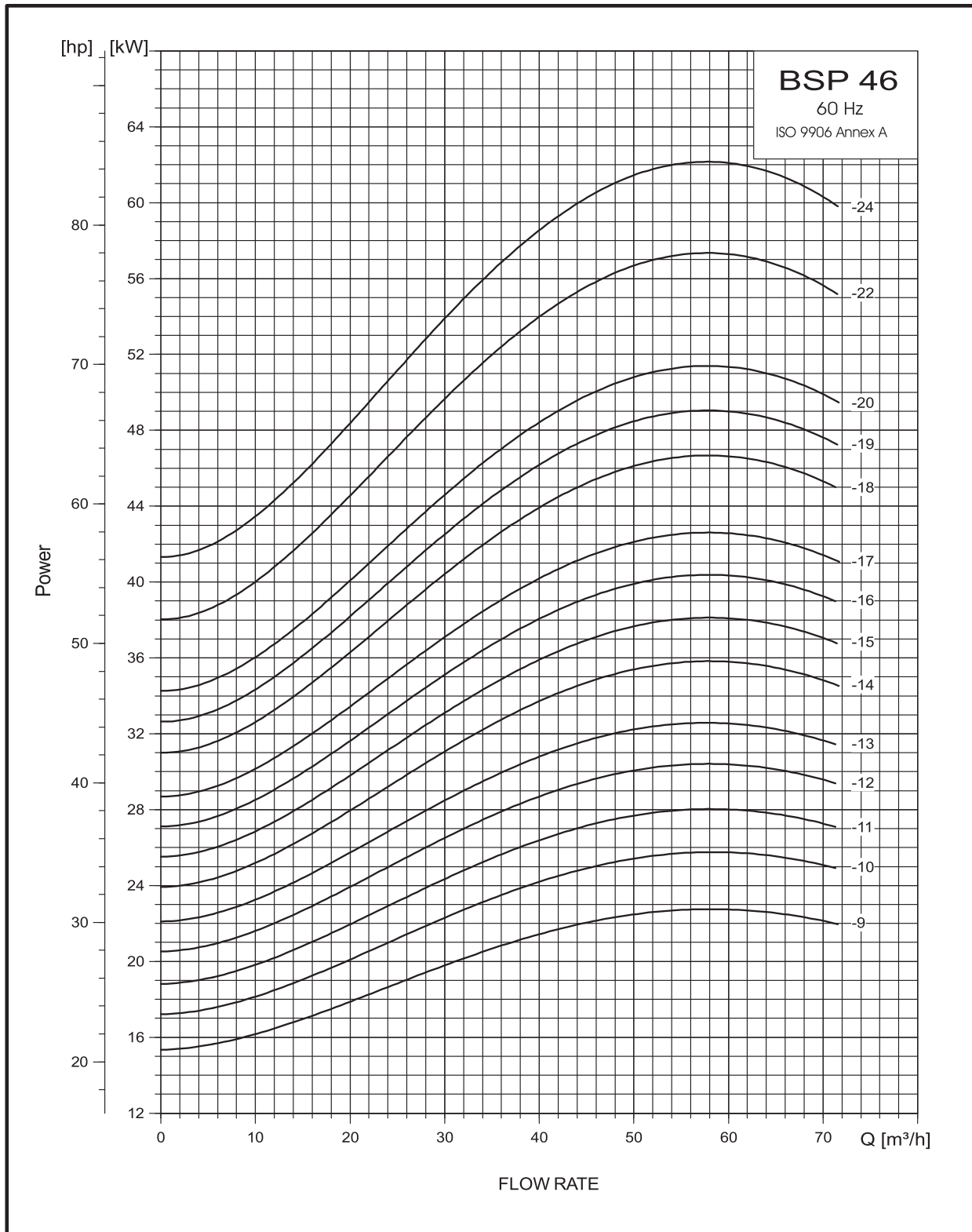
The pump types above are also available in N- and R-versions (R-versions up to and including BSP 46-17). See page 3 for further details.

Pumps mounted in sleeve are only available in standard and N-versions. Other types of connection are possible by means of connecting pieces.

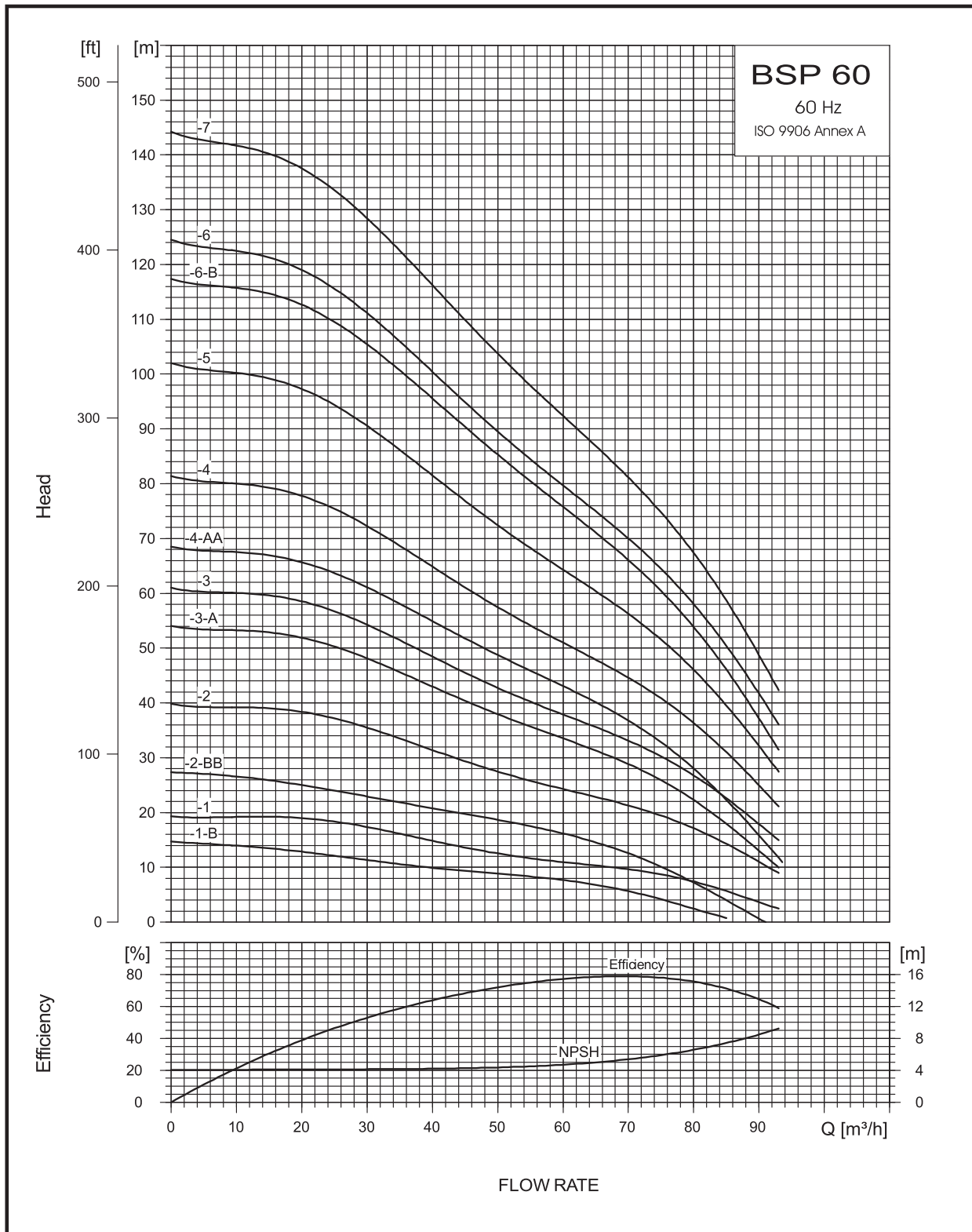
BSP 46 - Power Curve



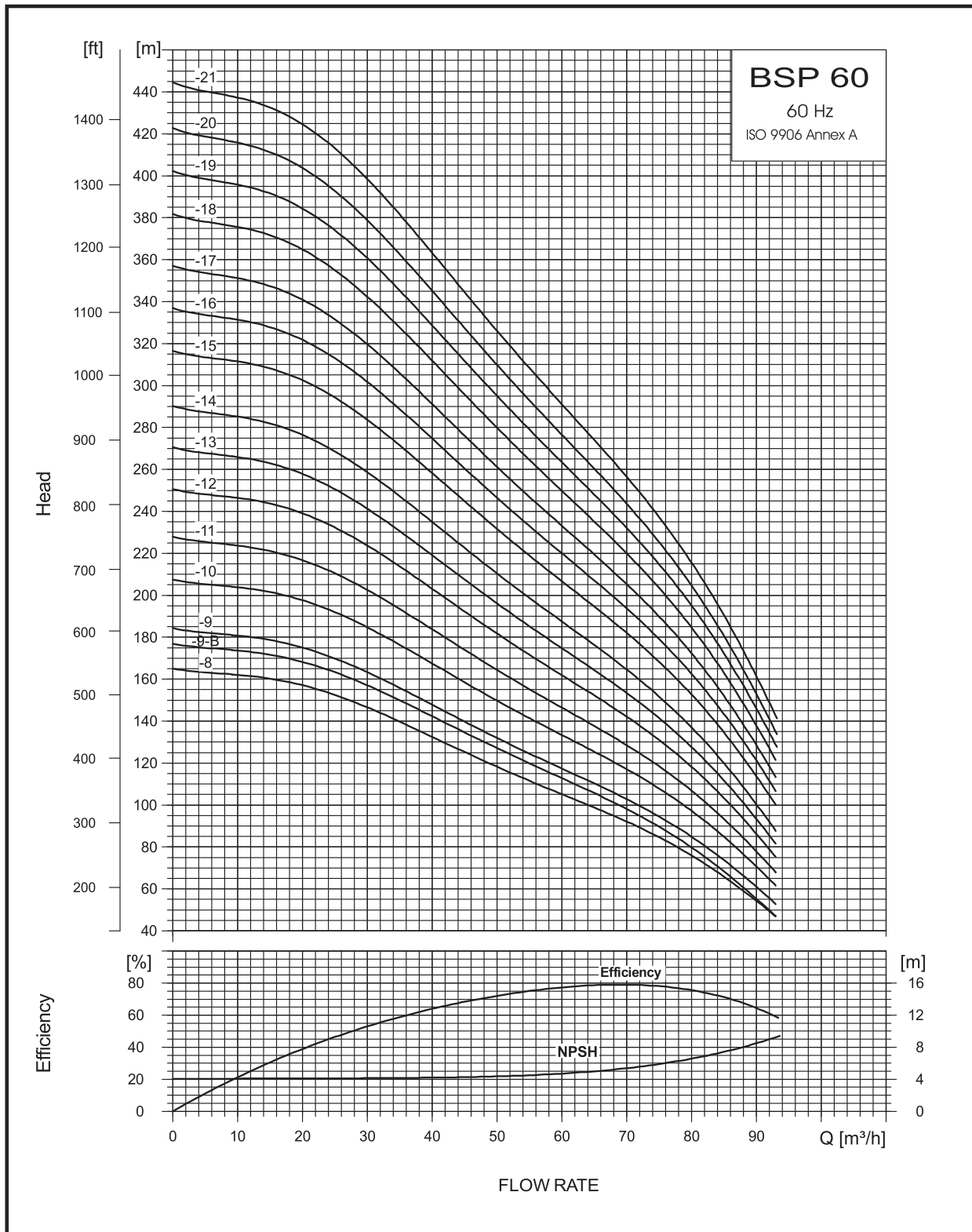
BSP 46 - Power Curve



3.10 BSP 60 - Performance Curve

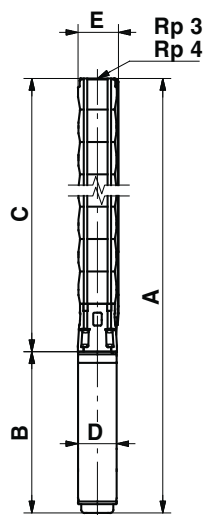


BSP 60 - Performance Curve



BSP 60 - Technical Data

Dimensions and Weights



BSP 60-19 to BSP 60-21 are mounted in sleeve for R 4 connection.

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	Rp 3/Rp 4 connection				B	D	
			A	C	E*	E**			
BSP 60-1-B	BM 4	2.2	856	399	146		457	95	23
BSP 60-1	BM 4	4	976	399	146		577	95	28
BSP 60-2-BB	BM 4	4	1089	512	146		577	95	31
BSP 60-2	BM 4	5.5	1189	512	146		677	95	36
BSP 60-3-A	BM 4	7.5	1402	625	146		777	95	43
BSP 60-2	BSF 6	5.5	1056	512	148	151	544	143	46
BSP 60-3-A	BSF 6	7.5	1199	625	148	151	574	143	52
BSP 60-3	BSF 6	9.2	1229	625	148	151	604	143	57
BSP 60-4-AA	BSF 6	9.2	1342	738	148	151	604	143	60
BSP 60-4	BSF 6	11	1372	738	148	151	634	143	63
BSP 60-5	BSF 6	13	1515	851	148	151	664	143	68
BSP 60-6-B	BSF 6	15	1663	964	148	151	699	143	74
BSP 60-6	BSF 6	18.5	1718	964	148	151	754	143	80
BSP 60-7	BSF 6	18.5	1831	1077	148	151	754	143	82
BSP 60-8	BSF 6	22	2004	1190	148	151	814	143	91
BSP 60-9-B	BSF 6	22	2117	1303	148	151	814	143	93
BSP 60-9	BSF 6	26	2177	1303	148	151	874	143	99
BSP 60-10	BSF 6	26	2290	1416	148	151	874	143	101
BSP 60-11	BSF 6	30	2473	1529	148	151	944	143	111
BSP 60-12	BSF 6	37	2954	1642	150	153	1312	144	154
BSP 60-13	BSF 6	37	3067	1755	150	153	1312	144	157
BSP 60-14	BSF 6	37	3180	1868	150	153	1312	144	159
BSP 60-15	BMCI 8	45	3251	1981	192	192	1270	192	223
BSP 60-16	BMCI 8	45	3364	2094	192	192	1270	192	225
BSP 60-17	BMCI 8	45	3697	2207	192	192	1490	192	268
BSP 60-18	BMCI 8	55	3670	2320	192	192	1350	192	245
BSP 60-19	BMCI 8	55	3783	2433	192	192	1350	192	272
BSP 60-20	BMCI 8	55	3896	2546	192	192	1350	192	275
BSP 60-21	BMCI 8	63	4149	2659	192	192	1490	192	304

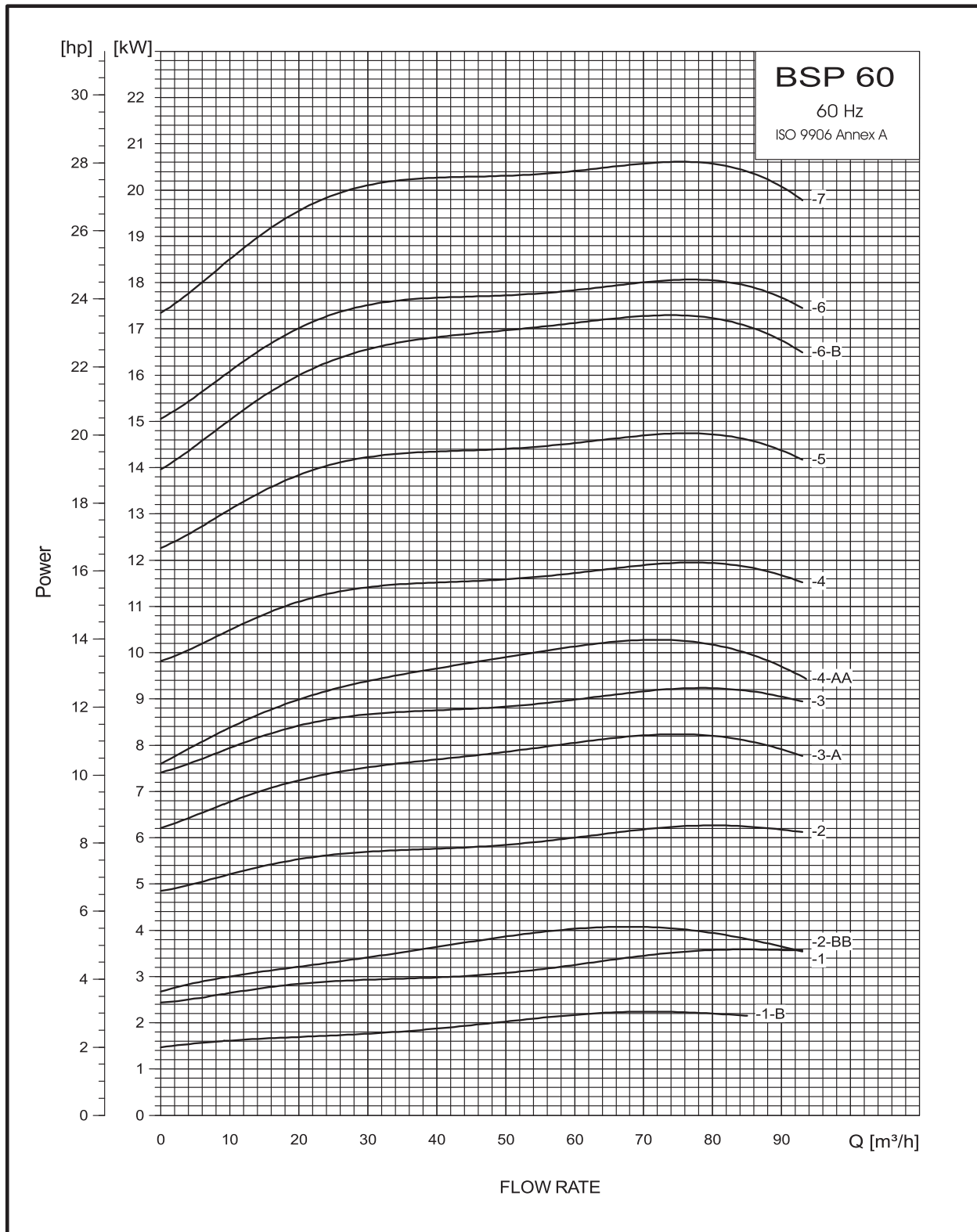
* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

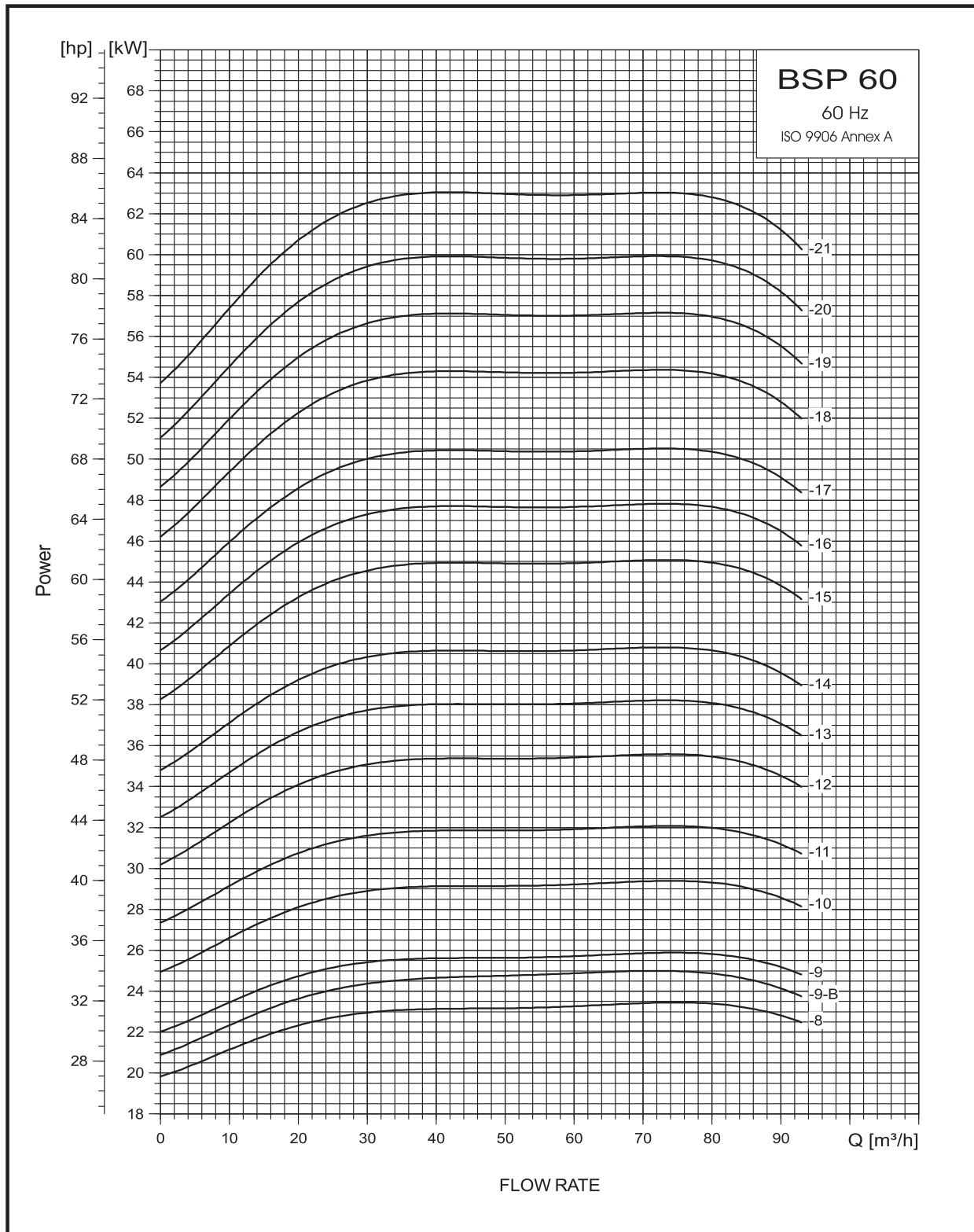
The pump types above are also available in N- and R-versions (R-versions up to and including BSP 60-18). See page 3 for further details.

Pumps mounted in sleeve are only available in standard and N-versions. Other types of connection are possible by means of connecting pieces.

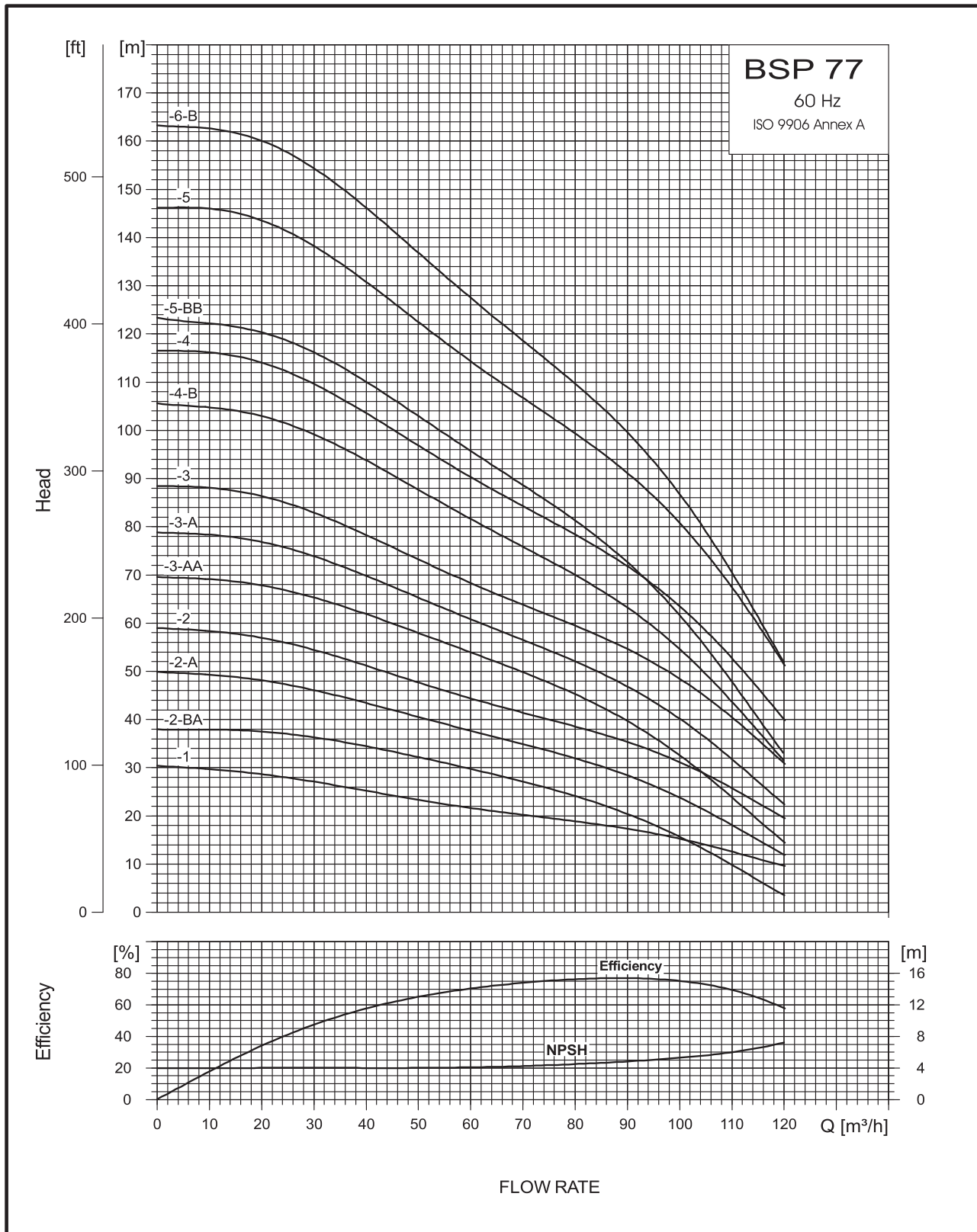
BSP 60 - Power Curve



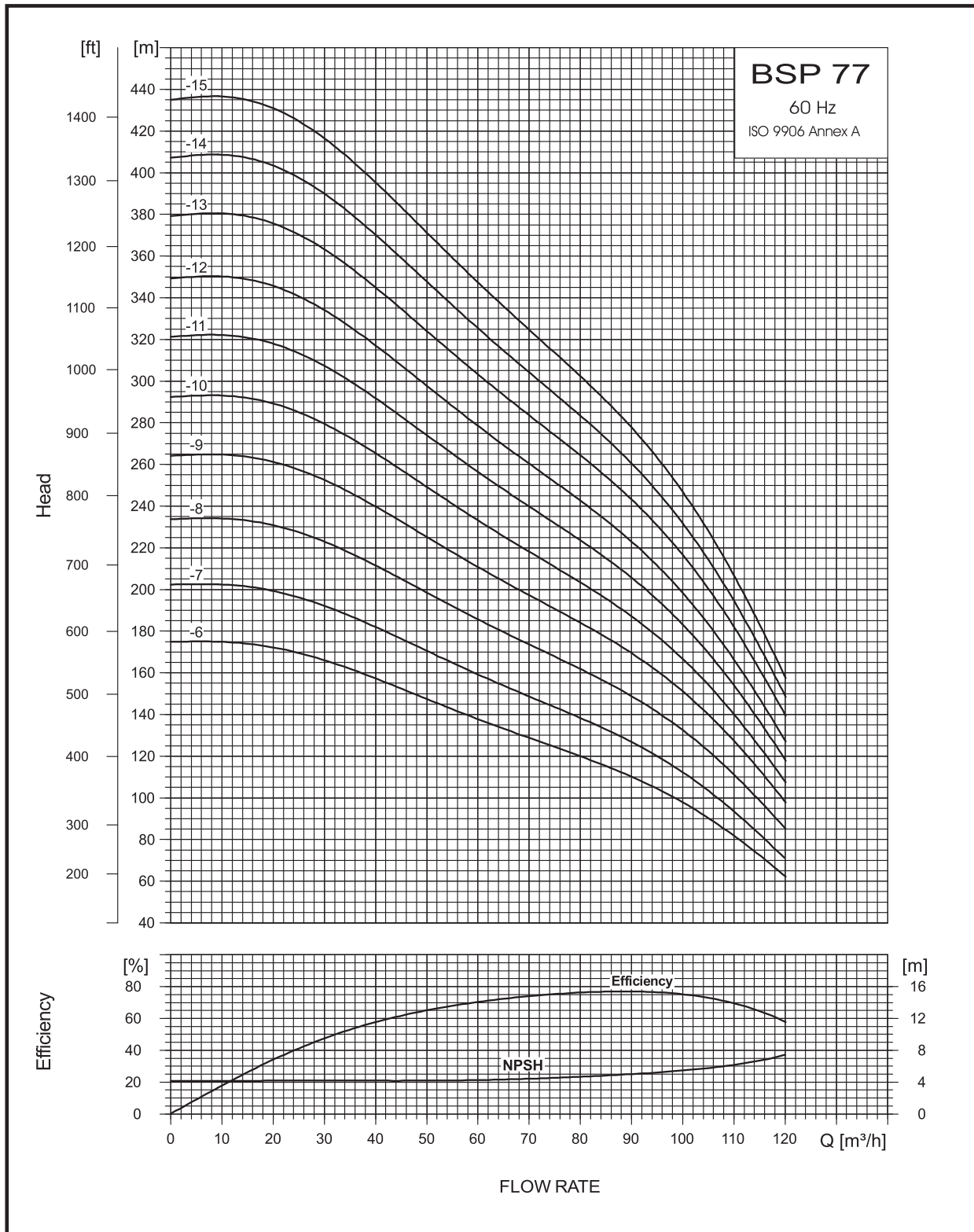
BSP 60 - Power Curve



3.11 BSP 77 - Performance Curve

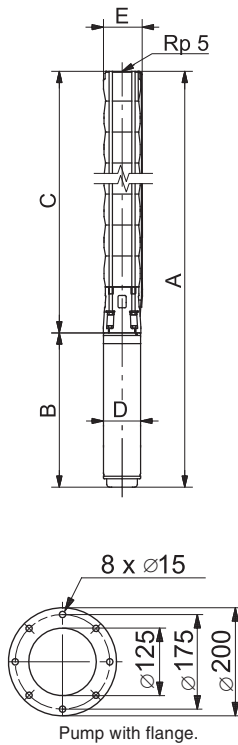


BSP 77 - Performance Curve



BSP 77 - Technical Data

Dimensions and Weights



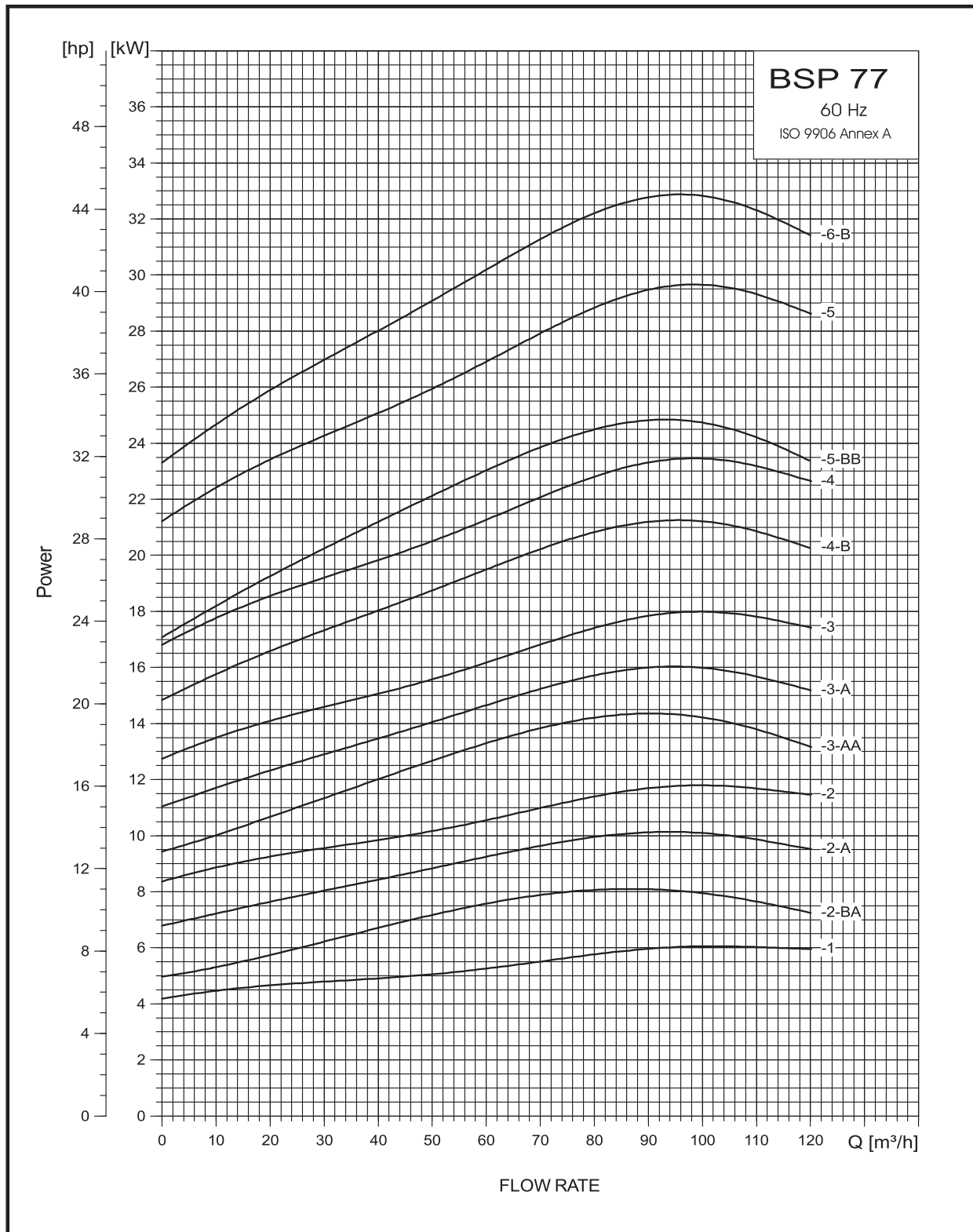
Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 5 connection				5" flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
BSP 77-1	BSF 6	5.5	1170	626	178	186	1162	618	200	200	544	138	55
BSP 77-2-BA	BSF 6	7.5	1328	754	178	186	1320	746	200	200	574	138	63
BSP 77-2-A	BSF 6	9.2	1358	754	178	186	1350	746	200	200	604	138	69
BSP 77-2	BSF 6	11	1388	754	178	186	1380	746	200	200	634	138	71
BSP 77-3-AA	BSF 6	13	1546	882	178	186	1538	874	200	200	664	138	78
BSP 77-3-A	BSF 6	15	1581	882	178	186	1573	874	200	200	699	138	82
BSP 77-3	BSF 6	18.5	1636	882	178	186	1628	874	200	200	754	138	87
BSP 77-4-B	BSF 6	18.5	1764	1010	178	186	1756	1002	200	200	754	138	91
BSP 77-4	BSF 6	22	1824	1010	178	186	1816	1002	200	200	814	138	97
BSP 77-5-BB	BSF 6	22	1952	1138	178	186	1944	1130	200	200	814	138	101
BSP 77-5	BSF 6	26	2012	1138	178	186	2004	1130	200	200	874	138	106
BSP 77-6-B	BSF 6	30	2210	1266	178	186	2202	1258	200	200	944	138	118
BSP 77-6	BSF 6	37	2578	1266	179	183	2570	1145	200	200	1312	138	161
BSP 77-7	BSF 6	37	2706	1394	179	183	2683	1273	200	200	1312	138	164
BSP 77-8	BMCI 8	45	2792	1522	200	204	2798	1528	205	205	1270	192	225
BSP 77-9	BMCI 8	55	3000	1650	200	204	3006	1656	205	205	1350	192	244
BSP 77-10	BMCI 8	55	3128	1778	200	204	3134	1784	205	205	1350	192	248
BSP 77-11	BMCI 8	63	3396	1906	200	204	3402	1912	205	205	1490	192	277
BSP 77-12	BMCI 8	63	3524	2034	200	204					1490	192	281
BSP 77-13	BMCI 8	75	3752	2162	200	204					1590	192	304
BSP 77-14	BMCI 8	92	4120	2290	200	202					1830	192	361
BSP 77-15	BMCI 8	92	4248	2418	200	202					1830	192	365

* Maximum diameter of pump with one motor cable.

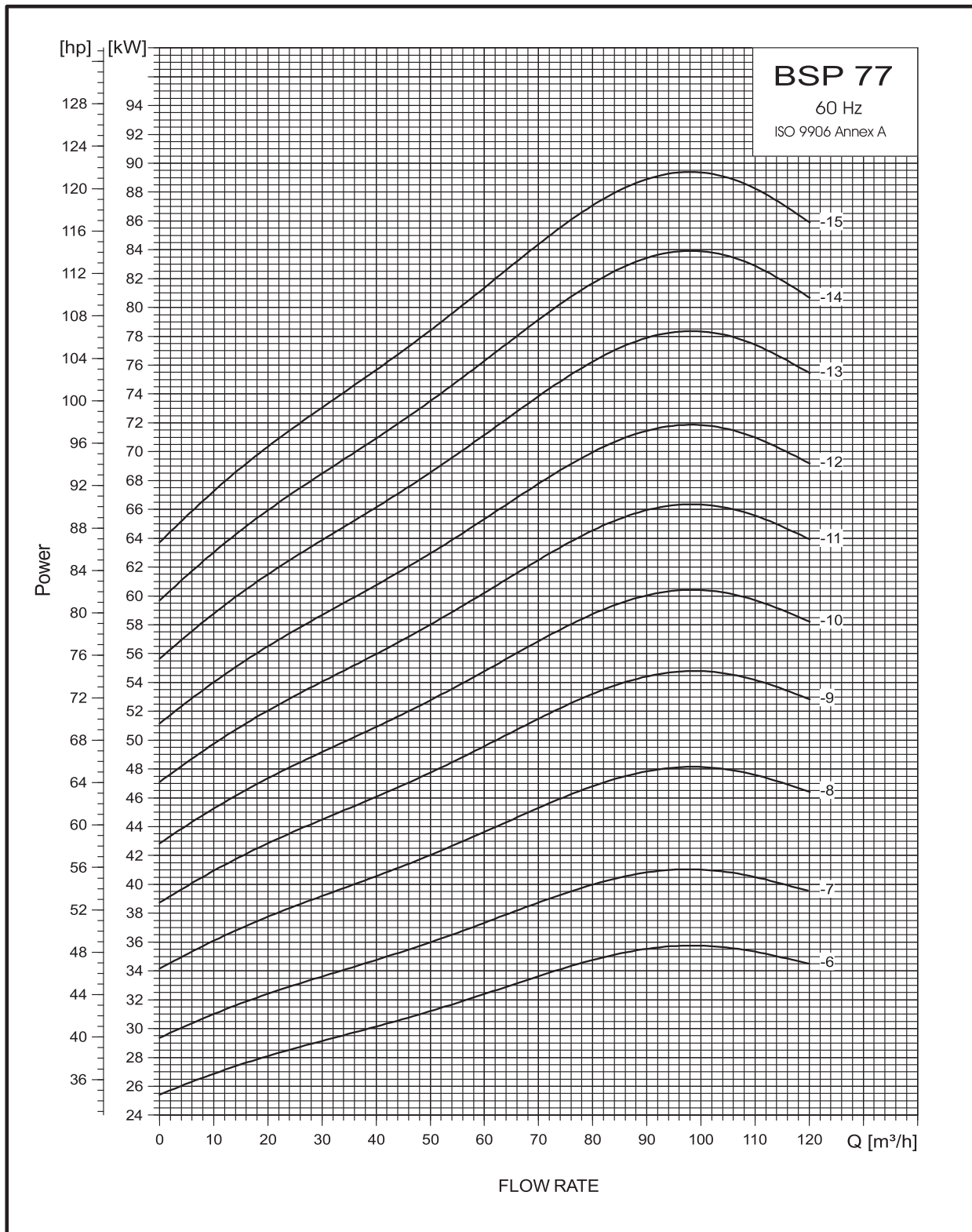
** Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 3 for further details.
Other types of connection are possible by means of connecting pieces.

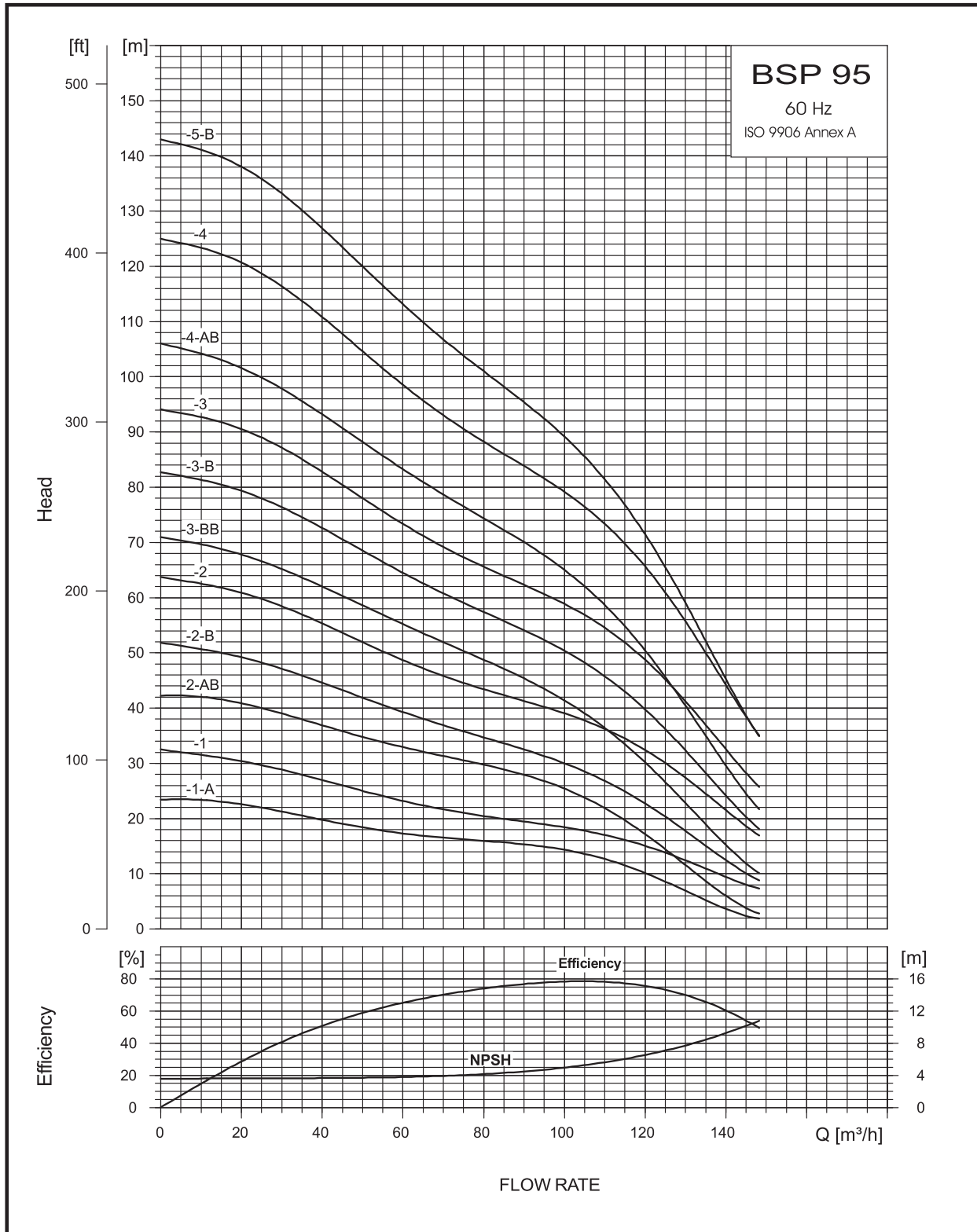
BSP 77 - Power Curve



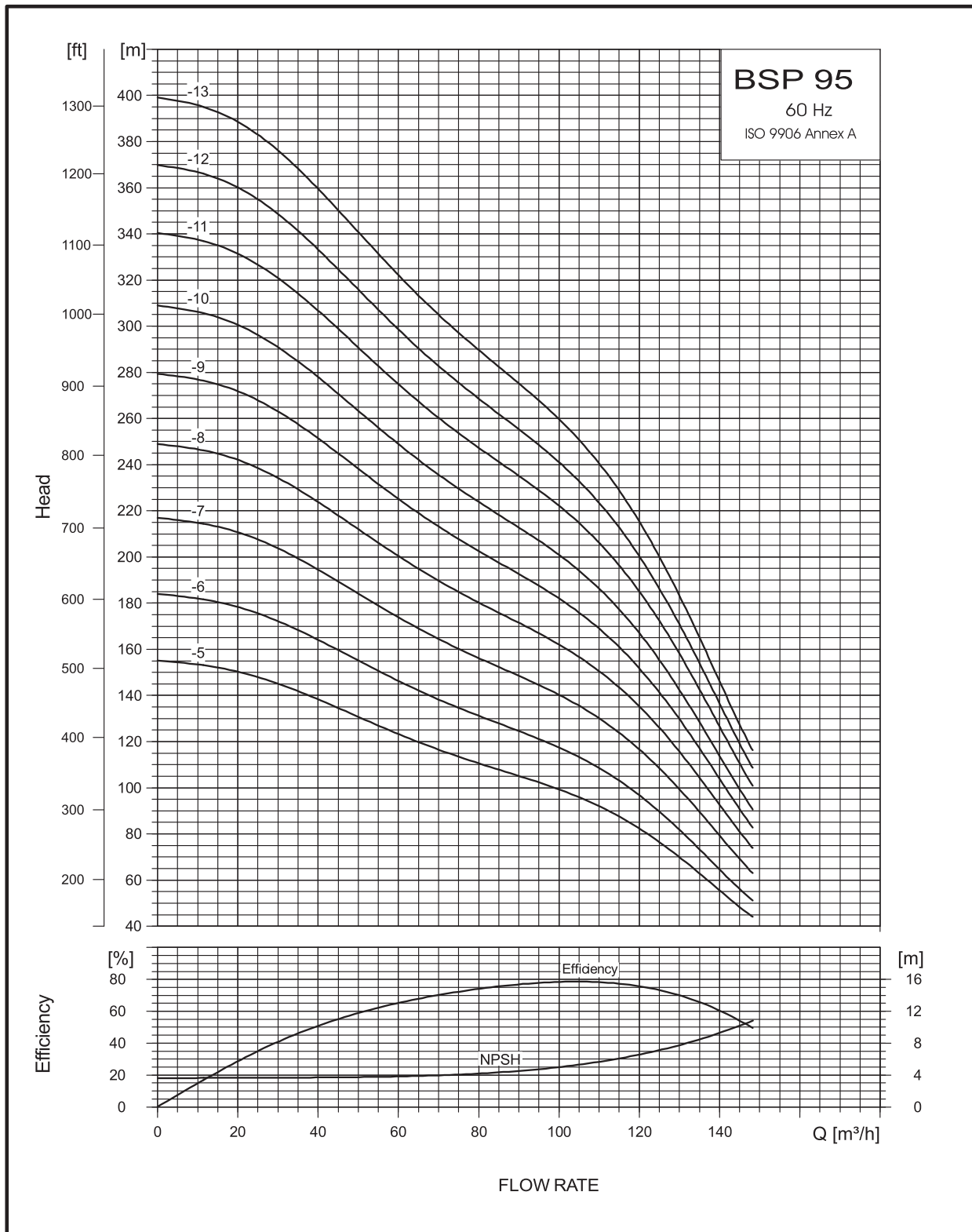
BSP 77 - Power Curve



3.12 BSP 95 - Performance Curve

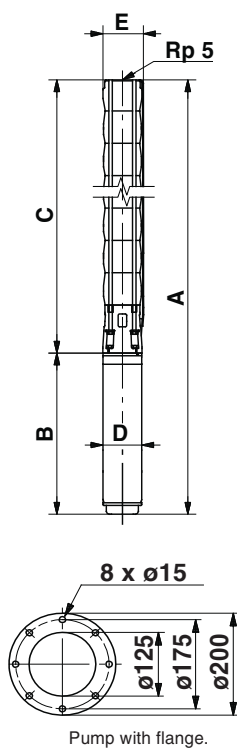


BSP 95 - Performance Curve



BSP 95 - Technical Data

Dimensions and Weights



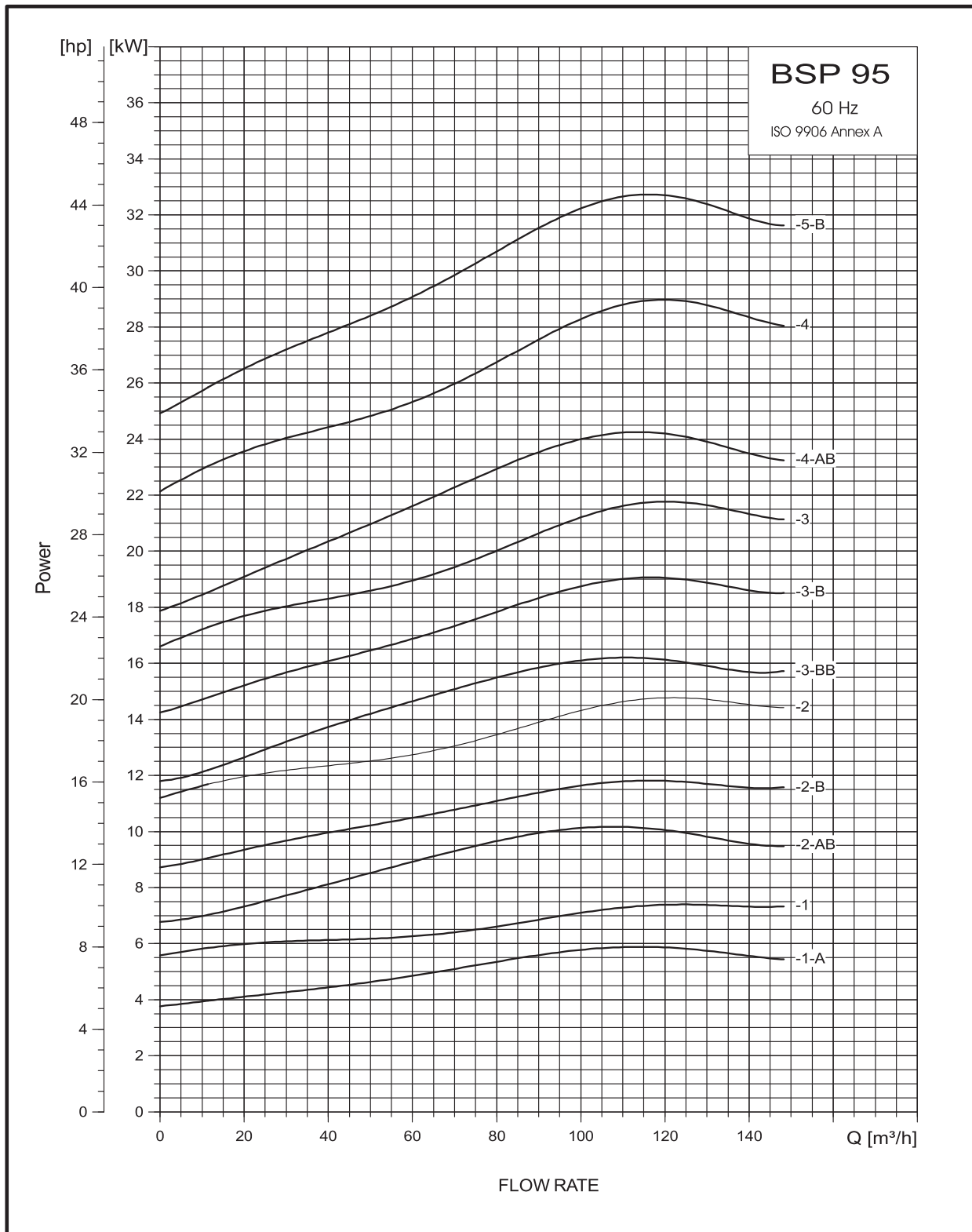
Pump type	Motor		Dimensions [mm]								Net weight [kg]		
	Type	Power [kW]	Rp 5 connection				5" flange						
			A	C	E*	E**	A	C	E*	E**		B	D
BSP 95-1-A	BSF 6	5.5	1170	626	179	183	1162	618	200	200	544	138	55
BSP 95-1	BSF 6	7.5	1200	626	179	183	1192	618	200	200	574	138	59
BSP 95-2-AB	BSF 6	9.2	1358	754	179	183	1350	746	200	200	604	138	69
BSP 95-2-B	BSF 6	11	1388	754	179	183	1380	746	200	200	634	138	71
BSP 95-2	BSF 6	13	1418	754	179	183	1410	746	200	200	664	138	74
BSP 95-3-BB	BSF 6	15	1581	882	179	183	1573	874	200	200	699	138	82
BSP 95-3-B	BSF 6	18.5	1636	882	179	183	1628	874	200	200	754	138	87
BSP 95-3	BSF 6	22	1696	882	179	183	1688	874	200	200	814	138	93
BSP 95-4-AB	BSF 6	22	1824	1010	179	183	1816	1002	200	200	814	138	97
BSP 95-4	BSF 6	26	1884	1010	179	183	1876	1002	200	200	874	138	103
BSP 95-5-B	BSF 6	30	2082	1138	179	183	2074	1130	200	200	944	138	114
BSP 95-5	BSF 6	37	2450	1138	179	183	2555	1130	200	200	1312	138	158
BSP 95-6	BSF 6	37	2578	1266	179	183	2570	1145	200	200	1312	138	161
BSP 95-7	BMCI 8	45	2664	1394	205	205	2670	1400	200	202	1270	192	221
BSP 95-8	BMCI 8	55	2872	1522	205	205	2878	1528	200	202	1350	192	240
BSP 95-9	BMCI 8	63	3140	1650	205	205	3146	1656	200	202	1490	192	270
BSP 95-10	BMCI 8	63	3268	1778	205	205	3274	1784	200	202	1490	192	274
BSP 95-11	BMCI 8	75	3496	1906	205	205					1590	192	296
BSP 95-12	BMCI 8	92	3864	2034	205	205					1830	192	346
BSP 95-13	BMCI 8	92	3992	2162	205	205					1830	192	350

* Maximum diameter of pump with one motor cable.

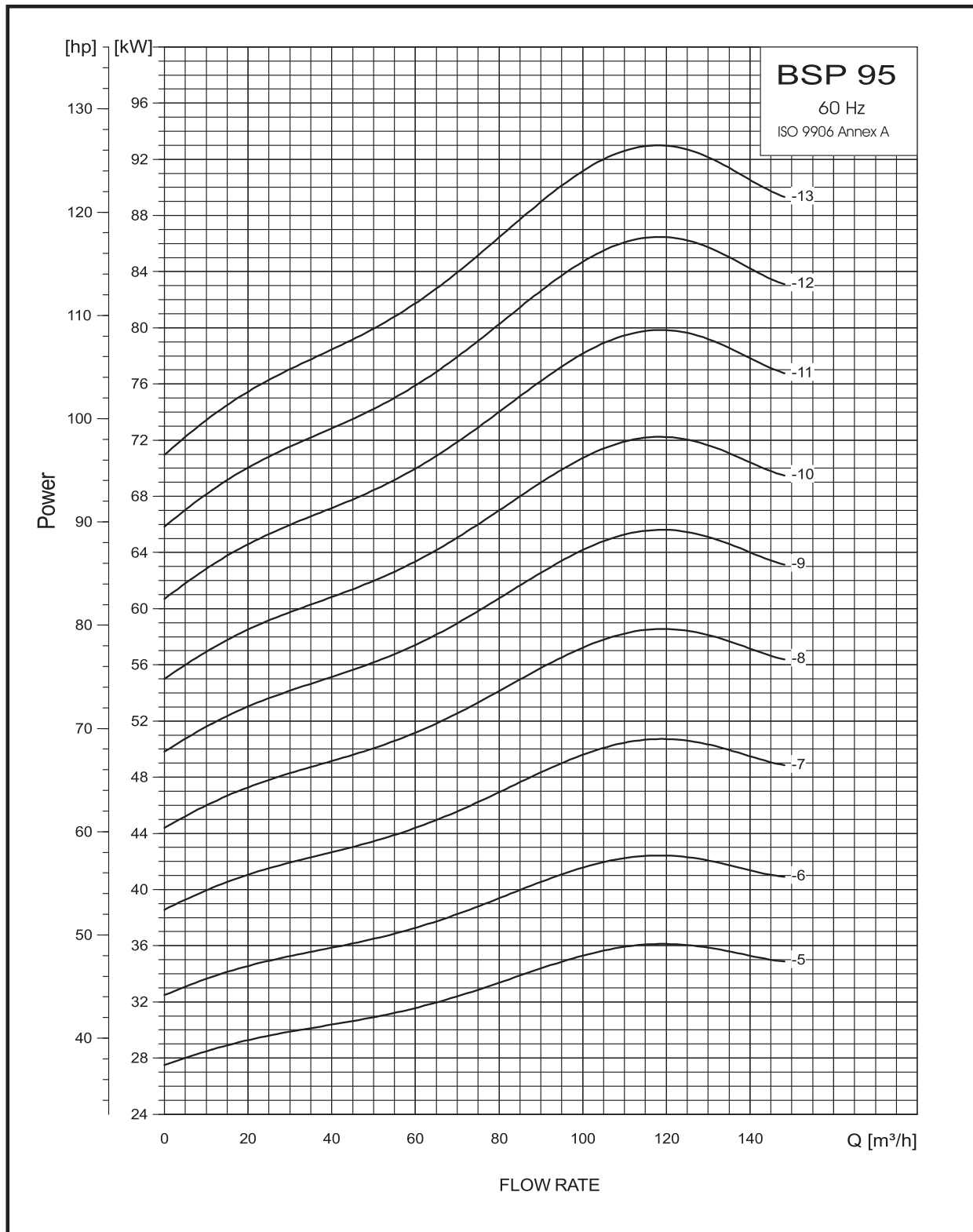
** Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 3 for further details.
Other types of connection are possible by means of connecting pieces.

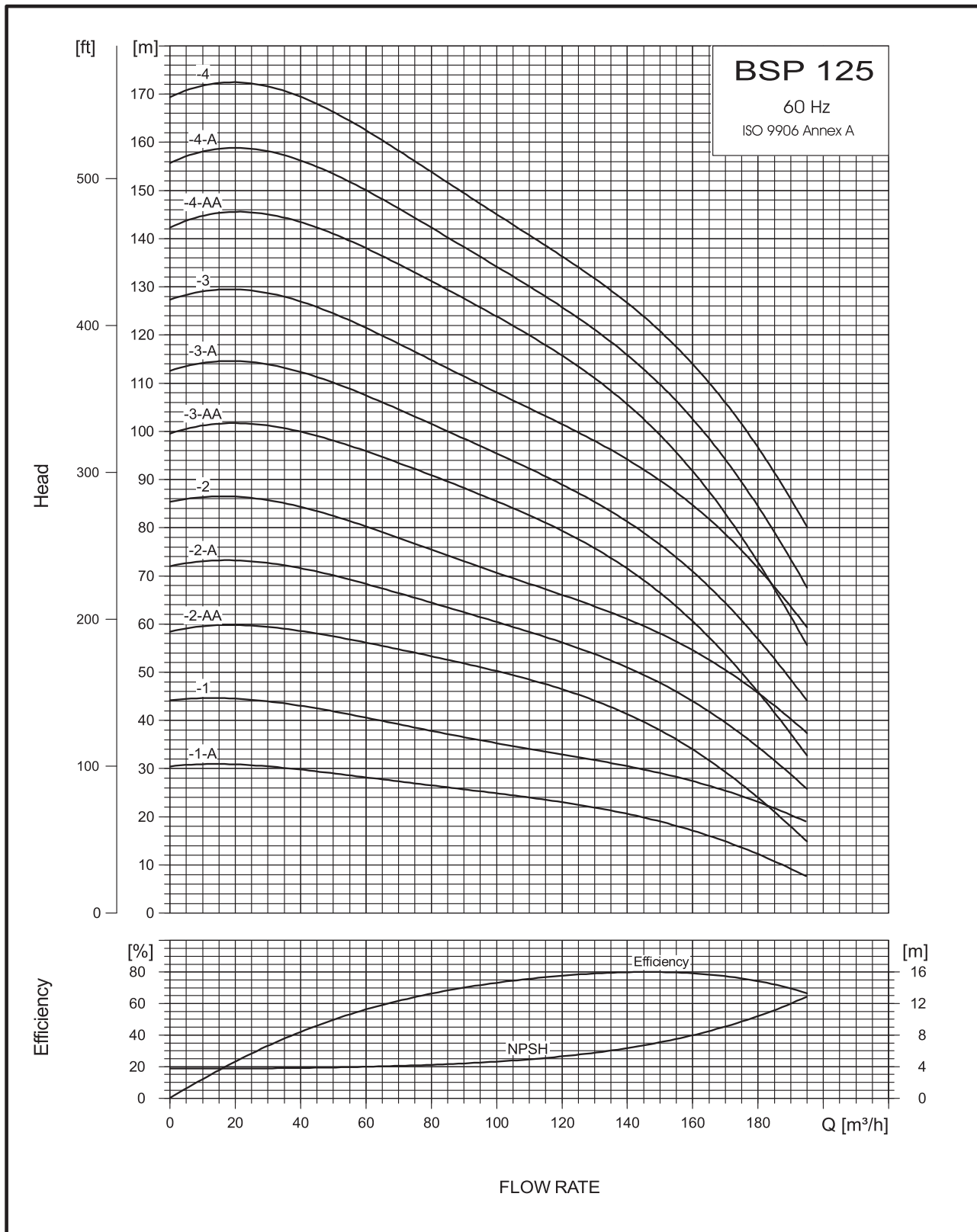
BSP 95 - Power Curve



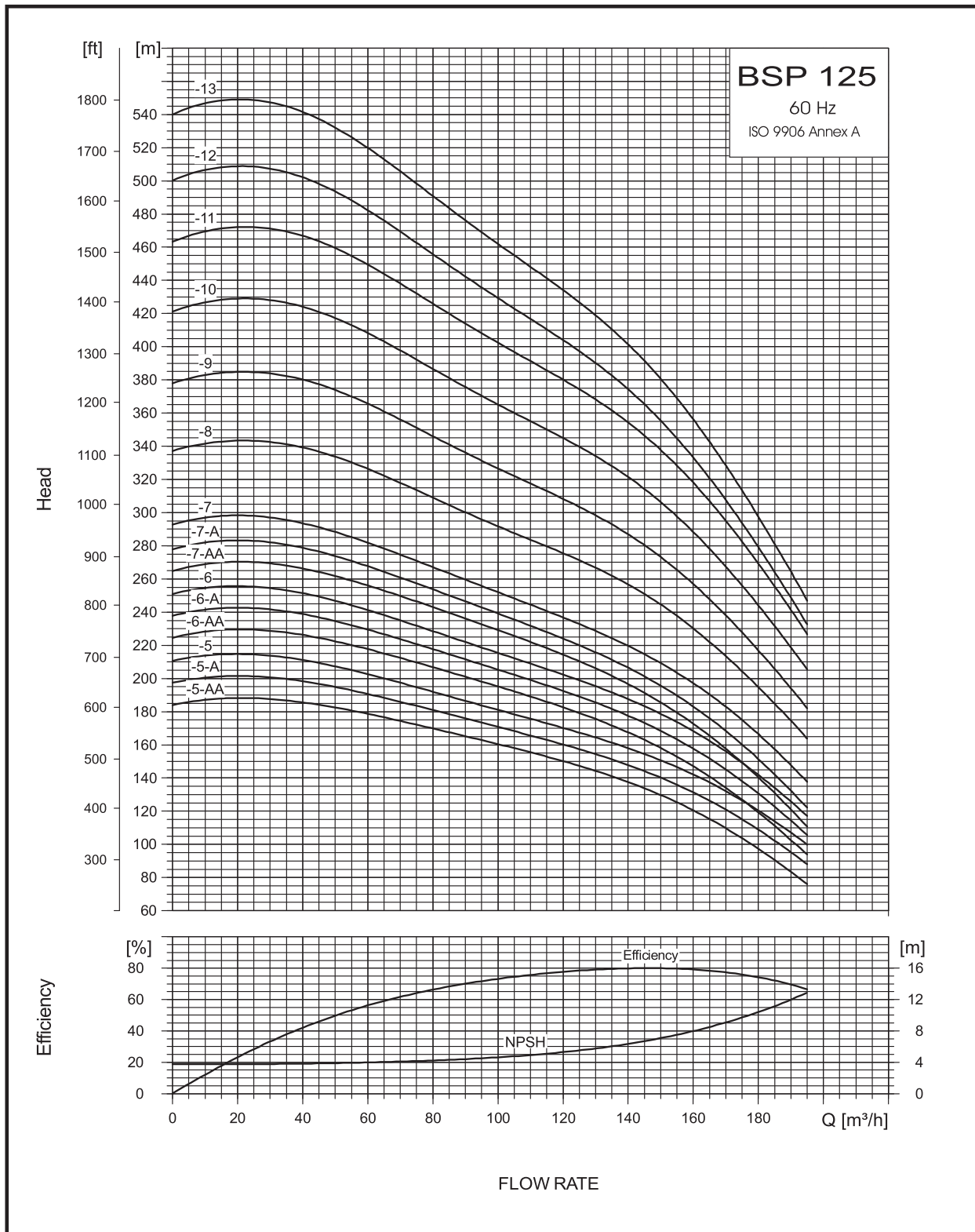
BSP 95 - Power Curve



3.13 BSP 125 - Performance Curve

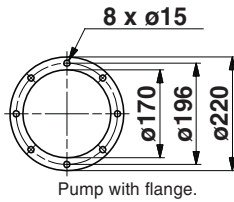
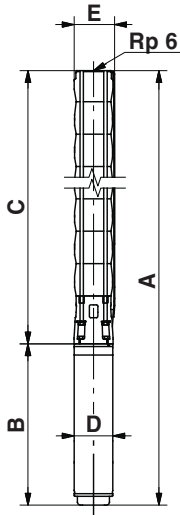


BSP 125 - Performance Curve



BSP 125 - Technical Data

Dimensions and Weights



Pump type	Motor		Dimensions [mm]								Net weight [kg]		
	Type	Power [kW]	Rp 6 connection				6" flange						
			A	C	E*	E**	A	C	E*	E**		B	D
BSP 125-1-A	BSF 6	11	1290	656	211	215	1286	652	222	226	634	138	81
BSP 125-1	BSF 6	18.5	1410	656	211	215	1406	652	222	226	754	138	93
BSP 125-2-AA	BSF 6	22	1622	808	211	215	1621	807	222	226	814	138	105
BSP 125-2-A	BSF 6	26	1682	808	211	215	1681	807	222	226	874	138	111
BSP 125-2	BSF 6	30	1752	808	211	215	1751	807	222	226	944	138	119
BSP 125-3-AA	BSF 6	37	2272	960	211	215	2275	850	222	226	1312	138	167
BSP 125-3-A	BSF 6	37	2272	960	211	215	2275	850	222	226	1312	138	167
BSP 125-3	BMCI 8	45	2230	960	213	219	2233	963	229	232	1270	192	226
BSP 125-4-AA	BMCI 8	55	2462	1112	213	219	2468	1118	229	232	1350	192	247
BSP 125-4-A	BMCI 8	55	2462	1112	213	219	2468	1118	229	232	1350	192	247
BSP 125-4	BMCI 8	63	2602	1112	213	219	2608	1118	229	232	1490	192	273
BSP 125-5-AA	BMCI 8	75	2854	1264	213	219					1590	192	296
BSP 125-5-A	BMCI 8	75	2854	1264	213	219					1590	192	296
BSP 125-5	BMCI 8	75	2854	1264	213	219					1590	192	296
BSP 125-6-AA	BMCI 8	75	3006	1416	213	219					1590	192	302
BSP 125-6-A	BMCI 8	92	3246	1416	213	219					1830	192	348
BSP 125-6	BMCI 8	92	3246	1416	213	219					1830	192	348
BSP 125-7-AA	BMCI 8	92	3398	1568	213	219					1830	192	354
BSP 125-7-A	BMCI 8	92	3398	1568	213	219					1830	192	354
BSP 125-7	BMCI 8	110	3628	1568	213	219					2060	192	404
BSP 125-8	BMCI 10	132	3590	1720	237	237					1870	237	532
BSP 125-9	BMCI 10	132	3742	1872	237	237					1870	237	538
BSP 125-10	BMCI 10	147	4094	2024	237	237					2070	237	609
BSP 125-11	BMCI 10	170	4396	2176	237	237					2220	237	655

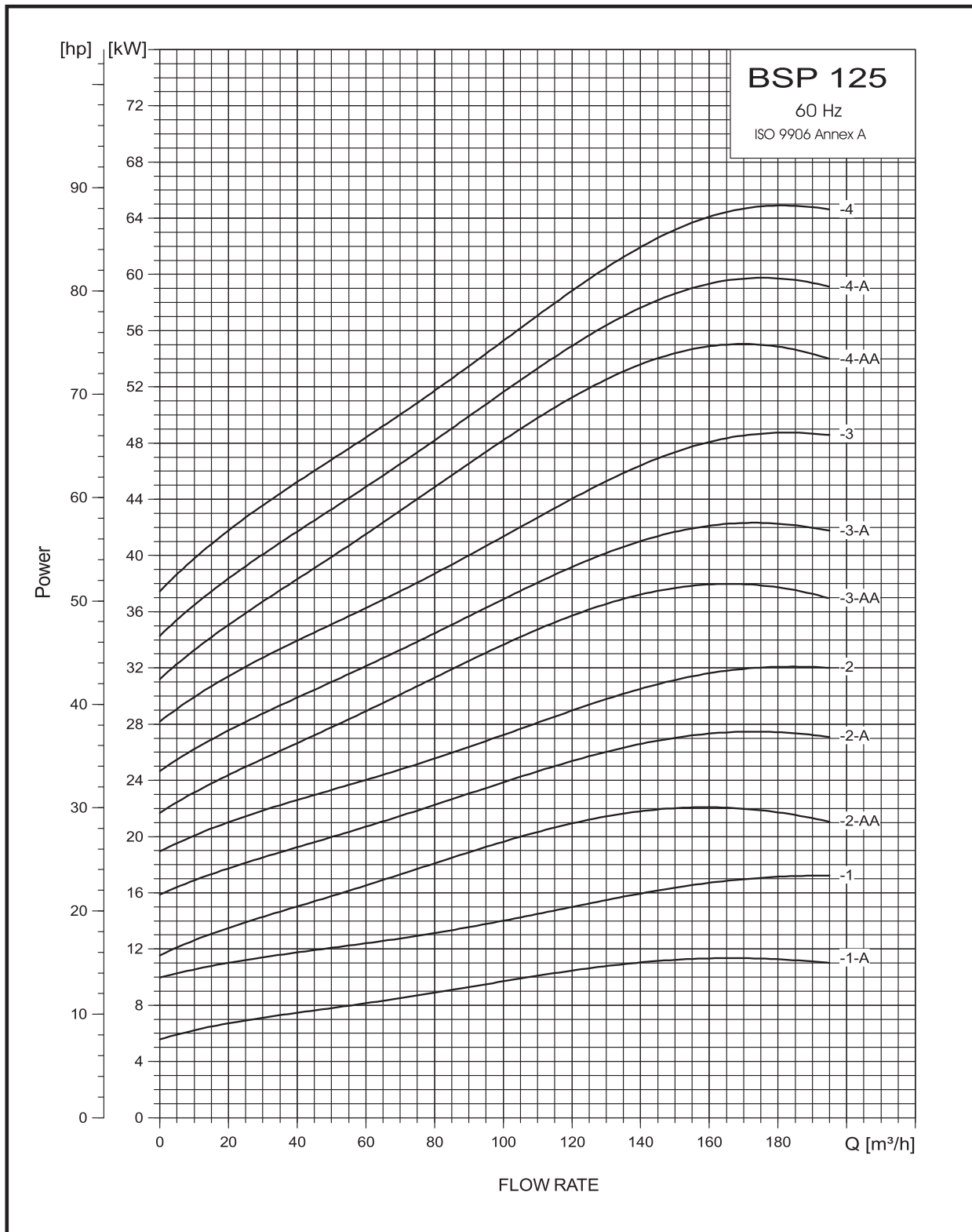
* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

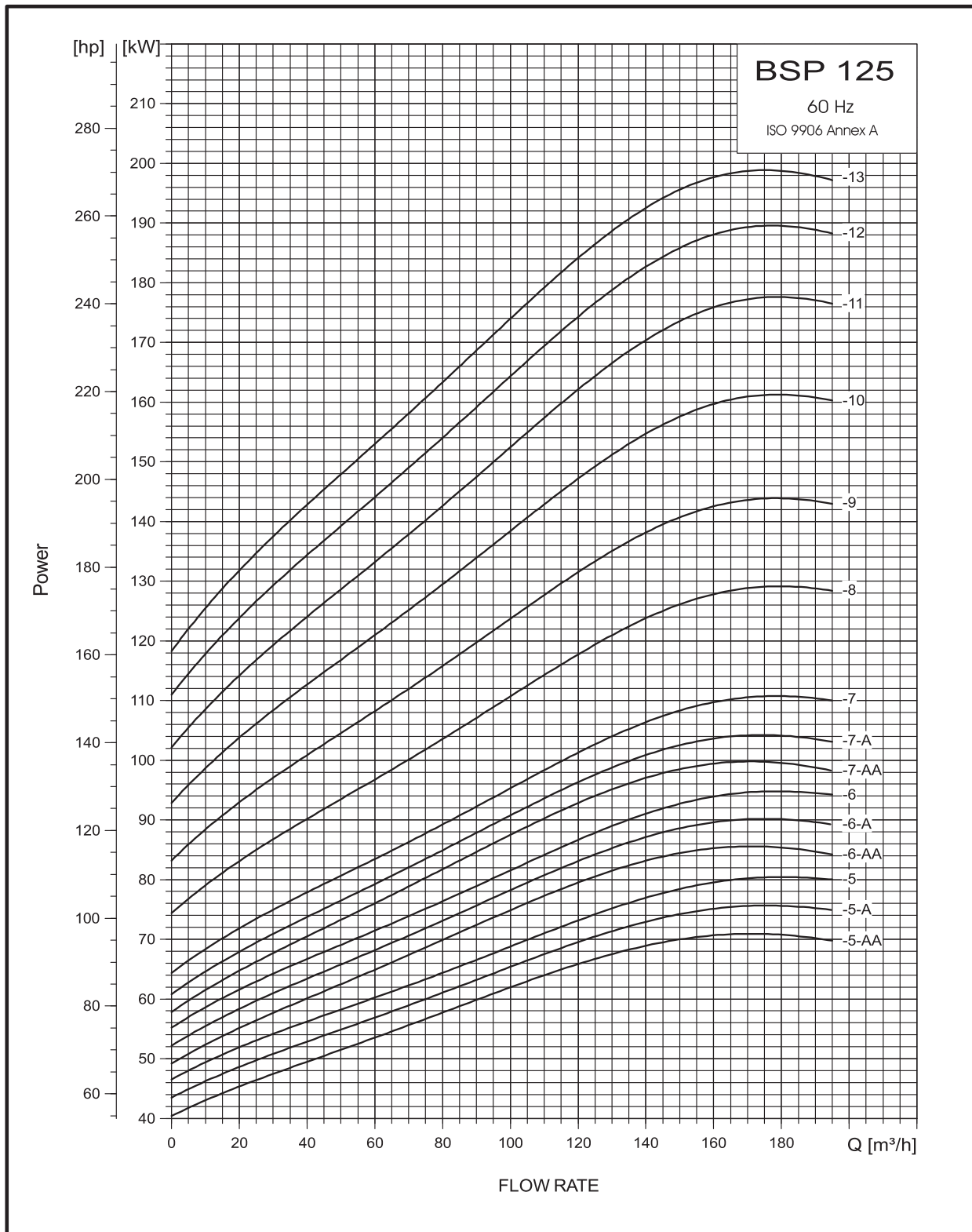
The pump types above are also available in N- and R-versions up to and including BSP 125-7. See page 3 for further details.

Other types of connection are possible by means of connecting pieces.

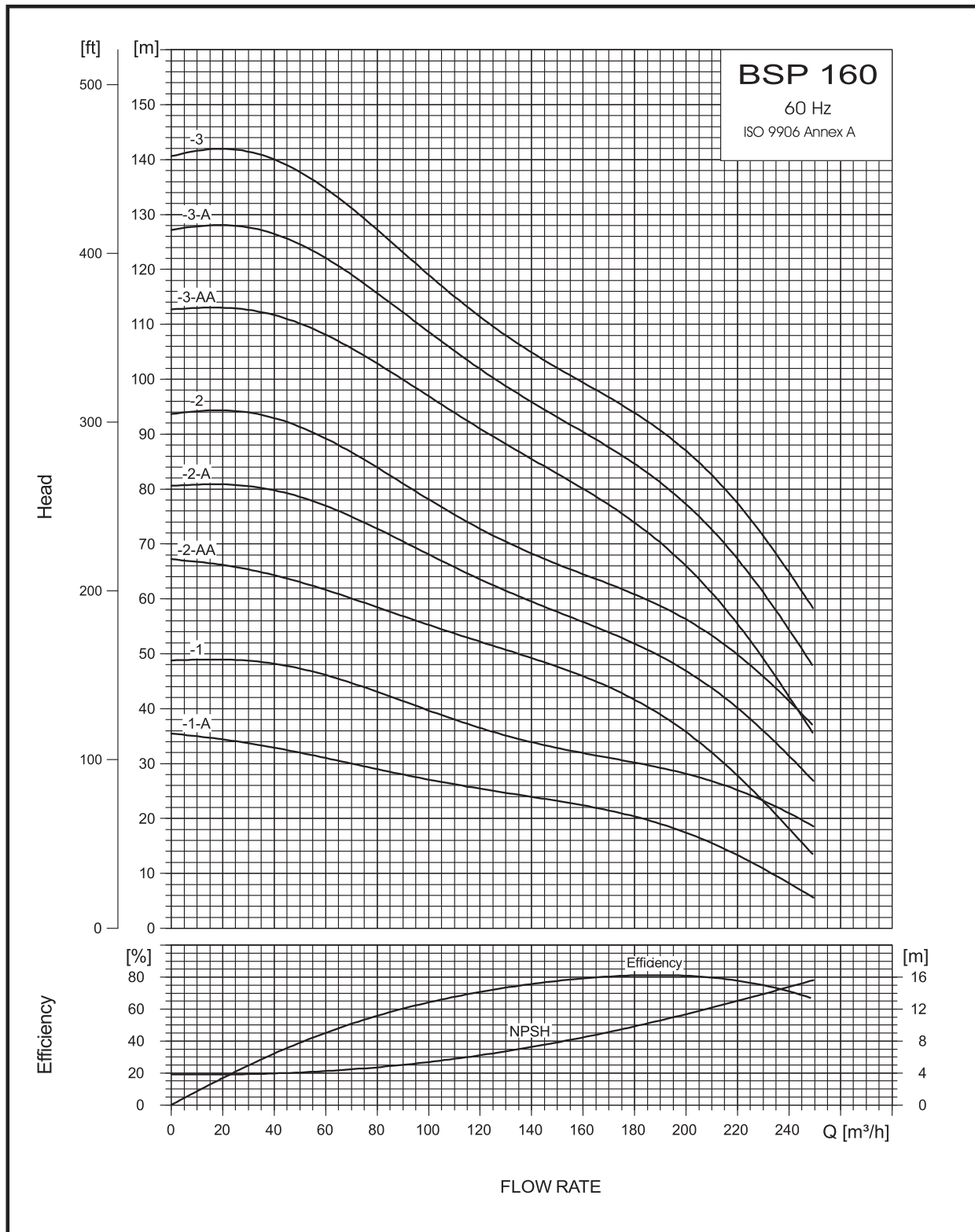
BSP 125 - Power Curve



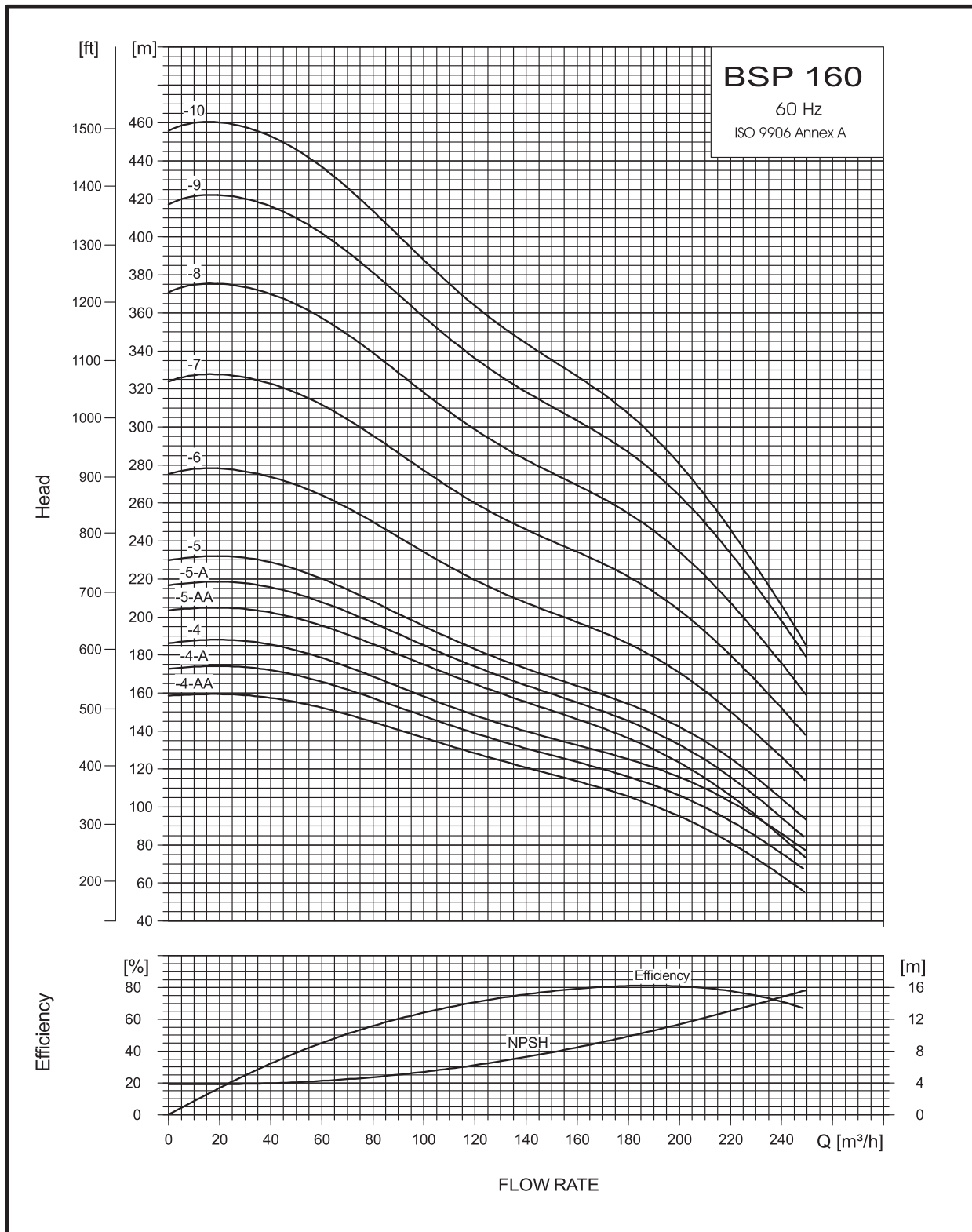
BSP 125 - Power Curve



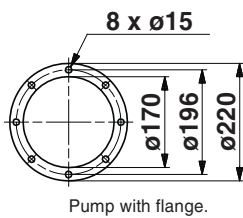
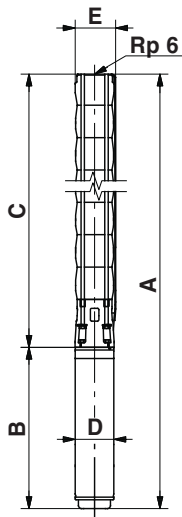
3.14 BSP 160 - Performance Curve



BSP 160 - Performance Curve



BSP 160 - Technical Data



Pump type	Motor		Dimensions [mm]								Net weight [kg]		
	Type	Power [kW]	Rp 6 connection				6" flange						
			A	C	E*	E**	A	C	E*	E**		B	D
BSP 160-1-A	BSF 6	15	1351	652	211	215	1351	652	222	226	699	138	88
BSP 160-1	BSF 6	22	1466	652	211	215	1466	652	222	226	814	138	99
BSP 160-2-AA	BSF 6	26	1681	807	211	215	1681	807	222	226	874	138	111
BSP 160-2-A	BSF 6	37	2119	694	211	215	2119	694	222	226	1312	138	161
BSP 160-2	BSF 6	37	2119	694	211	215	2119	694	222	226	1312	138	161
BSP 160-3-AA	BMCI 8	45	2233	963	213	219	2233	963	229	232	1270	192	226
BSP 160-3-A	BMCI 8	55	2313	963	213	219	2313	963	229	232	1350	192	241
BSP 160-3	BMCI 8	55	2313	963	213	219	2313	963	229	232	1350	192	241
BSP 160-4-AA	BMCI 8	63	2608	1118	213	219					1490	192	271
BSP 160-4-A	BMCI 8	75	2708	1118	213	219					1590	192	290
BSP 160-4	BMCI 8	75	2708	1118	213	219					1590	192	290
BSP 160-5-AA	BMCI 8	92	3104	1274	213	219					1830	192	342
BSP 160-5-A	BMCI 8	92	3104	1274	213	219					1830	192	342
BSP 160-5	BMCI 8	92	3104	1274	213	219					1830	192	342
BSP 160-6	BMCI 8	110	3789	1729	213	219					2060	192	408
BSP 160-7	BMCI 10	132	3807	1937	237	237					1870	237	526
BSP 160-8	BMCI 10	147	4162	2092	237	237					2070	237	597
BSP 160-9	BMCI 10	170	4468	2248	237	237					2220	237	643

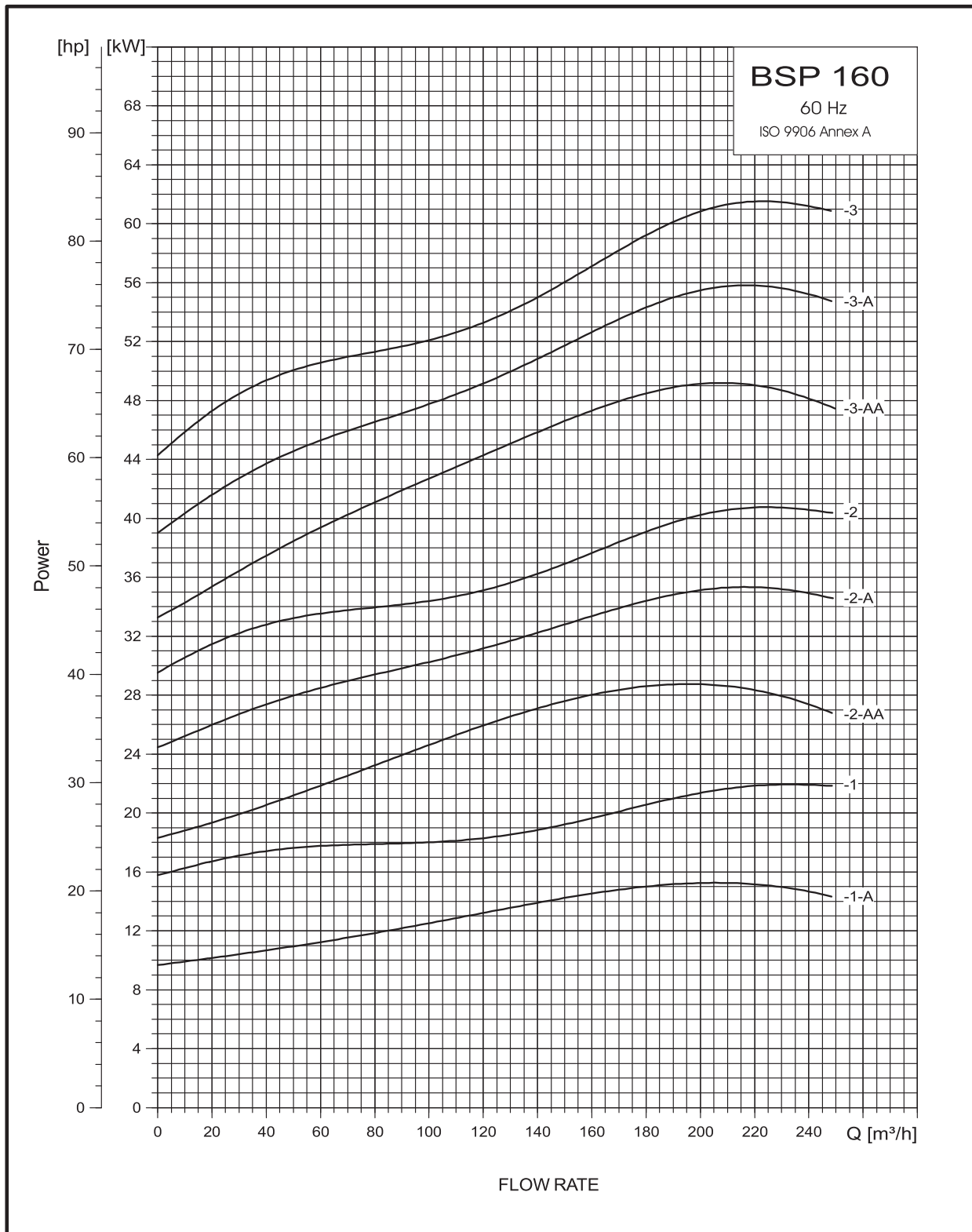
* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

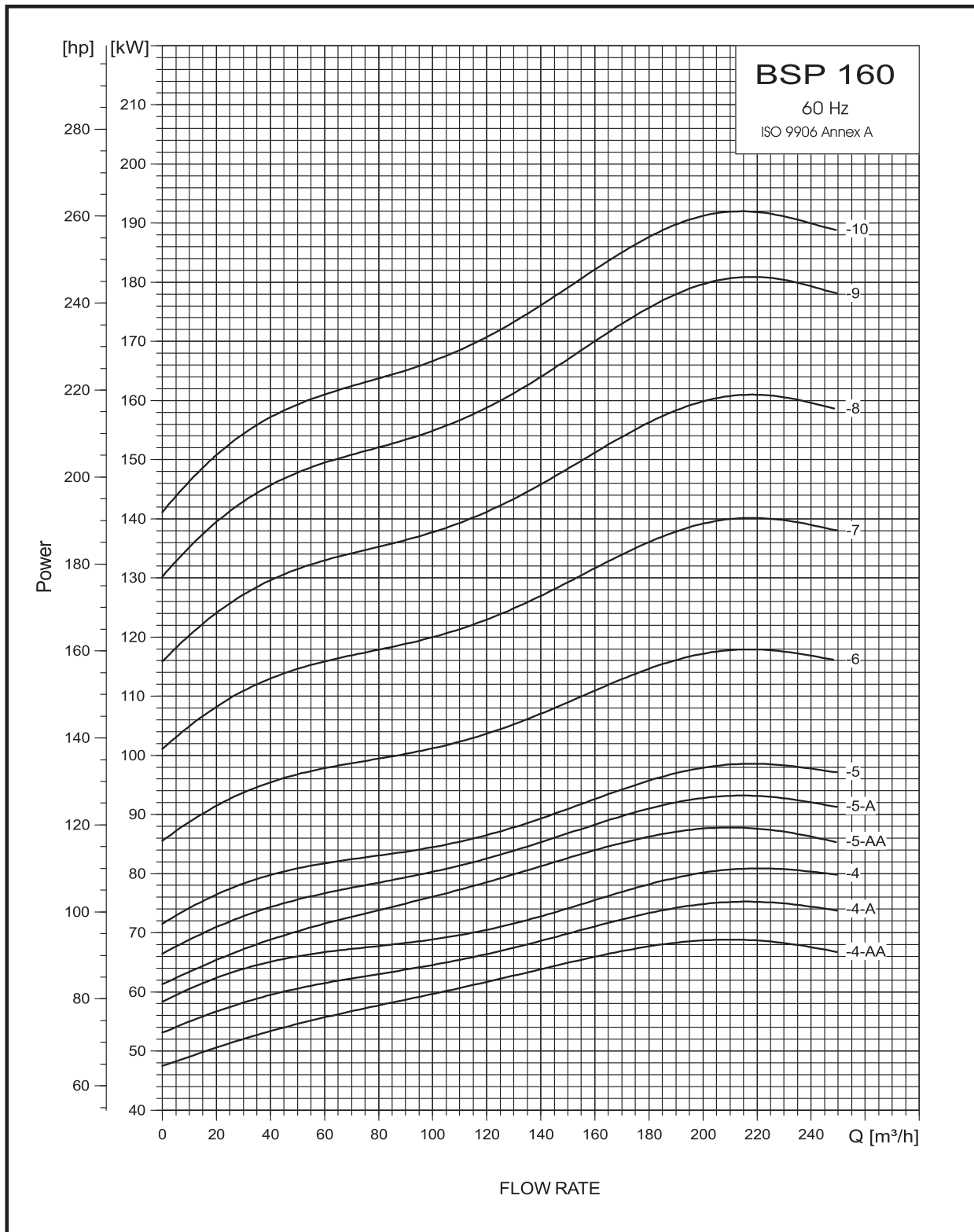
The pump types above are also available in N- and R-versions up to and including BSP 160-6. See page 3 for further details.

Other types of connection are possible by means of connecting pieces.

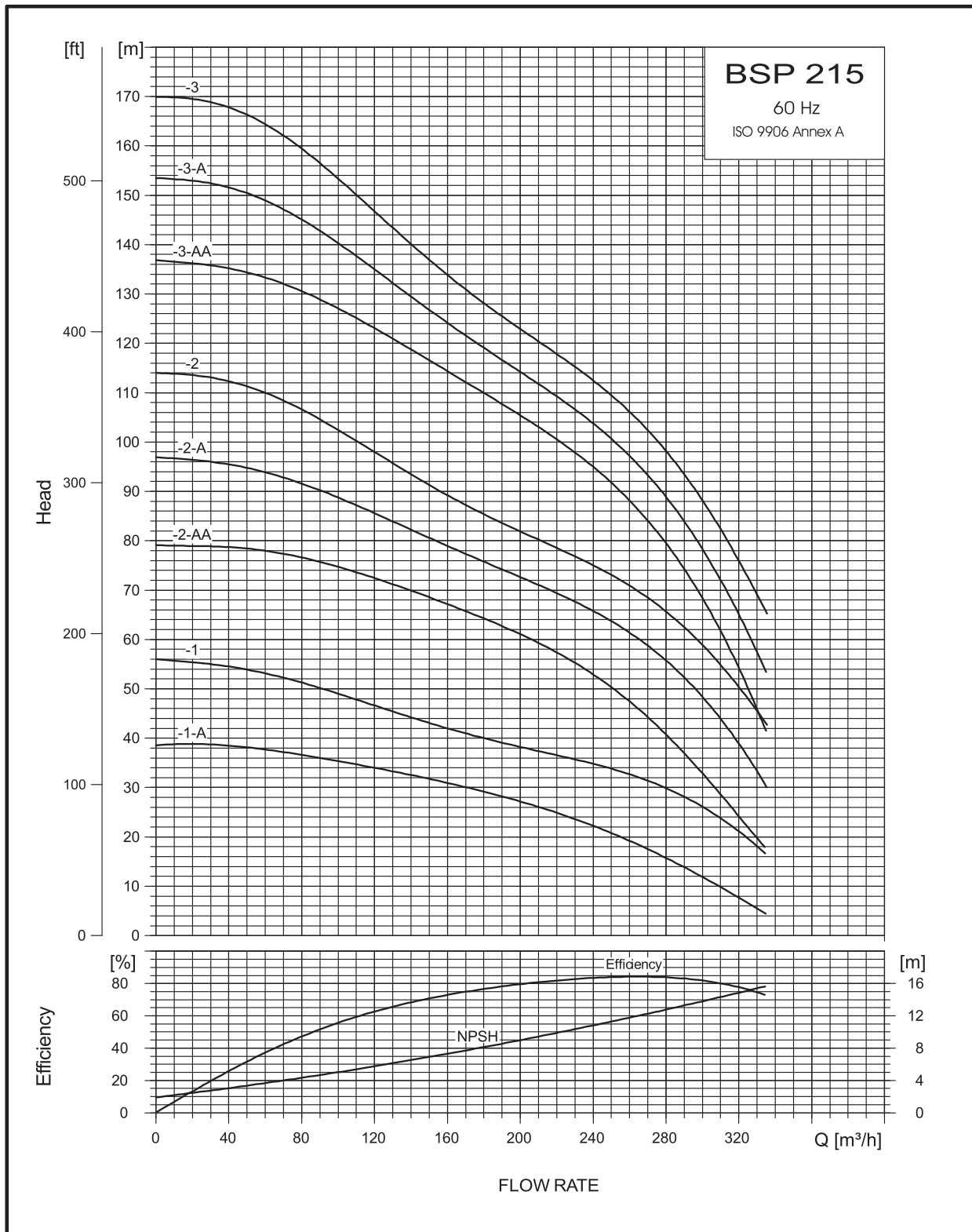
BSP 160 - Power Curve



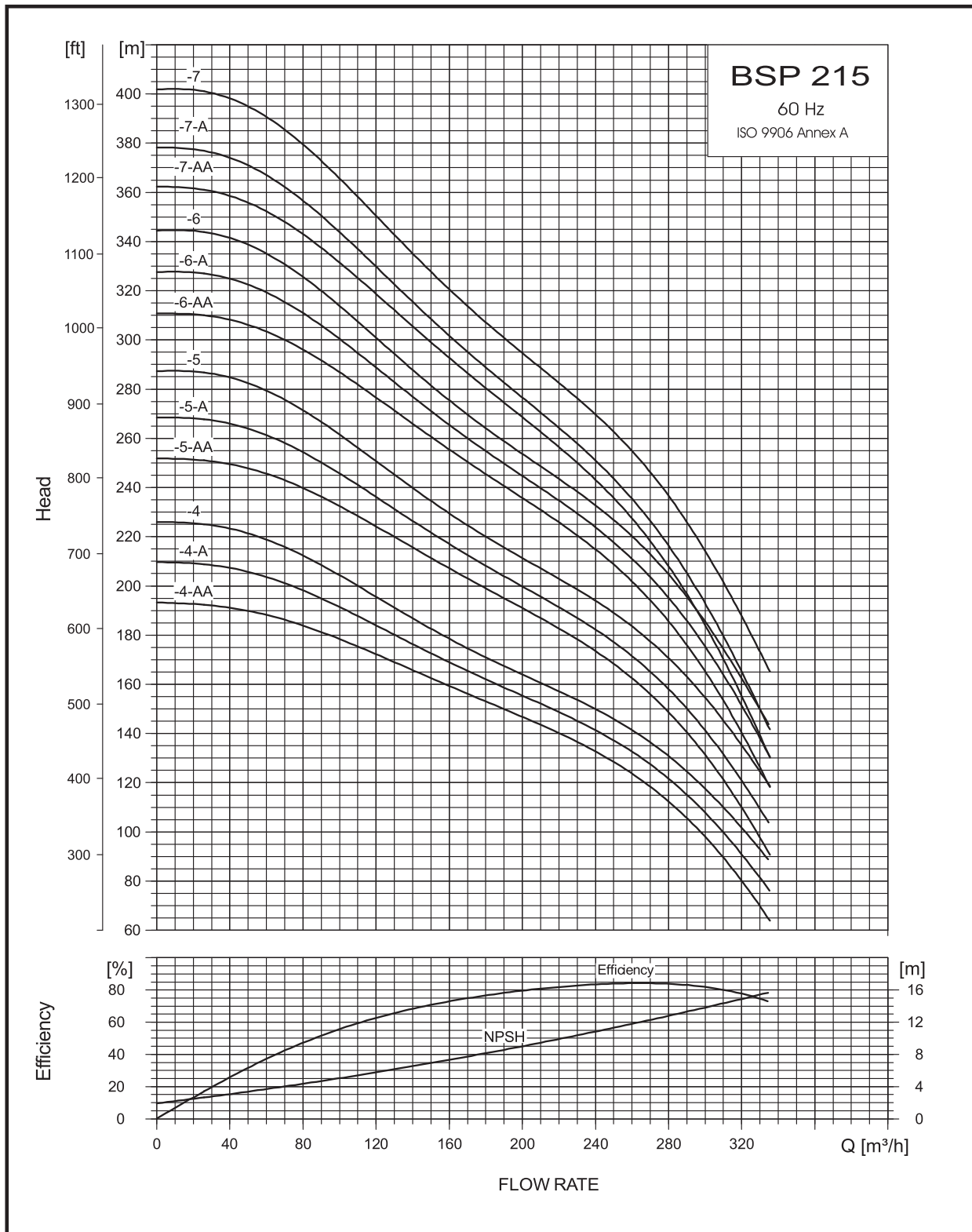
BSP 160 - Power Curve



3.15 BSP 215 - Performance Curve

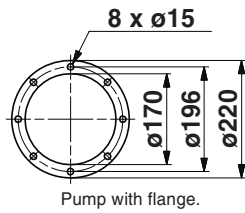
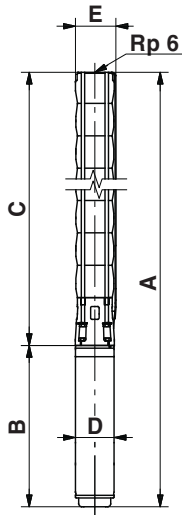


BSP 215 - Performance Curve



BSP 215 - Technical Data

Dimensions and Weights



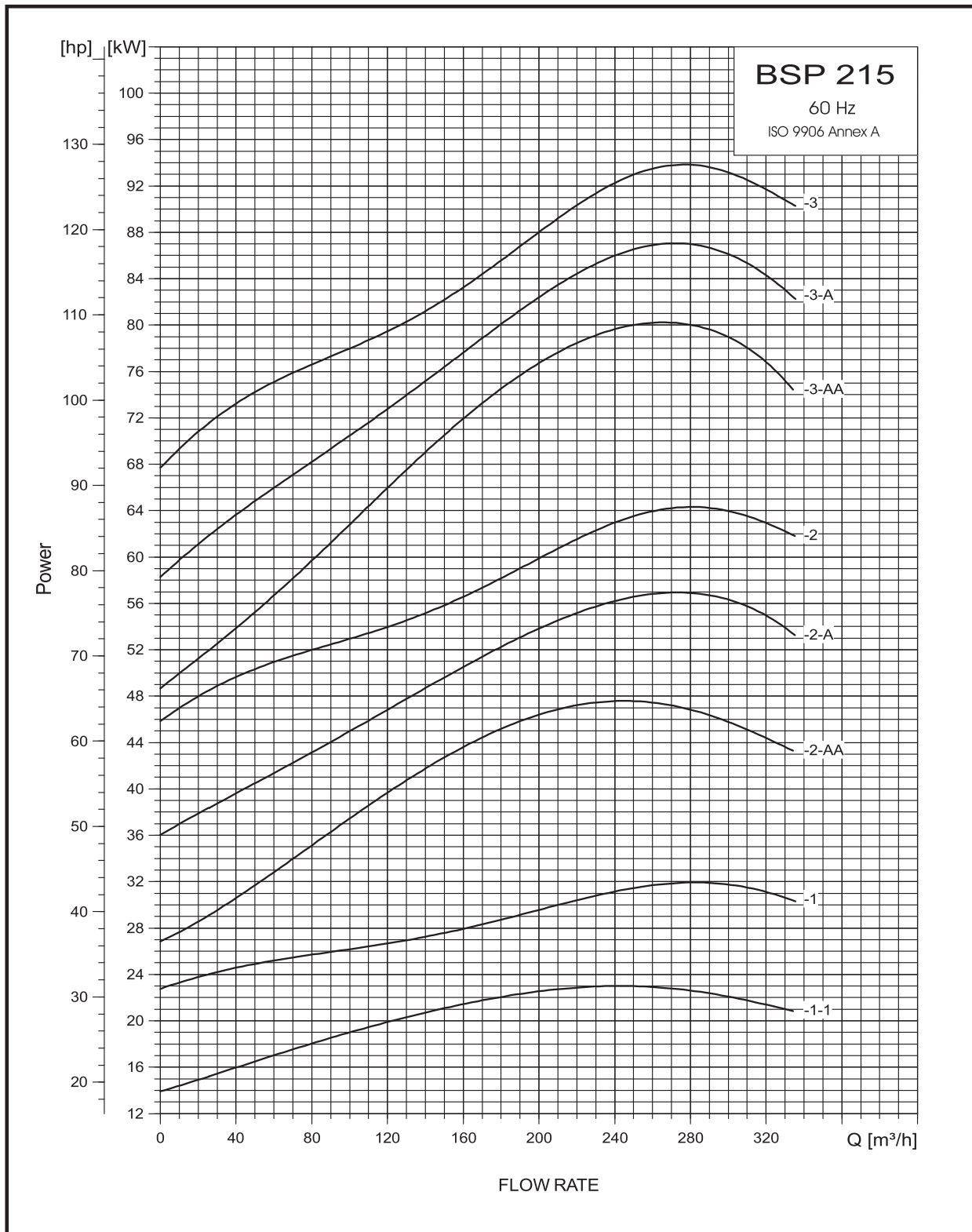
Pump type	Motor		Dimensions [mm]								Net weight [kg]		
	Type	Power [kW]	Rp 6 connection										
			A	C	E*	E**	A	C	E*	E**		B	D
BSP 215-1-A	BSF 6	22	1693	790	236	239	1693	790	241	247	903	143	106
BSP 215-1	BSF 6	30	1813	790	236	239	1813	790	241	247	1023	143	120
BSP 215-2-AA	BMCi 8	45	2236	966	239	244	2236	966	241	247	1270	192	231
BSP 215-2-A	BMCi 8	55	2316	966	239	244	2316	966	241	247	1350	192	246
BSP 215-2	BMCi 8	63	2456	966	239	244	2456	966	241	247	1490	192	272
BSP 215-3-AA	BMCi 8	75	2732	1142	239	244	2732	1142	241	247	1590	192	301
BSP 215-3-A	BMCi 8	92	2972	1142	239	244	2972	1142	241	247	1830	192	347
BSP 215-3	BMCi 8	92	2972	1142	239	244	2972	1142	241	247	1830	192	347
BSP 215-4-AA	BMCi 8	110	3378	1318	239	244	3378	1318	241	247	2060	192	407
BSP 215-4-A	BMCi 8	110	3378	1318	239	244	3378	1318	241	247	2060	192	407
BSP 215-4	BMCi 8	110	3378	1318	239	244	3378	1318	241	247	2060	192	407
BSP 215-5-AA	BMCi 10	132	3364	1494	250	254					1870	237	519
BSP 215-5-A	BMCi 10	132	3364	1494	250	254					1870	237	519
BSP 215-5	BMCi 10	147	3564	1494	250	254					2070	237	584
BSP 215-6-AA	BMCi 10	170	3890	1670	250	254					2220	237	634
BSP 215-6-A	BMCi 10	170	3890	1670	250	254					2220	237	634
BSP 215-6	BMCi 10	170	3890	1670	250	254					2220	237	634

* Maximum diameter of pump with one motor cable.
 ** Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions up to and including BSP 215-4. See page 3 for further details.

Other types of connection are possible by means of connecting pieces.

BSP 215 - Power Curve



BSP 215 - Power Curve

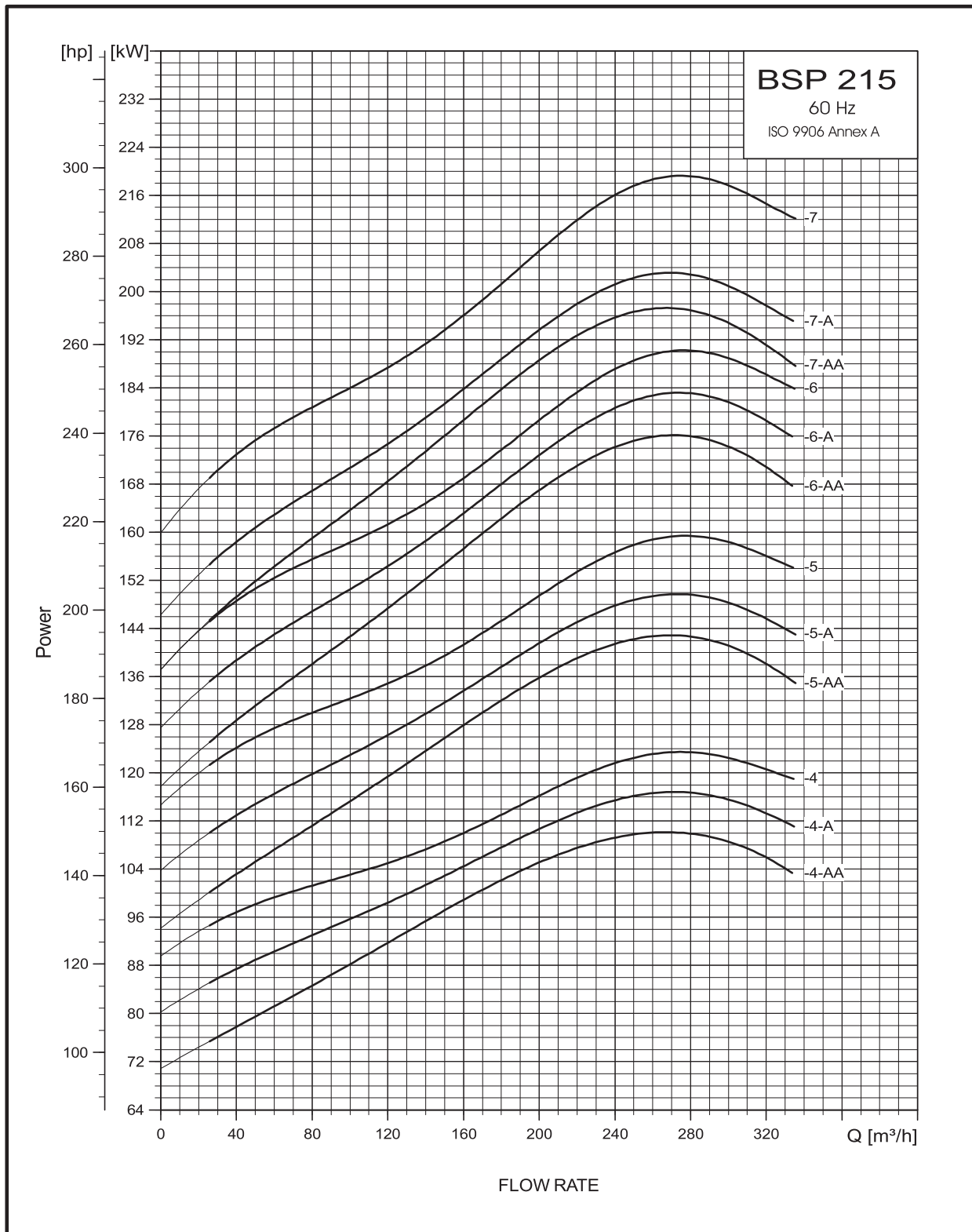


Table of head losses

4.1 Head Losses in Ordinary Water Pipes

Upper figures indicate the velocity of water in m/sec.

Lower figures indicate head in metres per 100 metres of straight pipes

Quantity of water			Head losses in ordinary water pipes												
m ³ /h	Litres/min.	Litres/sec.	Nominal pipe diameter in inches and internal diameter in [mm]												
			1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	
			15.75	21.25	27.00	35.75	41.25	52.50	68.00	80.25	92.50	105.0	130.0	155.5	
0.6	10	0.16	0.855 9.910	0.470 2.407	0.292 0.784										
0.9	15	0.25	1.282 20.11	0.705 4.862	0.438 1.570	0.249 0.416									
1.2	20	0.33	1.710 33.53	0.940 8.035	0.584 2.588	0.331 0.677	0.249 0.346								
1.5	25	0.42	2.138 49.93	1.174 11.91	0.730 3.834	0.415 1.004	0.312								
1.8	30	0.50	2.565 69.34	1.409 16.50	0.876 5.277	0.498 1.379	0.374 0.700	0.231 0.223							
2.1	35	0.58	2.993 91.54	1.644 21.75	1.022 6.949	0.581 1.811	0.436 0.914	0.269 0.291							
2.4	40	0.67		1.879 27.66	1.168 8.820	0.664 2.290	0.499 1.160	0.308 0.368							
3.0	50	0.83		2.349 41.40	1.460 13.14	0.830 3.403	0.623 1.719	0.385 0.544	0.229 0.159						
3.6	60	1.00		2.819 57.74	1.751 18.28	0.996 4.718	0.748 2.375	0.462 0.751	0.275 0.218						
4.2	70	1.12		3.288 76.49	2.043 24.18	1.162 6.231	0.873 3.132	0.539 0.988	0.321 0.287	0.231 0.131					
4.8	80	1.33		2.335 30.87	1.328 7.940	0.997 3.988	0.616 1.254	0.367 0.363	0.263 6.164						
5.4	90	1.50		2.627 38.30	1.494 9.828	1.122 4.927	0.693 1.551	0.413 0.449	0.269 0.203						
6.0	100	1.67		2.919 46.49	1.660 11.90	1.247 5.972	0.770 1.875	0.459 0.542	0.329 0.244	0.248 0.124					
7.5	125	2.08			3.649 70.41	2.075 17.93	1.558 8.967	0.962 2.802	0.574 0.809	0.412 0.365	0.310 0.185	0.241 0.101			
9.0	150	2.50			2.490 25.11	1.870 12.53	1.154 3.903	0.668 1.124	0.494 0.506	0.372 0.256	0.289 0.140				
10.5	175	2.92			2.904 33.32	2.182 16.66	1.347 5.179	0.803 1.488	0.576 0.670	0.434 0.338	0.337 0.184				
12	200	3.33			3.319 42.75	2.493 21.36	1.539 6.624	0.918 1.901	0.659 0.855	0.496 0.431	0.385 0.234	0.251 0.084			
15	250	4.17			4.149 64.86	3.117 32.32	1.924 10.03	1.147 2.860	0.823 1.282	0.620 0.646	0.481 0.350	0.314 0.126			
18	300	5.00			3.740 45.52	2.309 14.04	1.377 4.009	0.988 1.792	0.744 0.903	0.577 0.488	0.377 0.175	0.263 0.074			
24	400	6.67			4.987 78.17	3.078 24.04	1.836 6.828	1.317 3.053	0.992 1.530	0.770 0.829	0.502 0.294	0.351 0.124			
30	500	8.33					3.848 36.71	2.295 10.40	1.647 4.622	1.240 2.315	0.962 1.254	0.628 0.445	0.439 0.187		
36	600	10.0					4.618 51.84	2.753 14.62	1.976 6.505	1.488 3.261	1.155 1.757	0.753 0.623	0.526 0.260		
42	700	11.7						3.212 19.52	2.306 8.693	1.736 4.356	1.347 2.345	0.879 0.831	0.614 0.347		
48	800	13.3						3.671 25.20	2.635 11.18	1.984 5.582	1.540 3.009	1.005 1.066	0.702 0.445		
54	900	15.0						4.130 31.51	2.964 13.97	2.232 6.983	1.732 3.762	1.130 1.328	0.790 0.555		
60	1000	16.7						4.589 38.43	3.294 17.06	2.480 8.521	1.925 4.595	1.256 1.616	0.877 0.674		
75	1250	20.8						4.117 26.10	3.100 13.00	2.406 7.010	1.570 2.458	1.097 1.027			
90	1500	25.0						4.941 36.97	3.720 18.42	2.887 9.892	1.883 3.468				
105	1750	29.2							4.340 24.76	3.368 13.30	2.197 4.665	1.535 1.934			
120	2000	33.3							4.960 31.94	3.850 17.16	2.511 5.995	1.754 2.496			
150	2500	41.7								4.812 26.26	3.139 9.216	2.193 3.807			
180	3000	50.0									3.767 13.05	2.632 5.417			
240	4000	66.7										5.023 22.72	3.509 8.926		
300	5000	83.3											4.386 14.42		
			90 ° bends; slide valves	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.7	2.0	2.5
			T-pieces, non-return valves	4.0	4.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	7.0	8.0	9.0

The table is calculated in accordance with H. Lang's new formula $a = 0.02$ and for a water temperature of 10 °C.

The head loss in bends, slide valves, T-pieces and non-return valves is equivalent to the metres of straight pipes stated in the last two lines of the table.

To find the head loss in foot valves, multiply the loss in T-pieces by two.

4.2 Head Losses in Plastic Pipes

Upper figures indicate the velocity of water in m/sec.
Lower figures indicate head in metres per 100 metres of straight pipes

Quantity of water			PELM/PEH PN 10											
m ³ /h	Litres/min.	Litres/sec.	PELM					PEH						
			25	32	40	50	63	75	90	110	125	140	160	180
			20.4	26.2	32.6	40.8	51.4	61.4	73.6	90.0	102.2	114.6	130.8	147.2
0.6	10	0.16	0.49 1.8	0.30 0.66	0.19 0.27	0.12 0.085								
0.9	15	0.25	0.76 4.0	0.46 1.14	0.30 0.6	0.19 0.18	0.12 0.63							
1.2	20	0.33	1.0 6.4	0.61 2.2	0.39 0.9	0.25 0.28	0.16 0.11							
1.5	25	0.42	1.3 10.0	0.78 3.5	0.50 1.4	0.32 0.43	0.20 0.17	0.14 0.074						
1.8	30	0.50	1.53 13.0	0.93 4.6	0.6 1.9	0.38 0.57	0.24 0.22	0.17 0.092						
2.1	35	0.58	1.77 16.0	1.08 6.0	0.69 2.0	0.44 0.70	0.28 0.27	0.20 0.12						
2.4	40	0.67	2.05 22.0	1.24 7.5	0.80 3.3	0.51 0.93	0.32 0.35	0.23 0.16	0.16 0.063					
3.0	50	0.83	2.54 37.0	1.54 11.0	0.99 4.8	0.63 1.40	0.40 0.50	0.28 0.22	0.20 0.09					
3.6	60	1.00	3.06 43.0	1.85 15.0	1.2 6.5	0.76 1.90	0.48 0.70	0.34 0.32	0.24 0.13	0.16 0.050				
4.2	70	1.12	3.43 50.0	2.08 18.0	1.34 8.0	0.86 2.50	0.54 0.83	0.38 0.38	0.26 0.17	0.18 0.068				
4.8	80	1.33	2.47 25.0	1.59 10.5	1.02 3.00	0.64 1.20	0.45 0.50	0.31 0.22	0.20 0.084					
5.4	90	1.50	2.78 30.0	1.8 12.0	1.15 3.50	0.72 1.30	0.51 0.57	0.35 0.26	0.24 0.092	0.18 0.05				
6.0	100	1.67	3.1 39.0	2.0 16.0	1.28 4.6	0.80 1.80	0.56 0.73	0.39 0.30	0.26 0.12	0.20 0.07				
7.5	125	2.08	3.86 50.0	2.49 24.0	1.59 6.6	1.00 2.50	0.70 1.10	0.49 0.50	0.33 0.18	0.25 0.10	0.20 0.055			
9.0	150	2.50	3.00 33.0	1.91 8.6	1.20 3.5	0.84 1.40	0.59 0.63	0.39 0.24	0.30 0.13	0.20 0.075				
10.5	175	2.92	3.5 38.0	2.23 11.0	1.41 4.3	0.99 1.80	0.69 0.78	0.46 0.30	0.36 0.18	0.28 0.09				
12	200	3.33	3.99 50.0	2.55 14.0	1.60 5.5	1.12 2.40	0.78 1.0	0.52 0.40	0.41 0.22	0.32 0.12	0.25 0.065			
15	250	4.17	3.19 21.0	2.01 8.0	1.41 3.70	0.98 1.50	0.66 0.57	0.51 0.34	0.40 0.18	0.31 0.105	0.25 0.08	0.20 0.06	0.25 0.060	
18	300	5.00	3.82 28.0	2.41 10.5	1.69 4.60	1.18 1.95	0.78 0.77	0.61 0.45	0.48 0.25	0.37 0.13	0.29 0.085	0.29 0.085	0.29 0.085	
24	400	6.67	3.21 19.0	2.25 8.0	1.69 3.60	1.18 1.40	0.78 0.78	0.61 0.44	0.48 0.23	0.37 0.15	0.29 0.15	0.29 0.15	0.29 0.15	
30	500	8.33	4.01 28.0	2.81 11.5	1.96 5.0	1.31 2.0	1.02 0.63	0.81 0.33	0.62 0.33	0.49 0.21				
36	600	10.0	4.82 37.0	3.38 15.0	2.35 6.6	1.57 2.60	1.22 1.50	0.97 0.82	0.74 0.45	0.59 0.28				
42	700	11.7	5.64 47.0	3.95 24.0	2.75 8.0	1.84 3.50	1.43 1.90	1.13 1.10	0.87 0.60	0.69 0.40				
48	800	13.3	4.49 26.0	3.13 11.0	2.09 4.5	1.62 2.60	1.29 1.40	0.99 0.81	0.78 0.48					
54	900	15.0	5.07 33.0	3.53 13.5	2.36 5.5	1.83 3.20	1.45 1.70	1.12 0.95	0.08 0.58					
60	1000	16.7	5.64 40.0	3.93 16.0	2.63 6.7	2.04 3.90	1.62 2.2	1.24 1.2	0.96 0.75					
75	1250	20.8	4.89 25.0	3.27 9.0	2.54 5.0	2.02 3.0	1.55 1.6	1.22 0.95						
90	1500	25.0	5.88 33.0	3.93 13.0	3.05 8.0	2.42 4.1	1.86 2.3	1.47 1.40						
105	1750	29.2	6.86 44.0	4.59 17.5	3.56 9.7	2.83 5.7	2.17 3.2	1.72 1.9						
120	2000	33.3	5.23 23.0	4.06 13.0	3.23 7.0	2.48 4.0	1.96 2.4							
150	2500	41.7	6.55 34.0	5.08 18.0	4.04 10.5	3.10 6.0	2.45 3.5							
180	3000	50.0	7.86 45.0	6.1 27.0	4.85 14.0	3.72 7.6	2.94 4.4							
240	4000	66.7	8.13 43.0	6.47 24.0	4.96 13.0	3.92 7.5								
300	5000	83.3	8.08 33.0	6.2 18.0	4.89 11.0									

The table is based on a nomogram.
Roughness: K = 0.01 mm.
Water temperature: t = 10 °C.



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