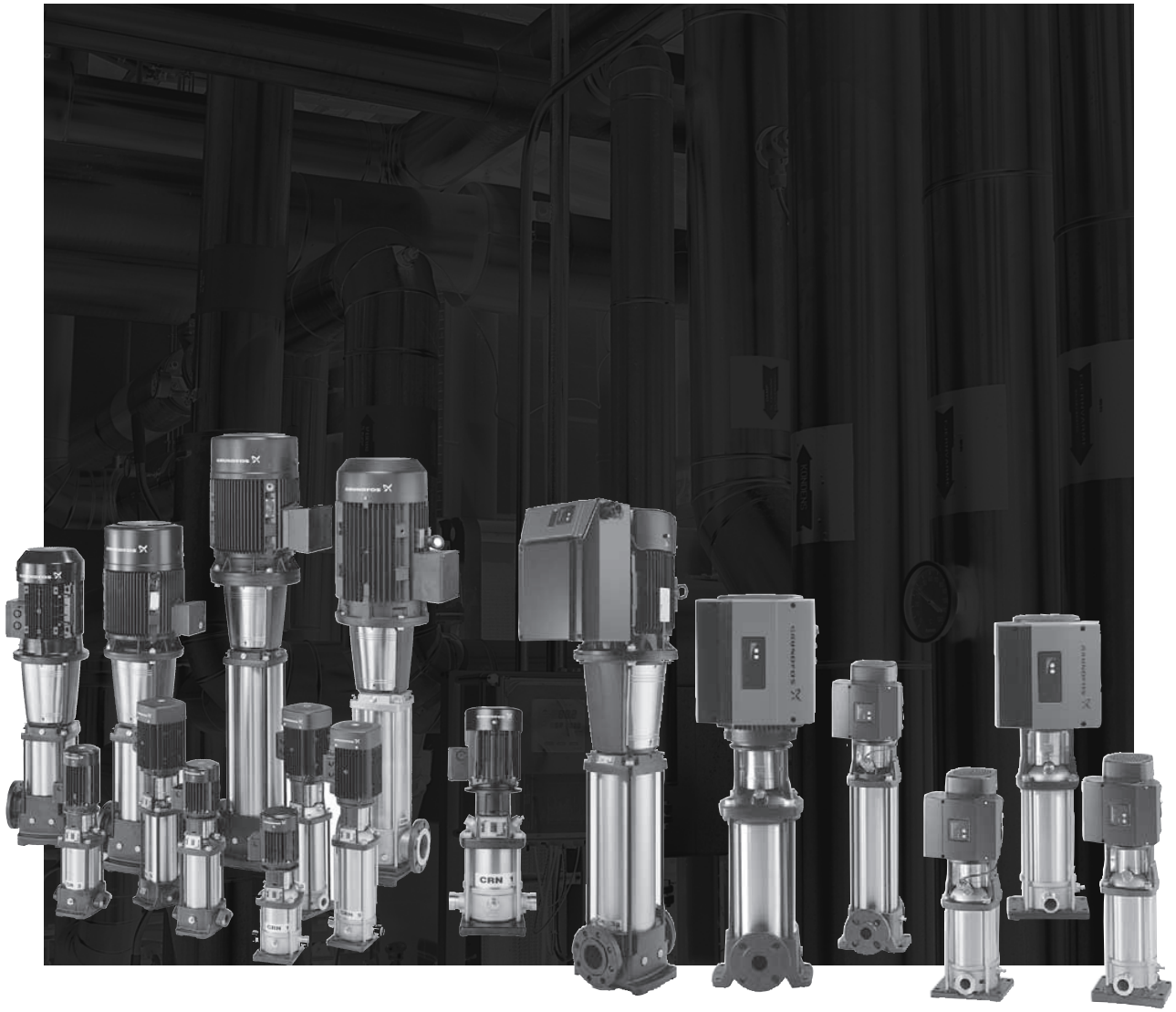
GRUNDFOS **DATA BOOKLET**

CR, CRI, CRN, CRE, CRIE, CRNE

Vertical multistage centrifugal pumps
50 Hz



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Contents

Introduction

This data booklet deals with CR, CRI and CRN as well as CRE, CRIE and CRNE pumps.

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Fig. 1 CR, CRI and CRN pumps

CR, CRI and CRN pumps are vertical multistage centrifugal pumps. The in-line design enables the pump to be installed in a horizontal one-pipe system where the suction and discharge ports are in the same horizontal plane and have the same pipe dimensions. This design provides a more compact pump design and pipework.

Grundfos CR pumps come with various pump sizes and various numbers of stages to provide the flow and the pressure required.

CR pumps are suitable for a variety of applications from pumping of potable water to pumping of chemicals. The pumps are therefore used in a wide diversity of pumping systems where the performance and material of the pump meet specific demands.

The CR pumps consist of two main components: The motor and the pump unit. The motor of CR pumps is a Grundfos motor designed to EN standards.

The pump unit consists of optimised hydraulics, various types of connections, an outer sleeve, a pump head and various other parts.

CR pumps are available in various material versions according to the pumped liquid.

CRE, CRIE, CRNE pumps

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Fig. 2 CRE, CRIE and CRNE pumps

CRE, CRIE and CRNE pumps are built on the basis of CR, CRI, CRN pumps.

CRE, CRIE and CRNE pumps belong to the so-called E-pump family. CRE, CRIE and CRNE pumps are referred to as E-pumps.

The difference between the CR and the CRE pump range is the motor. CRE, CRIE and CRNE pumps are fitted with an E-motor, i.e. a motor with built-in frequency control.

The motor of the CRE pump is a Grundfos MGE or MMGE motor designed to EN standards.

Frequency control enables continuously variable control of motor speed, which makes it possible to set the pump to operation at any duty point. The aim of continuously variable control of the motor speed is to adjust the performance to a given requirement.

CRE, CRIE and CRNE pumps are available with an integrated pressure sensor connected to the frequency control.

The pump materials are the same as those of the CR, CRI and CRN pump range.

Selecting a CRE pump

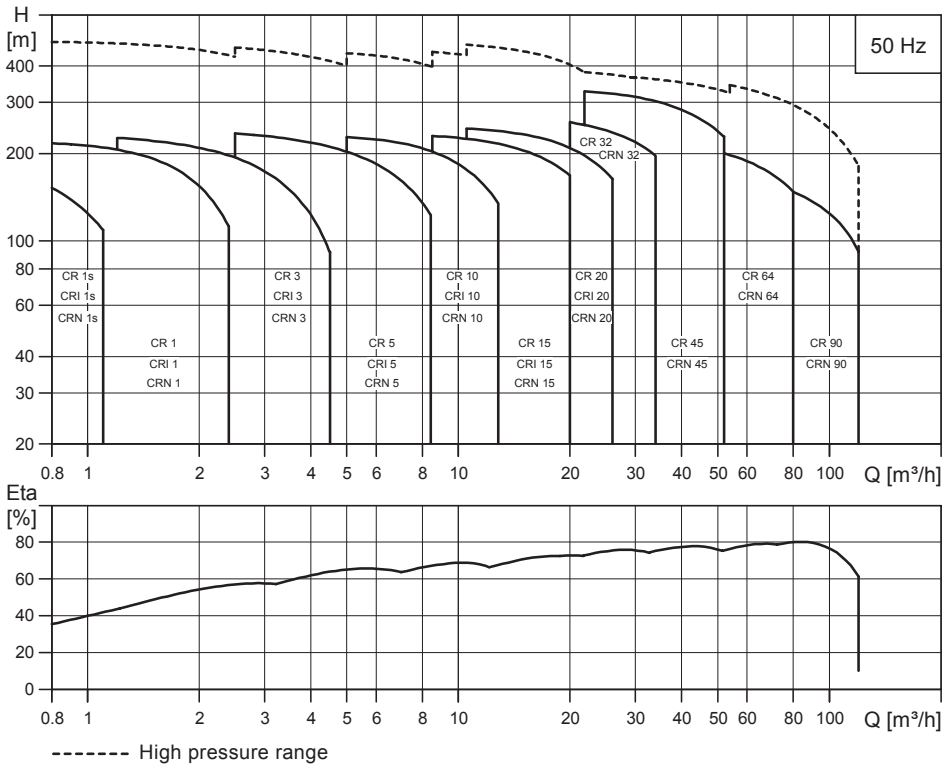
Select a CRE pump if:

- controlled operation is required, i.e. consumption fluctuates,
- constant pressure is required,
- communication with the pump is required.

Adaptation of performance through frequency-controlled speed control offers obvious advantages:

- Energy savings.
- Increased comfort.
- Control and monitoring of the pump performance.

Performance range - CR, CRI, CRN



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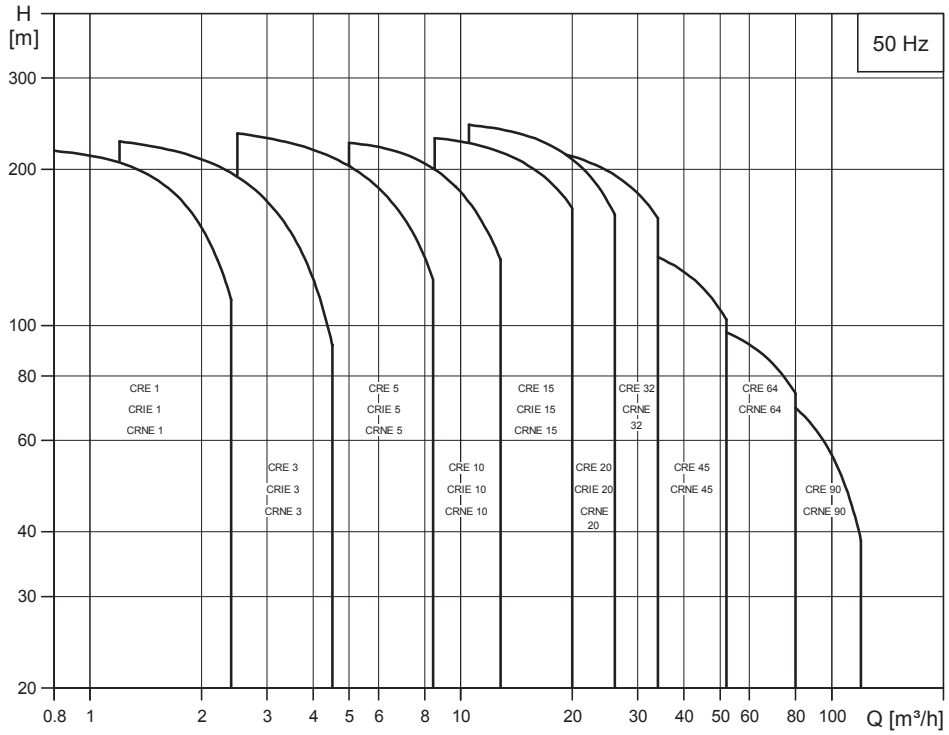
Performance range - CRE, CRIE, CRNE



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Applications

Application	CR, CRI	CRN	CRE, CRNE
Water supply			
Filtration and transfer at waterworks	●	❍	●
Distribution from waterworks	●	❍	●
Pressure boosting in mains	●	❍	●
Pressure boosting in high-rise buildings, hotels, etc.	●	❍	●
Pressure boosting for industrial water supply	●	❍	●
Industry			
Pressure boosting in...			
process water systems	●	●	●
washing and cleaning systems	●	●	❍
vehicle washing tunnels	●	❍	●
fire fighting systems	●		❍
Liquid transfer in...			
cooling and air-conditioning systems (refrigerants)	●	❍	●
boiler feed and condensate systems	●	❍	●
machine tools (cooling lubricants)	●	●	●
aquafarming★	●	❍	
Transfer of...			
oils and alcohols	●	●	
acids and alkalis★		●	
glycol and coolants	●		
Water treatment			
Ultra-filtration systems		●	
Reverse osmosis systems★		●	
Softening, ionising, demineralizing systems		●	
Distillation systems		●	
Separators	●	●	●
Swimming baths★		●	
Irrigation			
Field irrigation (flooding)	●	❍	
Sprinkler irrigation	●	❍	●
Drip-feed irrigation	●	❍	

● Recommended version.

❍ Alternative version.

★ CRT, CRTE version available. For further information about CRT, CRTE pumps see, "Pumped liquids" page 68 or related CRT, CRTE data booklet.

Product range

Range	CR 1s	CR, CRE 1	CR, CRE 3	CR, CRE 5	CR, CRE 10	CR, CRE 15	CR, CRE 20	CR, CRE 32	CR, CRE 45	CR, CRE 64	CR, CRE 90
Nominal flow rate [m^3/h]	0.8	1	3	5	10	15	20	32	45	64	90
Temperature range [°C]	–20 to +120							–30 to +120			
Temperature range [°C] – on request	–40 to +180							–40 to +180			
Max. pump efficiency [%]	35	48	58	66	70	72	72	78	79	80	81
CR pumps											
Flow range [m^3/h]	0.3-1.1	0.7-2.4	1.2-4.5	2.5-8.5	5-13	9-24	11-29	15-40	22-58	30-85	45-120
Max. pressure [bar]	21	22	24	24	22	23	25	28	26	20	20
High pressure [bar] – on request	-	47	47	47	47	47	47	39	40	39	39
Motor power [kW]	0.37-1.1	0.37-2.2	0.37-3	0.37-5.5	0.37-7.5	1.1-15	1.1-18.5	1.5-30	3-45	4-45	5.5-45
CRE pumps											
Flow range [m^3/h]	-	0.7-2.4	1.2-4.5	2.5-8.5	5-13	8.5-23.5	10.5-29	15-40	22-58	30-85	45-120
Max. pressure [bar]	-	22	24	24	22	23	25	28	26	20	20
Motor power [kW]	-	0.37-2.2	0.37-3	0.37-5.5	0.37-7.5	1.1-15	1.1-18.5	1.5-22	3-22	4-22	5.5-22
Version											
CR, CRE: Cast iron and stainless steel EN 1.4301/AISI 304	●	●	●	●	●	●	●	●	●	●	●
CRI, CRIE: Stainless steel EN 1.4301/AISI 304	●	●	●	●	●	●	●	-	-	-	-
CRN, CRNE: Stainless steel EN 1.4401/AISI 316	●	●	●	●	●	●	●	●	●	●	●
CRT, CRTE: Titanium	See the CRT, CRTE data booklet.										
CR, CRE pipe connection											
Oval flange (BSP)	Rp 1	Rp 1	Rp 1	Rp 1¼	Rp 1½	Rp 2	Rp 2	-	-	-	-
Oval flange (BSP) – on request	Rp 1¼	Rp 1¼	Rp 1¼	Rp 1	Rp 1¼ Rp 2	Rp 2½	Rp 2½	-	-	-	-
Flange	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 40	DN 50	DN 50	DN 65	DN 80	DN 100	DN 100
Flange – on request	-	-	-	-	DN 50	-	-	DN 80	DN 100	DN 125	DN 125
CRI, CRIE pipe connection											
Oval flange (BSP)	Rp 1	Rp 1	Rp 1¼	Rp 1¼	Rp 1½	Rp 2	Rp 2	-	-	-	-
Oval flange (BSP) – on request	Rp 1¼	Rp 1¼	Rp 1	Rp 1	Rp 2	-	-	-	-	-	-
Flange	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 40	DN 50	DN 50	-	-	-	-
Flange – on request	-	-	-	-	DN 50	-	-	-	-	-	-
PJE coupling (Victaulic)	R 1¼ DN 32	R 1¼ DN 32	R 1¼ DN 32	R 1¼ DN 32	R 2 DN 50	R 2 DN 50	R 2 DN 50	-	-	-	-
Clamp coupling (L-coupling)	ø48.3	ø48.3	ø48.3	ø48.3	ø60.3	ø60.3	ø60.3	-	-	-	-
Union (+GF+)	G 2	G2	G 2	G 2	G 2¾	G 2¾	G 2¾	-	-	-	-
CRN(E) pipe connection											
Oval flange (BSP)	Rp 1	Rp 1	Rp 1¼	Rp 1¼	Rp 1½	Rp 2	Rp 2	-	-	-	-
Oval flange (BSP) – on request	Rp 1¼	Rp 1¼	Rp 1	Rp 1	Rp 2	-	-	-	-	-	-
Flange	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 40	DN 50	DN 50	DN 65	DN 80	DN 100	DN 100
Flange – on request	-	-	-	-	DN 50	-	-	DN 80	DN 100	DN 125	DN 125
PJE coupling (Victaulic)	R 1¼ DN 32	R 1¼ DN 32	R 1¼ DN 32	R 1¼ DN 32	R 2 DN 50	R 2 DN 50	R 2 DN 50	R 3 [1]	R 4 [1]	R 4 [1]	R 5 [1]
Clamp coupling (L-coupling)	ø48.3	ø48.3	ø48.3	ø48.3	ø60.3	ø60.3	ø60.3	-	-	-	-
Union (+GF+)	G 2	G2	G 2	G 2	G 2¾	G 2¾	G 2¾	-	-	-	-

1) On request

Pump

The CR and CRE pumps are non-self-priming, vertical multistage centrifugal pumps.

The pumps are available with a Grundfos standard motor (CR pumps) or a frequency-controlled motor (CRE pumps).

The pump consists of a base and a pump head. The chamber stack and the outer sleeve are secured between the pump head and the base by means of staybolts. The base has suction and discharge ports on the same level (in-line). All pumps are equipped with a maintenance-free mechanical shaft seal of the cartridge type.

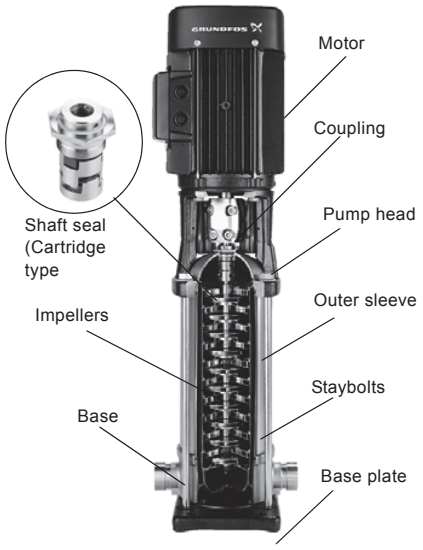

Fig. 3 CR pump

Motor

Grundfos standard motors - MG and Siemens motors
CR, CRI and CRN pumps are fitted with a totally enclosed, fan-cooled, 2-pole Grundfos standard motor with principal dimensions in accordance with the EN standards.

Electrical tolerances according to EN 60034.

From 0.37 to 2.2 kW Grundfos offers CR pumps fitted with single-phase MG motors (1 x 220-230/240 V).

Frequency-controlled motors - MGE
CRE, CRIE and CRNE pumps are fitted with a totally enclosed, fan-cooled, 2-pole frequency-controlled motor with principal dimensions in accordance with the EN standards.

Electrical tolerances according to EN 60034.

From 0.37 to 1.1 kW Grundfos offers CRE pumps fitted with single-phase MGE motors (1 x 200-240 V).

Electrical data

CR, CRI, CRN pumps

	MG motor
Mounting designation	Up to 4 kW: V 18 From 5.5 kW: V 1
Insulation class	F
Efficiency class	EFF 1 (0.37-0.75 kW and 3 kW are EFF 2)
Enclosure class	IP 55★
Supply voltage (Tolerance: ±10%)	P_2: 0.37-1.5 kW: 3 x 220-240/380-415 V, 50 Hz P_2: 2.2-45 kW: 3 x 380-415, 50 Hz
Supply frequency	50 Hz

★ IP 44, IP 54 and IP 65 - on request.

CRE, CRIE, CRNE pumps

	MGE motor ($P_2 \leq$ 7.5 kW)	MGE motor ($P_2 \geq$ 11-22 kW)
Mounting designation	Up to 4 kW: V 18 From 5.5 kW: V 1	
Insulation class	F	
Efficiency class	EFF 1★	EFF 2
Enclosure class	IP 54	
Supply voltage (Tolerance: ±10%)	P_2: 0.37-1.1 kW: 1 x 200-240 V P_2: 0.75-7.5 kW: 3 x 380-480 V	P_2: 11-22 kW: 3 x 380-415 V
Supply frequency	50/60 Hz	

★ Single-phase MGE motors are EFF 2.

Optional motors

The Grundfos standard range of motors covers a wide variety of application demands. However, for special applications or operating conditions, custom-built motor solutions can be provided.

For special applications or operating conditions, Grundfos offers custom-built motors such as:

- ATEX approved motors,
- MG motors with anti-condensation heating unit,
- motors with thermal protection.

Motor protection

MG and Siemens motors

Single-phase Grundfos motors have a built-in thermal overload switch (IEC 34-11: TP 211).

Three-phase motors **must** be connected to a motor starter in accordance with local regulations.

Three-phase Grundfos motors from 3 kW and upwards have a built-in thermistor (PTC) according to DIN 44 082 (IEC 34-11: TP 211).

MGE motors

CRE, CRIE, CRNE pumps require no external motor protection. The MGE motor incorporates thermal protection against slow overloading and blocking (IEC 34-11: TP 211).

Terminal box positions

As standard the terminal box is mounted on the suction side of the pump.

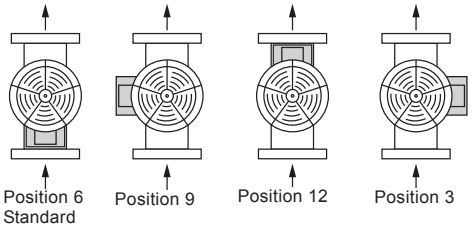

Fig. 4 Terminal box positions

Ambient temperature

0.37-0.75 kW motors (EFF 2, MG): Max. +40°C.

1.1-11 kW motors (EFF 1, MG): Max. +60°C.

15-45 kW motors (EFF 1, Siemens): Max. +55°C.

If the ambient temperature exceeds above maximum values or if the motor is located 1000 metres above sea level, the motor output (P2) must be reduced due to the low density and consequently low cooling effect of the air. In such cases, it may be necessary to use a motor with a higher rated output.

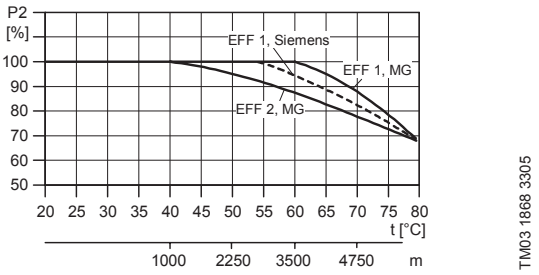

Fig. 5 Relationship between motor output (P2) and ambient temperature

Viscosity

The pumping of liquids with densities or kinematic viscosities higher than those of water will cause a considerable pressure drop, a drop in the hydraulic performance and a rise in the power consumption.

In such situations the pump should be equipped with a larger motor. If in doubt, contact Grundfos.

Examples of E-pump applications

CRE, CRIE and CRNE pumps are the ideal solution in a number of applications characterized by a need for variable flow at constant pressure. The pumps are suited for water supply systems and pressure boosting, but also industrial applications.

Depending on the nature of the application, the pumps offer energy-savings, increased comfort and improved processing.

E-pumps in the service of industry

Industry uses a large number of pumps in many different applications. Demands on pumps in terms of pump performance and mode of operation make speed control a must in many applications.

Below is mentioned some of the applications in which E-pumps are often used.

Constant pressure

- Water supply,
- Washing and cleaning systems,
- Distribution from waterworks,
- Humidifying systems,
- Water treatment systems,
- Process boosting systems, etc.

Example: Within industrial water supply, E-pumps with integrated pressure sensor are used to ensure a constant pressure in the piping network. From the sensor, the E-pump receives inputs about changes of pressure as a result of changes in the consumption. The E-pump responds to the input by adjusting the speed until the pressure is equalized. The constant pressure is stabilized once more on the basis of a preset setpoint.

Constant temperature

- Air-conditioning systems at industrial plants,
- Industrial cooling systems,
- Industrial freezing systems,
- Casting and moulding tools, etc.

Example: In industrial freezing systems, E-pumps with temperature sensor increase comfort and lower operating costs compared with pumps without a temperature sensor.

An E-pump continuously adapts its performance to the changing demands reflected in the differences in temperature of the liquid circulating in the freezing system. Thus, the lower the demand for cooling, the smaller the quantity of liquid circulated in the system and vice versa.

Constant flow

- Steam boiler systems,
- Condensate systems,
- Sprinkler irrigation systems,
- Chemical industry, etc.

Example: In a steam boiler, it is important to be able to monitor and control pump operation to maintain a constant level of water in the boiler.

By using an E-pump with level sensor in the boiler, it is possible to maintain a constant water level.

A constant water level ensures optimum and cost-efficient operation as a result of a stable steam production.

Dosing applications

- Chemical industry (i.e. control of pH-values),
- Petrochemical industry,
- Paint industry,
- Degreasing systems,
- Bleaching systems, etc.

Example: In the petrochemical industry, E-pumps with pressure sensor are used as dosing pumps. The E-pumps helps to ensure that the correct mixture ratio is achieved when more liquids are combined.

E-pumps functioning as dosing pumps improves processing and offer energy-savings.

E-pumps in commercial building services

Commercial building services use E-pumps to maintain a constant pressure or a constant temperature based on a variable flow.

Constant pressure

- Water supply in high-rise buildings i.e. office buildings, hotels, etc.

Example: E-pumps with pressure sensor are used for water supply in high-rise buildings to ensure a constant pressure even at the highest draw-off point. As the consumption pattern and thus the pressure changes during the day, the E-pump continuously adapts its performance until the pressure is equalized.

Constant temperature

- Air-conditioning systems in hotels, schools,
- Building cooling systems, etc.

Example: E-pumps are an excellent solution in buildings where constant temperature is essential. E-pumps keep the temperature constant in air-conditioned high-rise glass buildings, irrespective of the seasonal fluctuations of the out-door temperature, and various heat impacts inside the building.

Control options of E-pumps

Communication with CRE, CRIE, CRNE pumps is possible by means of

- a central management system,
- remote control (Grundfos R100) or
- a control panel.

The purpose of controlling an E-pump is to monitor and control the pressure, temperature, flow and liquid level of the system.

Central management system

Communication with the E-pump is possible even though the operator is not present near the E-pump. Communication is enabled by having connected the E-pump to a central management system allowing the operator to monitor and change control modes and setpoint settings of the E-pump.

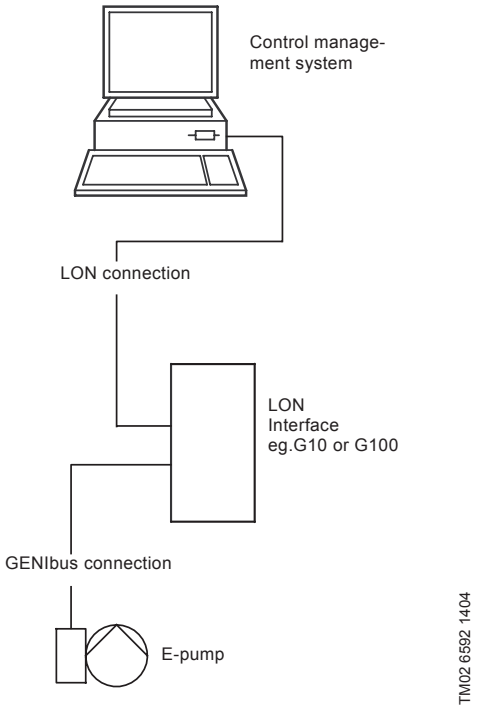

Fig. 6 Structure of a central management system

Remote control

The R100 remote control produced by Grundfos is available as an accessory.

The operator communicates with the E-pump by pointing the IR-signal transmitter at the control panel of the E-pump terminal box.

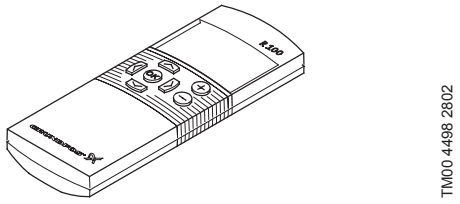

Fig. 7 R100 remote control

On the R100 display it is possible to monitor and change control modes and settings of the E-pump.

Control panel

The control panel of the E-pump terminal box makes it possible to change the setpoint settings manually.

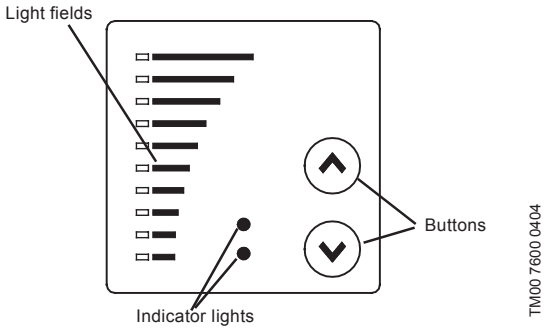

Fig. 8 Control panel on CRE pump

Control modes for E-pumps

Grundfos offers CRE, CRIE and CRNE pumps in two different variants:

- CRE, CRIE and CRNE with integrated pressure sensor
- CRE, CRIE and CRNE without sensor.

CRE, CRIE, CRNE with integrated pressure sensor

CRE, CRIE and CRNE pumps with integrated pressure sensor are suitable for applications where you want to control the pressure after the pump, irrespective of the flow. For further information, see the section "Examples of E-pump applications" page 9.

Signals of pressure changes in the piping system are transmitted continuously from the sensor to the pump. The pump responds to the signals by adjusting its performance up or down to compensate for the pressure difference between the actual and the desired pressure. As this adjustment is a continuous process, a constant pressure is maintained in the piping system.

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Fig. 9 CRE, CRIE and CRNE pumps

A CRE, CRIE or CRNE pump with integrated pressure sensor facilitates installation and commissioning.

CRE, CRIE and CRNE pumps with integrated pressure sensor can be set to:

- constant-pressure mode (factory setting) or
- constant-curve mode.

In **constant-pressure** mode, the pump maintains a preset pressure after the pump, irrespective of the flow, see figure below.

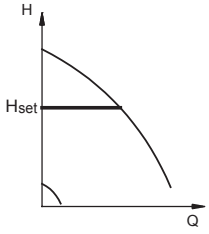

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Fig. 10 Constant pressure mode

In **constant-curve** mode, the pump is not controlled. It can be set to pump according to a preset pump characteristic within the range from min. curve to max. curve, see figure below.

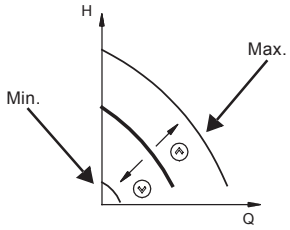

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Fig. 11 Constant curve mode

CRE, CRIE and CRNE without sensor

CRE, CRIE and CRNE pumps without sensor are suitable for applications where

- uncontrolled operation is required
- you want to fit another sensor later in order to control the flow, temperature, differential temperature, liquid level, pH value, etc at some arbitrary point in the system.

CRE, CRIE and CRNE pumps without sensor can be set to:

- controlled-operation mode or
- uncontrolled-operation mode (factory-setting).

In **controlled**-operation mode, the pump adjusts its performance to the desired setpoint, see figure below.

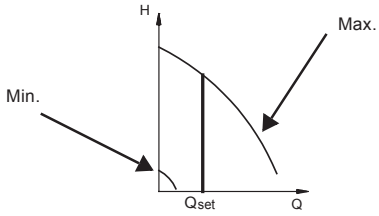

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Fig. 12 Constant flow mode

In **uncontrolled**-operation mode, the pump operates according to the constant curve set, see figure below.

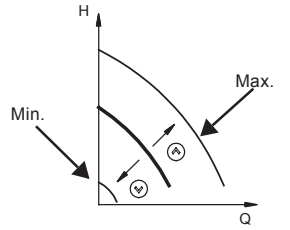

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Fig. 13 Constant curve mode

CRE, CRIE and CRNE pumps can be fitted with sensor types meeting the requirements mentioned in the data booklet titled "Grundfos E-pumps".

CR(E) 1s, 1, 3, 5, 10, 15 and 20

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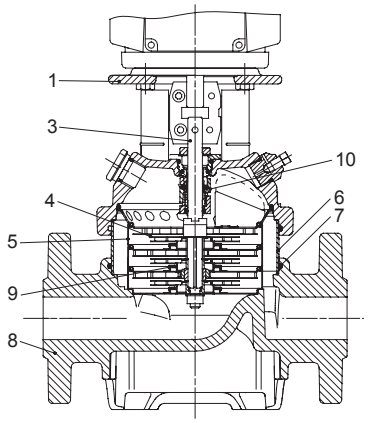
Sectional drawing



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Materials: CR(E)

Pos.	Designation	Materials	EN/DIN	AISI/ASTM
1	Pump head	Cast iron EN-GJL-200	EN-JL1030	ASTM 25B
3	Shaft	Stainless steel	1.4401	AISI 316 AISI 431
4	Impeller	Stainless steel	1.4301	AISI 304
5	Chamber	Stainless steel	1.4301	AISI 304
6	Outer sleeve	Stainless steel	1.4301	AISI 304
7	O-ring for outer sleeve	EPDM or FKM		
8	Base	Cast iron EN-GJL-200	EN-JL1030	ASTM 25B
9	Neck ring	PTFE		
10	Shaft seal			
	Rubber parts	EPDM or FKM		

CRI(E), CRN(E) 1s, 1, 3, 5, 10, 15 and 20

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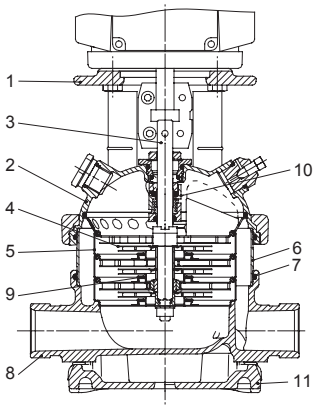
Sectional drawing



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Materials: CRI(E), CRN(E)

Pos.	Designation	Materials	EN/DIN	AISI/ASTM
1	Pump head	Cast iron EN-GJL-200 1)	EN-JL1030	ASTM 25B
2	Pump head cover	Stainless steel	1.4408	CF 8M eq. to AISI 316
3	Shaft	Stainless steel	1.4401 2) 1.4460 3)	AISI 316 AISI 329
8	Base	Stainless steel	1.4408	CF 8M eq. to AISI 316
9	Neck ring	PTFE		
10	Shaft seal	Cartridge type		
11	Base plate	Cast iron EN-GJL-200 1)	EN-JL1030	ASTM 25B
	Rubber parts	EPDM or FKM		
		CRI(E)		
4	Impeller	Stainless steel	1.4301	AISI 304
5	Chamber	Stainless steel	1.4301	AISI 304
6	Outer sleeve	Stainless steel	1.4301	AISI 304
7	O-ring for outer sleeve	EPDM or FKM		
		CRN(E)		
4	Impeller	Stainless steel	1.4401	AISI 316
5	Chamber	Stainless steel	1.4401	AISI 316
6	Outer sleeve	Stainless steel	1.4401	AISI 316
7	O-ring for outer sleeve	EPDM or FKM		

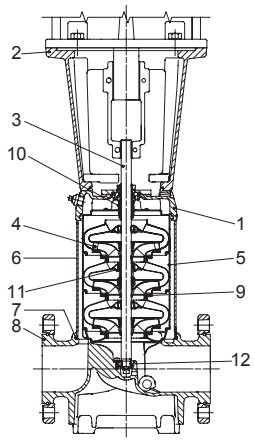
1) Stainless steel available on request.
2) CRI(E), CRN(E) 1S, 1, 3, 5
3) CRI(E), CRN(E) 10, 15, 20

Construction

CR(E) 32, 45, 64 and 90

TM01 2150 1298 - GR5952

Sectional drawing



TM01 1836 1403

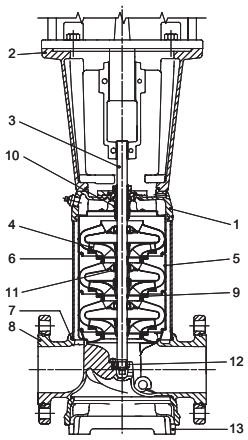
Materials: CR(E)

Pos.	Designation	Materials	EN/DIN	AISI/ASTM
1	Pump head	Cast iron EN-GJS-500-7	EN-JS1050	ASTM 80-55-06
2	Motor stool	Cast iron EN-GJL-200	EN-JL1030	ASTM 25B
3	Shaft	Stainless steel	1.4057	AISI 431
4	Impeller	Stainless steel	1.4301	AISI 304
5	Chamber	Stainless steel	1.4301	AISI 304
6	Outer sleeve	Stainless steel	1.4301	AISI 304
7	O-ring for outer sleeve	EPDM or FKM		
8	Base	Cast iron EN-GJS-500-7	EN-JS1050	ASTM 80-55-06
9	Neck ring	Carbon-graphite filled PTFE		
10	Shaft seal			
11	Bearing ring	Bronze		
12	Bottom bearing ring	Tungsten carbide/Tungsten carbide		
	Rubber parts	EPDM or FKM		

CRN(E) 32, 45, 64 and 90

TM02 7399 3403

Sectional drawing



TM01 1837 1403

Materials: CRN(E)

Pos.	Designation	Materials	EN/DIN	AISI/ASTM
1	Pump head	Stainless steel	1.4408	CF 8M eq. to AISI 316
2	Motor stool	Cast iron EN-GJL-200 1)	EN-JL1030	ASTM 25B
3	Shaft	Stainless steel	1.4462	
4	Impeller	Stainless steel	1.4401	AISI 316
5	Chamber	Stainless steel	1.4401	AISI 316
6	Outer sleeve	Stainless steel	1.4401	AISI 316
7	O-ring for outer sleeve	EPDM or FKM		
8	Base	Stainless steel	1.4408	CF 8M eq. to AISI 316
9	Neck ring	Carbon-graphite filled PTFE		
10	Shaft seal			
11	Bearing ring	Carbon-graphite filled PTFE		
12	Bottom bearing ring	Tungsten carbide/Tungsten carbide		
13	Base plate	Cast iron EN-GJS-500-7 1)	EN-JS1050	ASTM 88-55-06
	Rubber parts	EPDM or FKM		

1) Stainless steel available on request.

Type keys

CR(E), CRI(E), CRN(E)

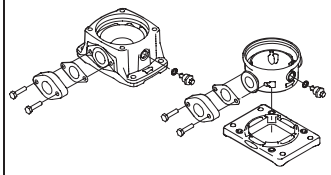
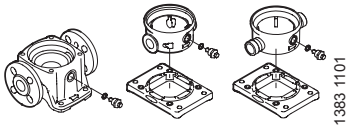
Example	CR	E	32	(s)	-4	-2	-A	-F	-G	-E	-H	QQ	E
Type range: CR, CRI, CRN													
Pump with integrated frequency control													
Flow rate [m^3/h]													
All impellers with reduced diameter (applies only to CR, CRI, CRN 1s)													
Number of impellers													
Number of reduced-diameter impellers (CR(E), CRN(E) 32, 45, 64, 90)													
Code for pump version													
Code for pipe connection													
Code for materials													
Code for rubber parts													
Code for shaft seal													

Codes

Example	A	-F	-A	-E	-H	QQ	E
Pump version							
A Basic version							
B Oversize motor							
F CR pump for high temperatures (air-cooled top assembly)							
H Horizontal version							
HS High-pressure pump with high speed MGE motor							
I Different pressure rating							
J Pump w/different max. speed							
K Pump with low NPSH							
M Magnetic drive							
N Fitted with sensor							
P Undersize motor							
R Horizontal version with bearing bracket							
SF High pressure pump							
X Special version							
Pipe connection							
A Oval flange							
B NPT thread							
CA FlexiClamp (CRI(E), CRN(E) 1, 3, 5, 10, 15, 20)							
F DIN flange							
G ANSI flange							
J JIS flange							
N Changed diameter of ports							
P PJE coupling							
X Special version							
Materials							
A Basic version							
D Carbon-graphite filled PTFE (bearings)							
G Wetted parts 1.4401/AISI 316							
GI All parts stainless steel, wetted parts 1.4401/AISI 316							
I Wetted parts 1.4301/AISI 304							
II All parts stainless steel, wetted parts 1.4301/AISI 304							
K Bronze (bearings)							
S SiC bearings + PTFE neck rings							
X Special version							
Code for rubber parts							
E EPDM							
F FXM							
K FFKM							
V FKM							
Shaft seal							
H Balanced cartridge seal							
Q Silicon carbide							
U Tungsten carbide							
B Carbon							
E EPDM							
F FXM							
K FFKM							
V FKM							

Operating and inlet pressures

Maximum operating pressure and temperature range

	Oval flange		PJE, Clamp, UNION, DIN	
	 TM02 1379 1101		 TM02 1383 1101	
	Max. permissible operating pressure	**Liquid temperature range**	**Max. permissible operating pressure**	**Liquid temperature range**
CR, CRI, CRN 1s	16 bar	–20°C to +120°C	25 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 1	16 bar	–20°C to +120°C	25 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 3	16 bar	–20°C to +120°C	25 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 5	16 bar	–20°C to +120°C	25 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 10-1 → CR(E), CRI(E), CRN(E) 10-16	16 bar	–20°C to +120°C	16 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 10-17 → CR(E), CRI(E), CRN(E) 10-22	-	-	25 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 15-1 → CR(E), CRI(E), CRN(E) 15-7	10 bar	–20°C to +120°C	-	-
CR(E), CRI(E), CRN(E) 15-1 → CR(E), CRI(E), CRN(E) 15-10	-	-	16 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 15-12 → CR(E), CRI(E), CRN(E) 15-17	-	-	25 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 20-1 → CR(E), CRI(E), CRN(E) 20-7	10 bar	–20°C to +120°C	-	-
CR(E), CRI(E), CRN(E) 20-1 → CR(E), CRI(E), CRN(E) 20-10	-	-	16 bar	–20°C to +120°C
CR(E), CRI(E), CRN(E) 20-12 → CR(E), CRI(E), CRN(E) 20-17	-	-	25 bar	–20°C to +120°C
CR(E), CRN(E) 32-1-1 → CR(E), CRN(E) 32-7	-	-	16 bar	–30°C to +120°C
CR(E), CRN(E) 32-8-2 → CR(E), CRN(E) 32-14	-	-	30 bar	–30°C to +120°C
CR(E), CRN(E) 45-1-1 → CR(E), CRN(E) 45-5	-	-	16 bar	–30°C to +120°C
CR(E), CRN(E) 45-6-2 → CR, CRN 45-11	-	-	30 bar	–30°C to +120°C
CR, CRN 45-12-2 → CR, CRN 45-13-2	-	-	33 bar	–30°C to +120°C
CR(E), CRN(E) 64-1-1 → CR(E), CRN(E) 64-5	-	-	16 bar	–30°C to +120°C
CR, CRN 64-6-2 → CR, CRN 64-8-1	-	-	30 bar	–30°C to +120°C
CR(E), CRN(E) 90-1-1 → CR(E), CRN(E) 90-4	-	-	16 bar	–30°C to +120°C
CR, CRN 90-5-2 → CR, CRN 90-6	-	-	30 bar	–30°C to +120°C

Operating range of the shaft seal

The operating range of the shaft seal depends on operating pressure, pump type, type of shaft seal and liquid temperature. The following curves apply to clean water and water with anti-freeze liquids. For selecting the right shaft seal, see 'List of pumped liquids' page 68.

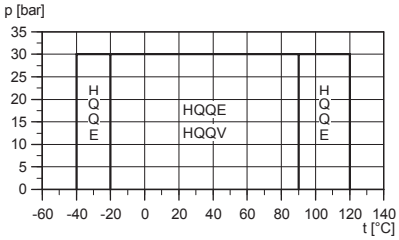


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Fig. 14 Operating range of standard shaft seals

Shaft seal	Description	Max. temp. range [°C]
HQQE	O-ring (cartridge) (balanced seal), SiC/SiC, EPDM	–40°C to +120°C
HQQV	O-ring (cartridge) (balanced seal), SiC/SiC, FKM	–20°C to +90°C

In case of extreme temperatures, i.e.

- low temperatures down to –40°C or
- high temperatures up to +180°C,

see "List of variants - on request" on page 79.

Operating and inlet pressures

Maximum inlet pressure

The following table shows the maximum permissible inlet pressure. However, the current inlet pressure + the pressure against a closed valve **must** always be lower than the maximum permissible operating pressure.

If the maximum permissible operating pressure is exceeded, the conical bearing in the motor may be damaged and the life of the shaft seal reduced.

CR, CRI, CRN 1s		
1s-2	› 1s-36	10 bar
CR(E), CRI(E), CRN(E) 1		
1-2	› 1-36	10 bar
CR(E), CRI(E), CRN(E) 3		
3-2	› 3-29	10 bar
3-31	› 3-36	15 bar
CR(E), CRI(E), CRN(E) 5		
5-2	› 5-16	10 bar
5-18	› 5-36	15 bar
CR(E), CRI(E), CRN(E) 10		
10-1	› 10-6	8 bar
10-7	› 10-22	10 bar
CR(E), CRI(E), CRN(E) 15		
15-1	› 15-3	8 bar
15-4	› 15-17	10 bar
CR(E), CRI(E), CRN(E) 20		
20-1	› 20-3	8 bar
20-4	› 20-17	10 bar
CR(E), CRN(E) 32		
32-1-1	› 32-4	4 bar
32-5-2	› 32-10	10 bar
32-11	› 32-14	15 bar
CR(E), CRN(E) 45		
45-1-1	› 45-2	4 bar
45-3-2	› 45-5	10 bar
45-6-2	› 45-13-2	15 bar
CR(E), CRN(E) 64		
64-1-1	› 64-2-2	4 bar
64-2-1	› 64-4-2	10 bar
64-4-1	› 64-8-1	15 bar
CR(E), CRN(E) 90		
90-1-1	› 90-1	4 bar
90-2-2	› 90-3-2	10 bar
90-3	› 90-6	15 bar

Examples of operating and inlet pressures

The values for operating and inlet pressures shown in the table must not be considered individually but must always be compared, see the following examples:

Example 1:

The following pump type has been selected:
CR 5-16 A-A-A

Max. operating pressure: **16 bar**
Max. inlet pressure: **10 bar**

Discharge pressure against a closed valve: **10.6 bar,** see page 41.

This pump is **not** allowed to start at an inlet pressure of 10 bar, but at an inlet pressure of 16.0 – 10.6 = **5.4 bar.**

Example 2:

The following pump type has been selected:
CR 10-2 A-A-A

Max. operating pressure: **16 bar**
Max. inlet pressure: **8.0 bar**

Discharge pressure against a closed valve: **2.0 bar**, see page 73.

This pump is allowed to start at an inlet pressure of 8.0 bar, as the discharge pressure against a closed valve is only 2.0 bar, which results in an operating pressure of 8.0 + 2.0 = **10.0 bar**. On the contrary, the max. operating pressure of this pump is limited to 16.0 bar, as a higher operating pressure will require an inlet pressure of more than 8.0 bar.

In case the inlet or operating pressure exceeds the pressure permitted, see "Lists of variants - on request" page 79.

Selection of pumps

Selection of pumps should be based on:

- The duty point of the pump (see section 1)
- Dimensional data such as pressure loss as a result of height differences, friction loss in the pipework, pump efficiency etc. (see section 2)
- Pump materials (see section 3)
- Pump connections (see section 4)
- Shaft seal (see section 5).

1. Duty point of the pump

From a duty point it is possible to select a pump on the basis of the curve charts shown in "Performance curves" from page 29.

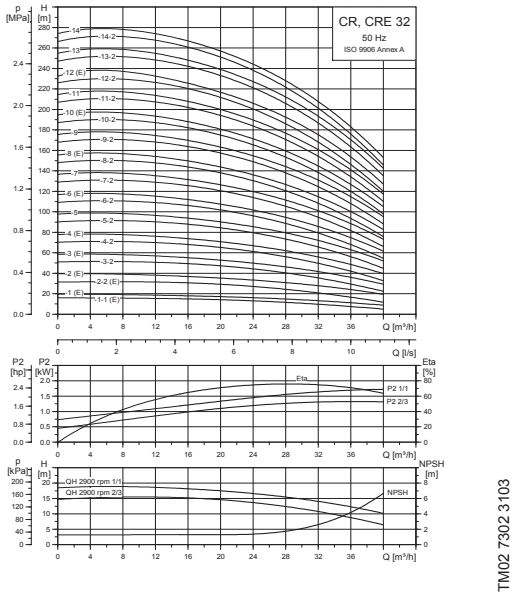

Fig. 15 Example of a curve chart

2. Dimensional data

When sizing a pump the following must be taken into account:

- Required flow and pressure at the draw-off point.
- Pressure loss as a result of height differences (H_{geo}).
- Friction loss in the pipework (H_f).
  It may be necessary to account for pressure loss in connection with long pipes, bends or valves, etc.
- Best efficiency at the estimated duty point.
- NPSH value.
  For calculation of the NPSH value, see "Minimum inlet pressure - NPSH", page 20.

Pump efficiency

Before determining the best efficiency point, the operation pattern of the pump needs to be identified.

Is the pump expected to operate at the **same** duty point, then select a CR pump which is operating at a duty point corresponding with the best efficiency of the pump.

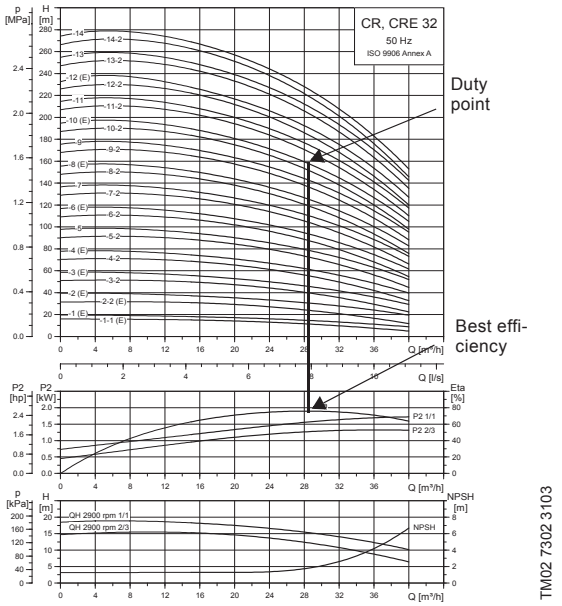

Fig. 16 Example of a CR pump's duty point

As the pump is sized on the basis of the highest possible flow, it is important always to have the duty point to the right on the efficiency curve (eta) in order to keep efficiency high when the flow drops.

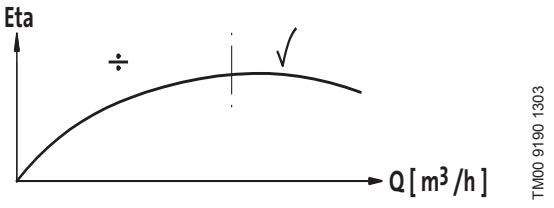

Fig. 17 Best efficiency

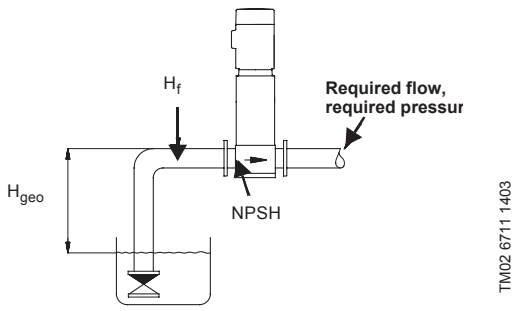

Fig. 18 Dimensional data

Normally, E-pumps are used in applications characterized by a **variable** flow. Consequently, it is not possible to select a pump that is constantly operating at optimum efficiency.

In order to achieve optimum operating economy, the pump should be selected on the basis of the following criteria:

- The max. duty point required should be as close as possible to the QH curve of the pump.
- The required duty point should be positioned so that P_2 is close to the max. point of the QH curve.

Between the min. and max. performance curve E-pumps have an infinite number of performance curves each representing a specific speed. Therefore it may not be possible to select a duty point close to the 100% curve.

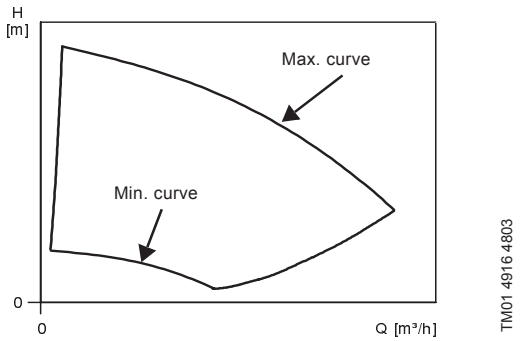

Fig. 19 Min. and max. performance curves

In situations where it is not possible to select a duty point close to the 100% curve the below affinity equations can be used. The head (H), the flow (Q) and the input power (P) are all the appropriate variables for the motor speed (n).

Note:

The approximated formulas apply on condition that the system characteristic remains unchanged for n_n and n_x and that it is based on the formula $H = k \times Q^2$, where k is a constant.

The power equation implies that the pump efficiency is unchanged at the two speeds. In practice this is **not** quite correct.

Finally, it is worth noting that the efficiencies of the frequency converter and the motor **must** be taken into account if a precise calculation of the power saving resulting from a reduction of the pump speed is wanted.

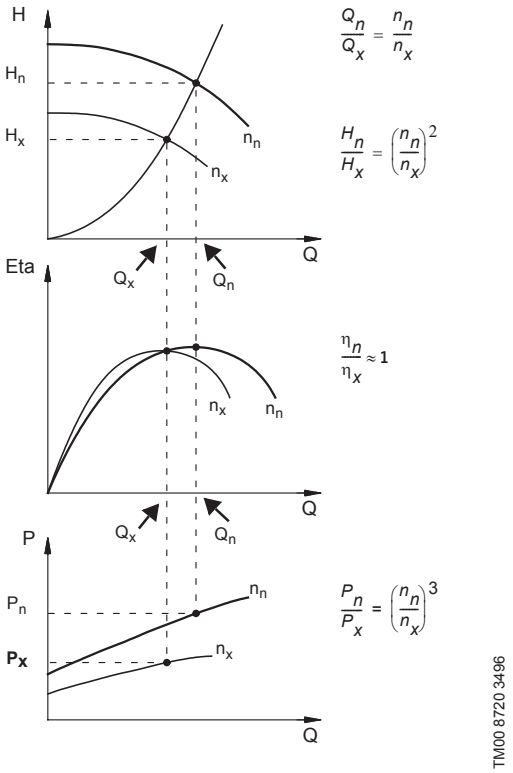

Fig. 20 Affinity equations

Legend

H_n	Rated head in metres
H_x	Current head in metres
Q_n	Rated flow in m^3/h
Q_x	Current flow in m^3/h
n_n	Rated motor speed in min^{-1} (n_n = 2900 min^{-1})
n_x	Current motor speed in min^{-1}
η_n	Rated efficiency in %
η_x	Current efficiency in %

WinCAPS and WebCAPS

WinCAPS and WebCAPS are both selection programmes offered by Grundfos.

The two programmes make it possible to calculate an E-pump's specific duty point and energy consumption.

By entering the dimensional data of the pump, WinCAPS and WebCAPS can calculate the exact duty point and energy comsumption. For further information see page 80 and page 81.

3. Pump material

The material variant (CR(E), CRI(E), CRN(E)) should be selected based of the liquid to be pumped. The product range covers the following three basic types.

- The CR(E), CRI(E) pump types are suitable for clean, non-aggressive liquids such as potable water, oils, etc.
- The CRN(E) pump type is suitable for industrial liquids and acids, see" "List of pumped liquids" on page 68 or contact Grundfos.

For saline or chloride-containing liquids such as sea water, CRT(E) pumps of titanium are available.

4. Pump connections

Selection of pump connection depends on the rated pressure and pipework. To meet any requirement the CR(E), CRI(E) and CRN(E) pumps offer a wide range of flexible connections such as:

- Oval flange (BSP)
- DIN flange
- PJE coupling
- Clamp coupling
- Union (+GF+)
- Other connections on request.

5. Shaft seal

As standard, the CR(E) range is fitted with a Grundfos shaft seal (cartridge type) suitable for the most common applications.

The following key parameters **must** be taken into account, when selecting the shaft seal:

- Type of pumped liquid
- liquid temperature and
- maximum pressure.

Grundfos offers a wide range of shaft seal variants to meet specific demands see "List of pumped liquids" on page 68.

Inlet pressure and operating pressure

The limit values stated on page 15 and page 16 must **not** be exceeded as regards ...

- maximum inlet pressure and
- maximum operating pressure.

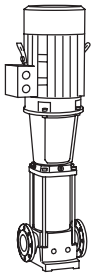

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Fig. 21 CR pump

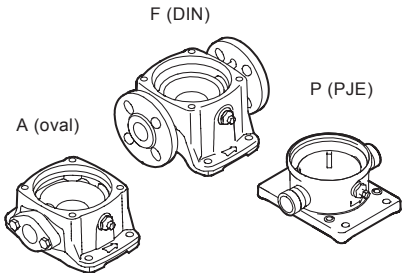

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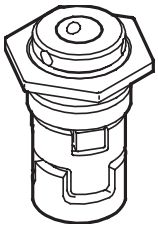
Fig. 22 Pump connections



TM02 0538 4800

Fig. 23 Shaft seal (cartridge type)

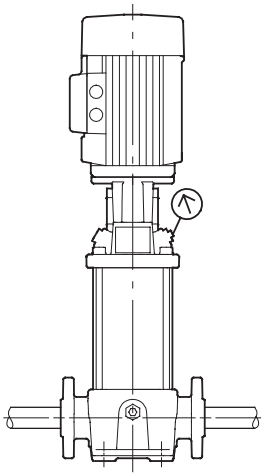


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Fig. 24 Inlet and operating pressure

Minimum inlet pressure - NPSH

Calculation of the inlet pressure "H" is recommended when

- the liquid temperature is high,
- the flow is significantly higher than the rated flow,
- water is drawn from depths,
- water is drawn through long pipes,
- inlet conditions are poor.

To avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump. The maximum suction lift "H" in metres head can be calculated as follows:

$H = p_b \times 10.2 - NPSH - H_f - H_v - H_s$

p_b = Barometric pressure in bar. (Barometric pressure can be set to 1 bar). In closed systems, p_b indicates the system pressure in bar.

NPSH = Net Positive Suction Head in metres head. (To be read from the NPSH curve at the highest flow the pump will be delivering).

H_f = Friction loss in suction pipe in metres head. (At the highest flow the pump will be delivering.)

H_v = Vapour pressure in metres head. (To be read from the vapour pressure scale. "H_v" depends on the liquid temperature "T_m").

H_s = Safety margin = minimum 0.5 metres head.

If the "H" calculated is positive, the pump can operate at a suction lift of maximum "H" metres head.

If the "H" calculated is negative, an inlet pressure of minimum "H" metres head is required.

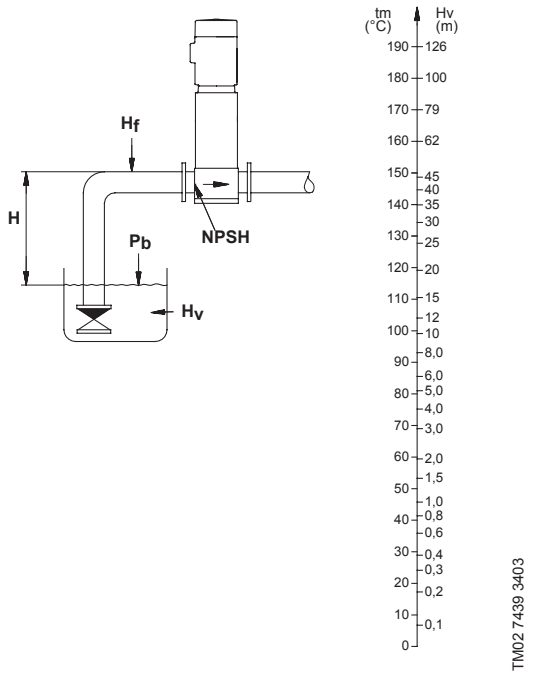


Fig. 25 Minimum inlet pressure - NPSH

Note: In order to avoid cavitation **never** select a pump with a duty point too far to the right on the NPSH curve.

Always check the NPSH value of the pump at the highest possible flow.

How to read the curve charts

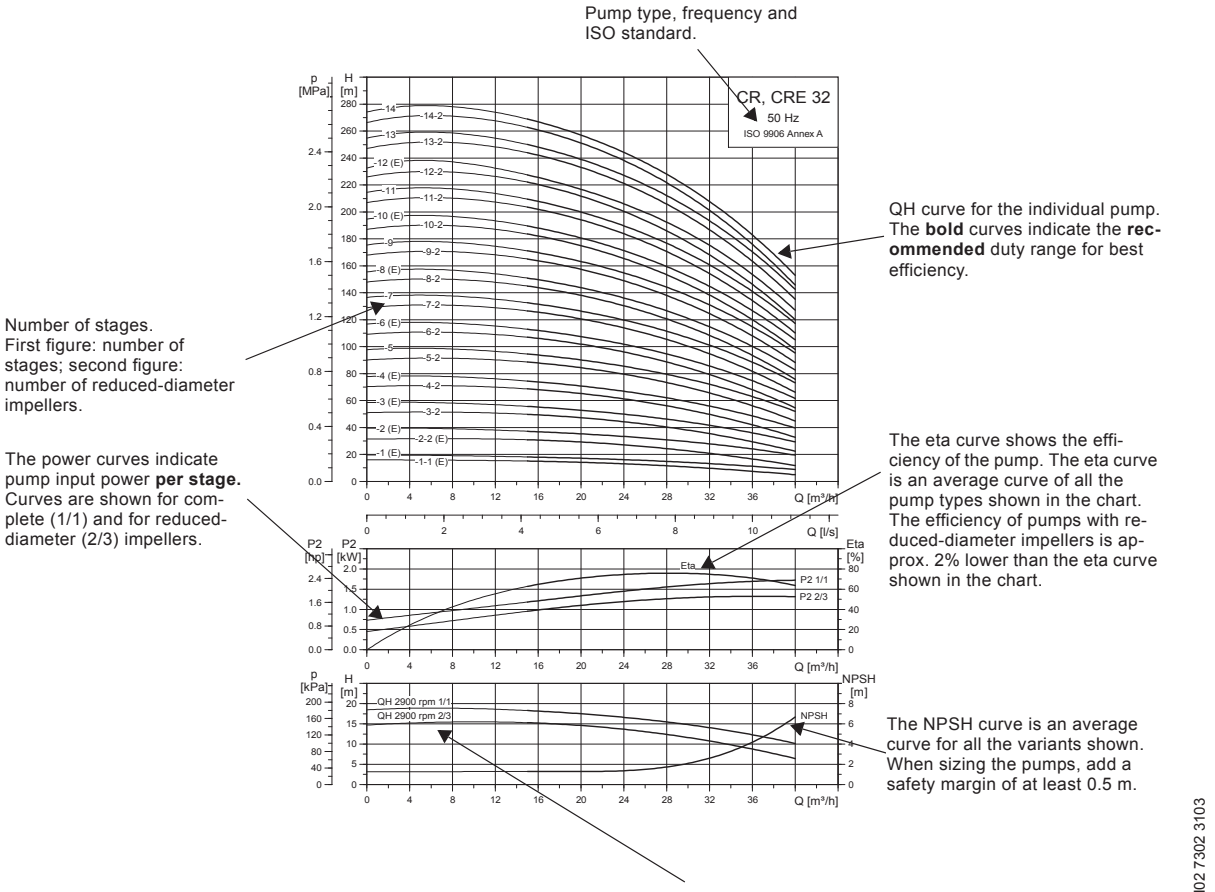


Fig. 26 How to read the curve charts

Guidelines to performance curves

The guidelines below apply to the curves shown on the following pages:

- Tolerances to ISO 9906, Annex A, if indicated.
- The motors used for the measurements are standard Grundfos motors (MG or MGE).
- Measurements have been made with airless water at a temperature of 20°C.
- The curves apply to a kinematic viscosity of $\upsilon = 1\ mm^2/s$ (1 cSt).
- Due to the risk of overheating, the pumps should not be used at a flow below the minimum flow rate.
- The QH curves apply to a rated motor speed of 2900 min^{-1}. All curves are based on current motor speeds.

The curve below shows the minimum flow rate as a percentage of the nominal flow rate in relation to the liquid temperature. The dotted line shows a CR pump fitted with an air-cooled top assembly.

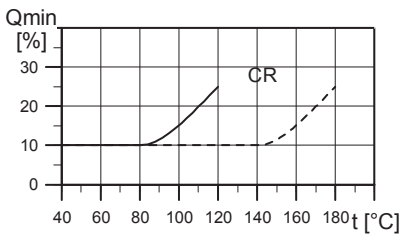
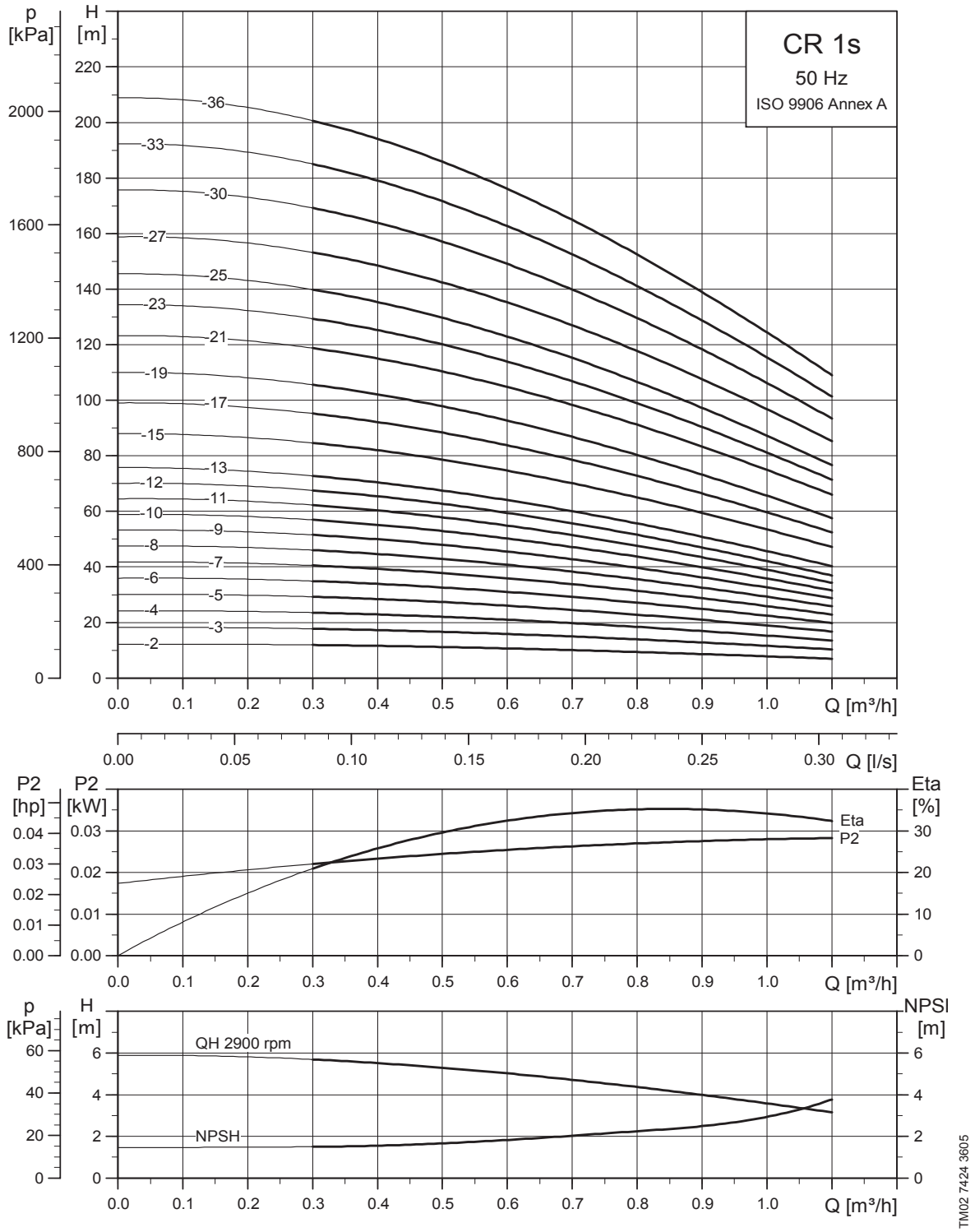


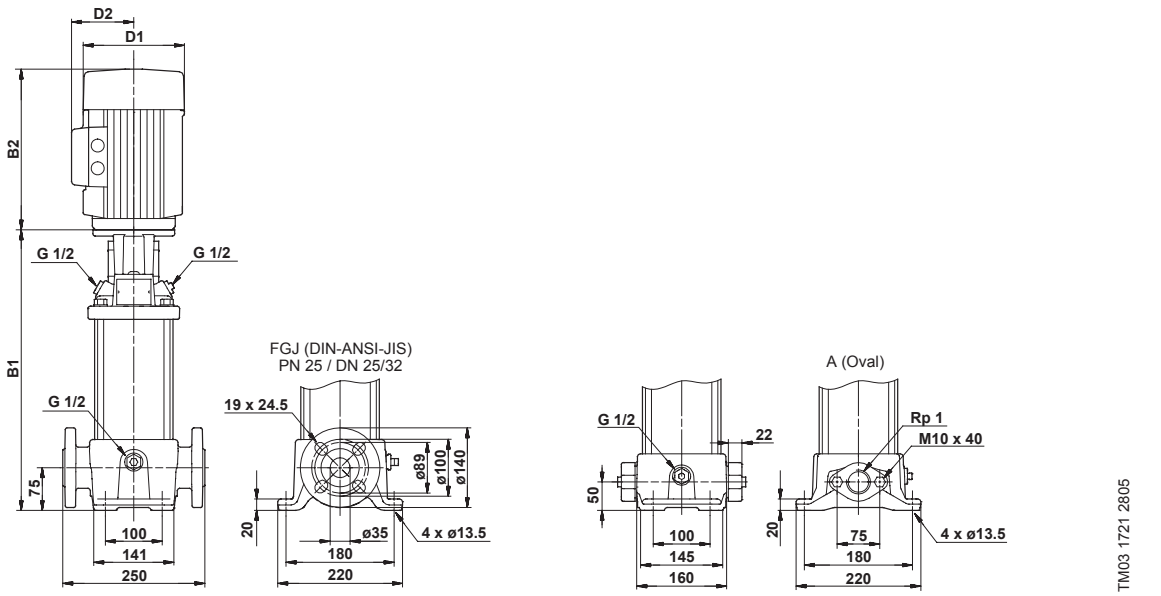
Fig. 27 Minimum flow rate

CR 1s


CR 1s
50 Hz
ISO 9906 Annex A
p [kPa]
H [m]
-36
-33
-30
-27
-25
-23
-21
-19
-17
-15
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
Q [m³/h]
Q [l/s]
P2 [hp]
P2 [kW]
Eta [%]
Eta
P2
QH 2900 rpm
NPSH
NPSH [m]
TM02 7424 3605

Technical data

Dimensional sketch

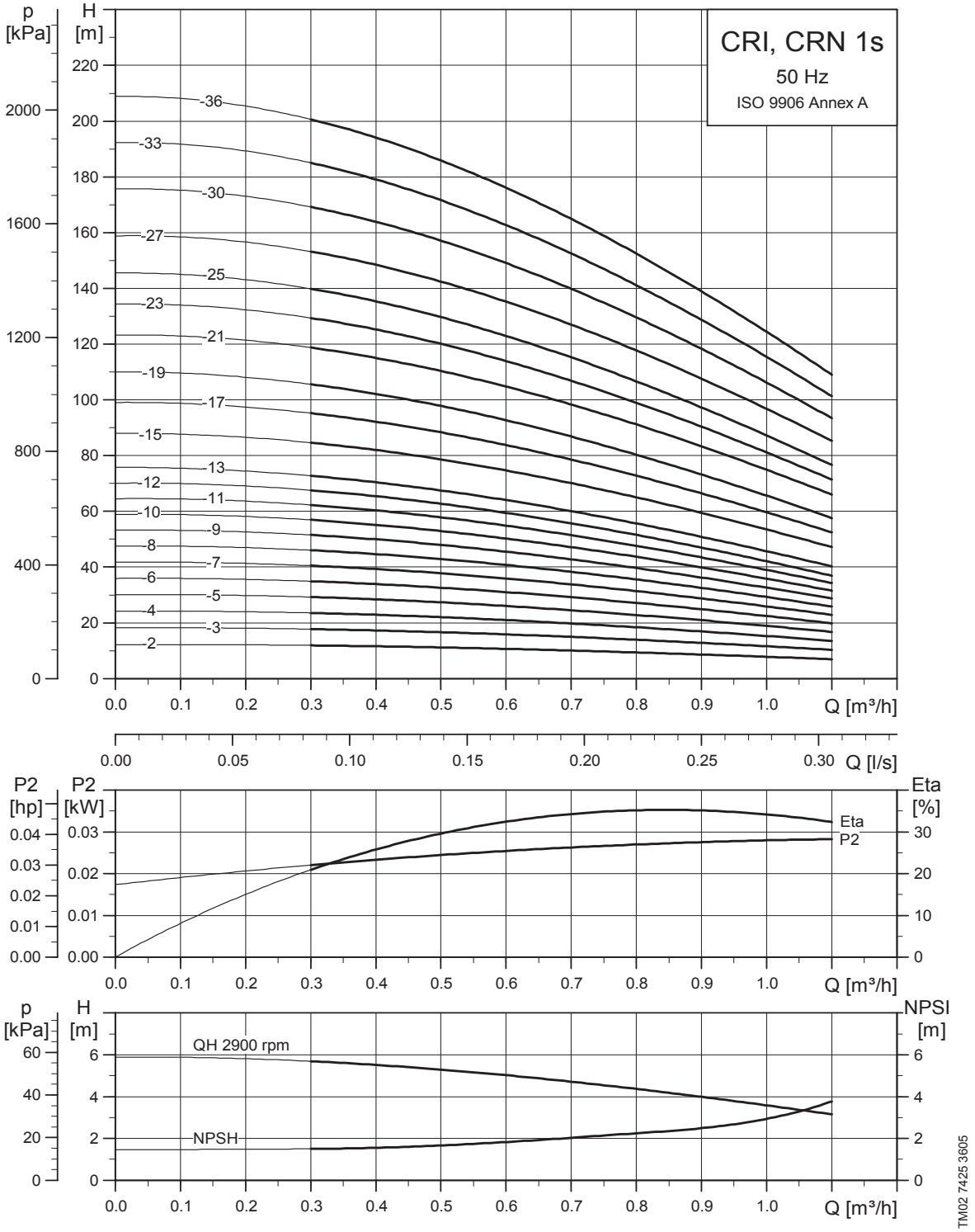


Dimensions and weights

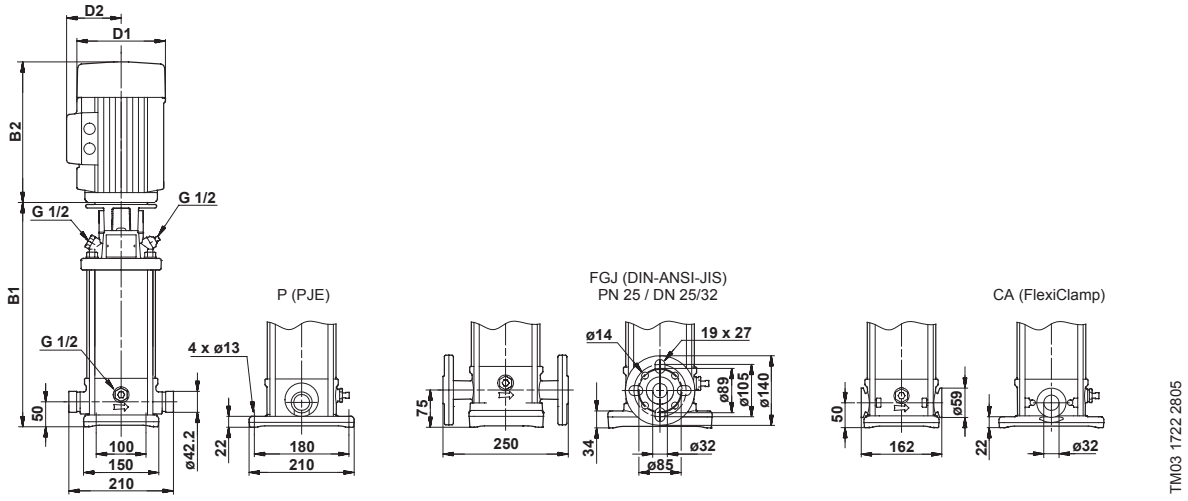
Pump type	Motor P_2 [kW]	Dimension [mm]						Net weight [kg]	
		Oval flange		DIN flange		D1	D2	Oval flange	DIN flange
		B1	B1+B2	B1	B1+B2				
CR 1s-2	0.37	254	445	279	470	141	109	18	23
CR 1s-3	0.37	254	445	279	470	141	109	18	23
CR 1s-4	0.37	272	463	297	488	141	109	19	23
CR 1s-5	0.37	290	481	315	506	141	109	19	24
CR 1s-6	0.37	308	499	333	524	141	109	19	24
CR 1s-7	0.37	326	517	351	542	141	109	20	24
CR 1s-8	0.37	344	535	369	560	141	109	20	25
CR 1s-9	0.37	362	553	387	578	141	109	21	25
CR 1s-10	0.37	380	571	405	596	141	109	21	26
CR 1s-11	0.37	398	589	423	614	141	109	21	26
CR 1s-12	0.37	416	607	441	632	141	109	22	26
CR 1s-13	0.37	434	625	459	650	141	109	22	27
CR 1s-15	0.55	470	661	495	686	141	109	24	28
CR 1s-17	0.55	506	697	531	722	141	109	25	29
CR 1s-19	0.55	542	733	567	758	141	109	25	30
CR 1s-21	0.75	584	815	609	840	141	109	28	32
CR 1s-23	0.75	620	851	645	876	141	109	29	33
CR 1s-25	0.75	656	887	681	912	141	109	29	34
CR 1s-27	1.1	692	923	717	948	141	109	32	37
CR 1s-30	1.1	-	-	771	1002	141	109	-	38
CR 1s-33	1.1	-	-	825	1056	141	109	-	39
CR 1s-36	1.1	-	-	879	1110	141	109	-	41

Performance curves

CRI, CRN 1s



Dimensional sketch

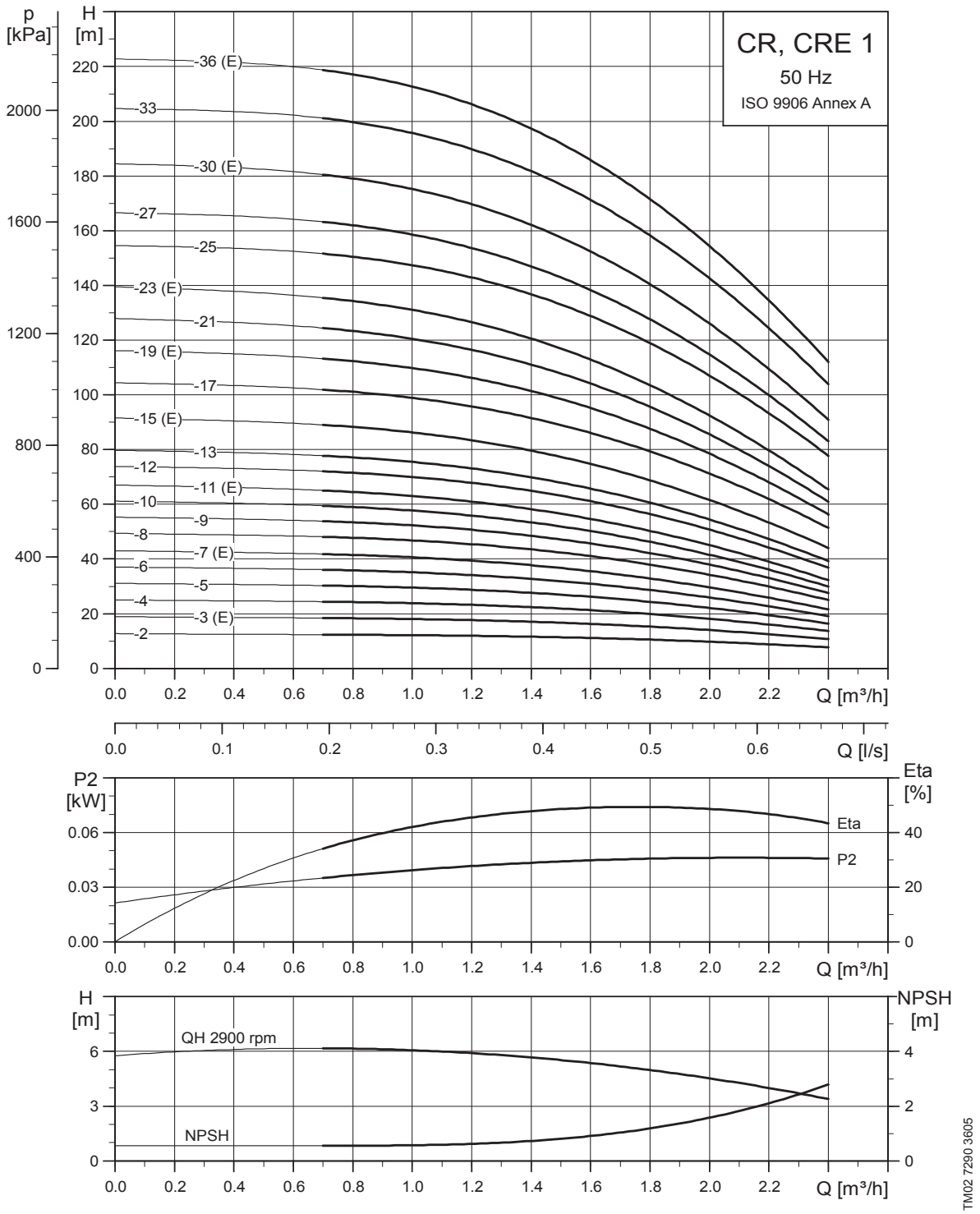


Dimensions and weights

Pump type	Motor P_2 [kW]	Dimension [mm]							Net weight [kg]	
		PJE/CA		DIN flange		B2	D1	D2	PJE/CA	DIN flange
		B1	B1+B2	B1	B1+B2					
CRI/CRN 1s-2	0.37	257	448	282	473	191	141	109	16	20
CRI/CRN 1s-3	0.37	257	448	282	473	191	141	109	16	21
CRI/CRN 1s-4	0.37	275	466	300	491	191	141	109	17	21
CRI/CRN 1s-5	0.37	293	484	318	509	191	141	109	17	21
CRI/CRN 1s-6	0.37	311	502	336	527	191	141	109	18	22
CRI/CRN 1s-7	0.37	329	520	354	545	191	141	109	18	22
CRI/CRN 1s-8	0.37	347	538	372	563	191	141	109	18	23
CRI/CRN 1s-9	0.37	365	556	390	581	191	141	109	19	23
CRI/CRN 1s-10	0.37	383	574	408	599	191	141	109	19	23
CRI/CRN 1s-11	0.37	401	592	426	617	191	141	109	19	24
CRI/CRN 1s-12	0.37	419	610	444	635	191	141	109	20	24
CRI/CRN 1s-13	0.37	437	628	462	653	191	141	109	20	25
CRI/CRN 1s-15	0.55	473	664	498	689	191	141	109	22	26
CRI/CRN 1s-17	0.55	509	700	534	725	191	141	109	23	27
CRI/CRN 1s-19	0.55	545	736	570	761	191	141	109	23	28
CRI/CRN 1s-21	0.75	587	818	612	843	231	141	109	26	31
CRI/CRN 1s-23	0.75	623	854	648	879	231	141	109	27	31
CRI/CRN 1s-25	0.75	659	890	684	915	231	141	109	28	32
CRI/CRN 1s-27	1.1	695	926	720	951	231	141	109	31	35
CRI/CRN 1s-30	1.1	749	980	774	1005	231	141	109	32	36
CRI/CRN 1s-33	1.1	803	1034	828	1059	231	141	109	33	37
CRI/CRN 1s-36	1.1	857	1088	882	1113	231	141	109	34	39

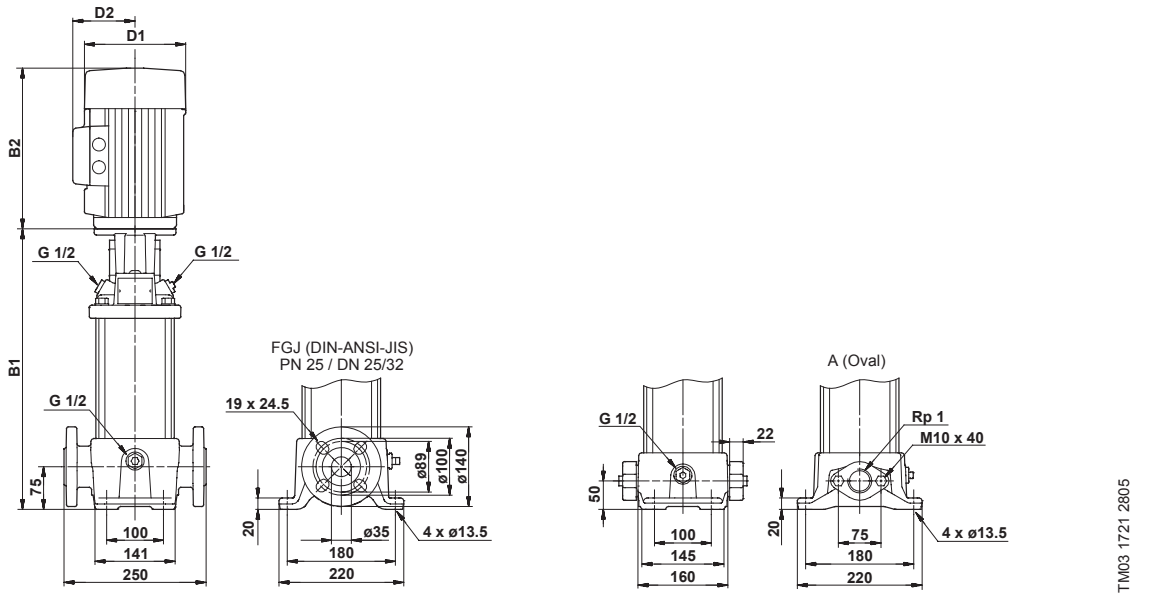
Performance curves

CR, CRE 1



Technical data

Dimensional sketch



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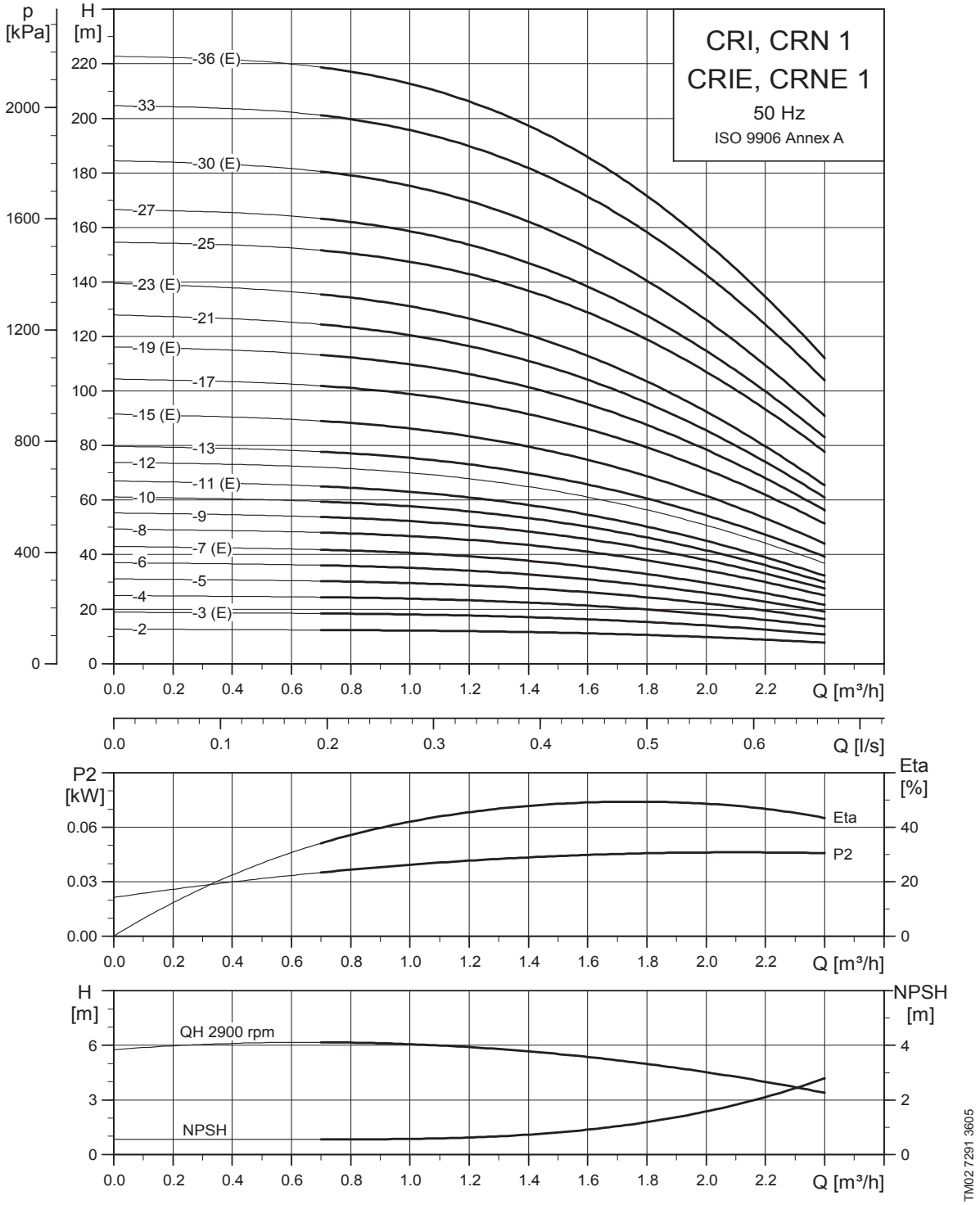
Dimensions and weights

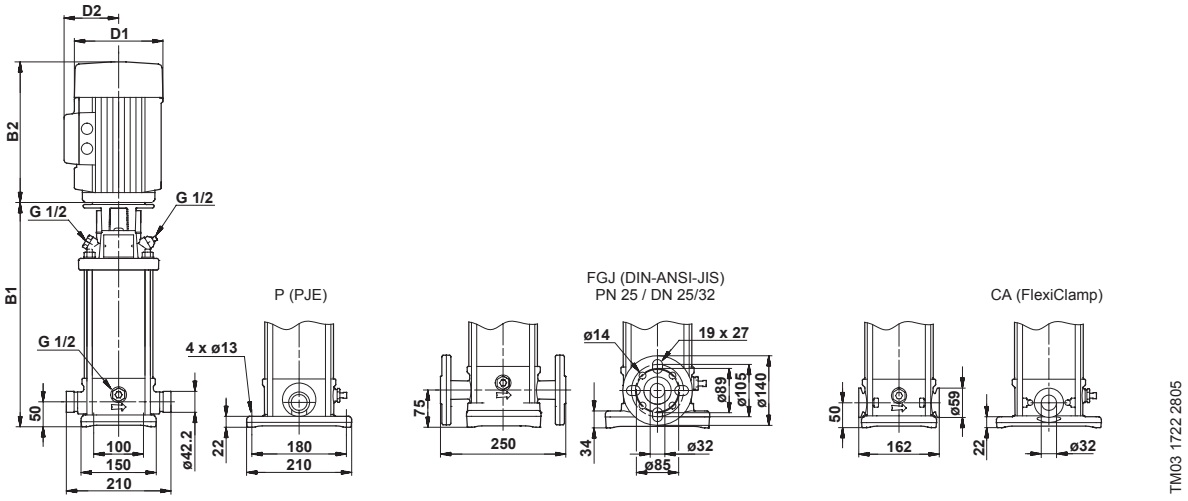
Pump type	Motor P_2 [kW]	CR								CRE							
		Dimension [mm]						Net weight [kg]		Dimension [mm]						Net weight [kg]	
		Oval flange		DIN flange		D1	D2	Oval flange	DIN flange	Oval flange		DIN flange		D1	D2	Oval flange	DIN flange
		B1	B1+B2	B1	B1+B2					B1	B1+B2	B1	B1+B2				
CR 1-2	0.37	254	445	279	470	141	109	18	23	-	-	-	-	-	-	-	-
CR(E) 1-3	0.37	254	445	279	470	141	109	18	23	254	445	279	470	141	140	19.8	23.9
CR 1-4	0.37	272	463	297	488	141	109	19	23	-	-	-	-	-	-	-	-
CR 1-5	0.37	290	481	315	506	141	109	19	24	-	-	-	-	-	-	-	-
CR 1-6	0.37	308	499	333	524	141	109	20	24	-	-	-	-	-	-	-	-
CR(E) 1-7	0.37	326	517	351	542	141	109	20	25	326	517	351	542	141	140	21.2	25.3
CR 1-8	0.55	344	535	369	560	141	109	21	26	-	-	-	-	-	-	-	-
CR 1-9	0.55	362	553	387	578	141	109	21	26	-	-	-	-	-	-	-	-
CR 1-10	0.55	380	571	405	596	141	109	22	26	-	-	-	-	-	-	-	-
CR(E) 1-11	0.55	398	589	423	614	141	109	22	27	398	589	423	614	141	140	24.0	28.1
CR 1-12	0.75	422	653	447	678	141	109	24	29	-	-	-	-	-	-	-	-
CR 1-13	0.75	440	671	465	696	141	109	25	29	-	-	-	-	-	-	-	-
CR(E) 1-15	0.75	476	707	501	732	141	109	26	30	476	707	501	732	178	167	28.7	32.7
CR 1-17	1.1	512	743	537	768	141	109	29	33	-	-	-	-	-	-	-	-
CR(E) 1-19	1.1	548	779	573	804	141	109	29	34	548	779	573	804	178	167	30.8	34.9
CR 1-21	1.1	584	815	609	840	141	109	30	35	-	-	-	-	-	-	-	-
CR(E) 1-23	1.1	620	851	645	876	141	109	31	36	620	851	645	876	178	167	32.4	36.5
CR 1-25	1.5	-	-	697	978	178	110	-	44	-	-	-	-	-	-	-	-
CR 1-27	1.5	-	-	733	1014	178	110	-	44	-	-	-	-	-	-	-	-
CR(E) 1-30	1.5	-	-	787	1068	178	110	-	46	-	-	787	1068	178	167	-	51.2
CR 1-33	2.2	-	-	841	1162	178	110	-	47	-	-	-	-	-	-	-	-
CR(E) 1-36	2.2	-	-	895	1216	178	110	-	49	-	-	895	1216	178	167	-	58.3

Performance curves

CRI, CRN, CRIE, CRNE 1



Dimensional sketch

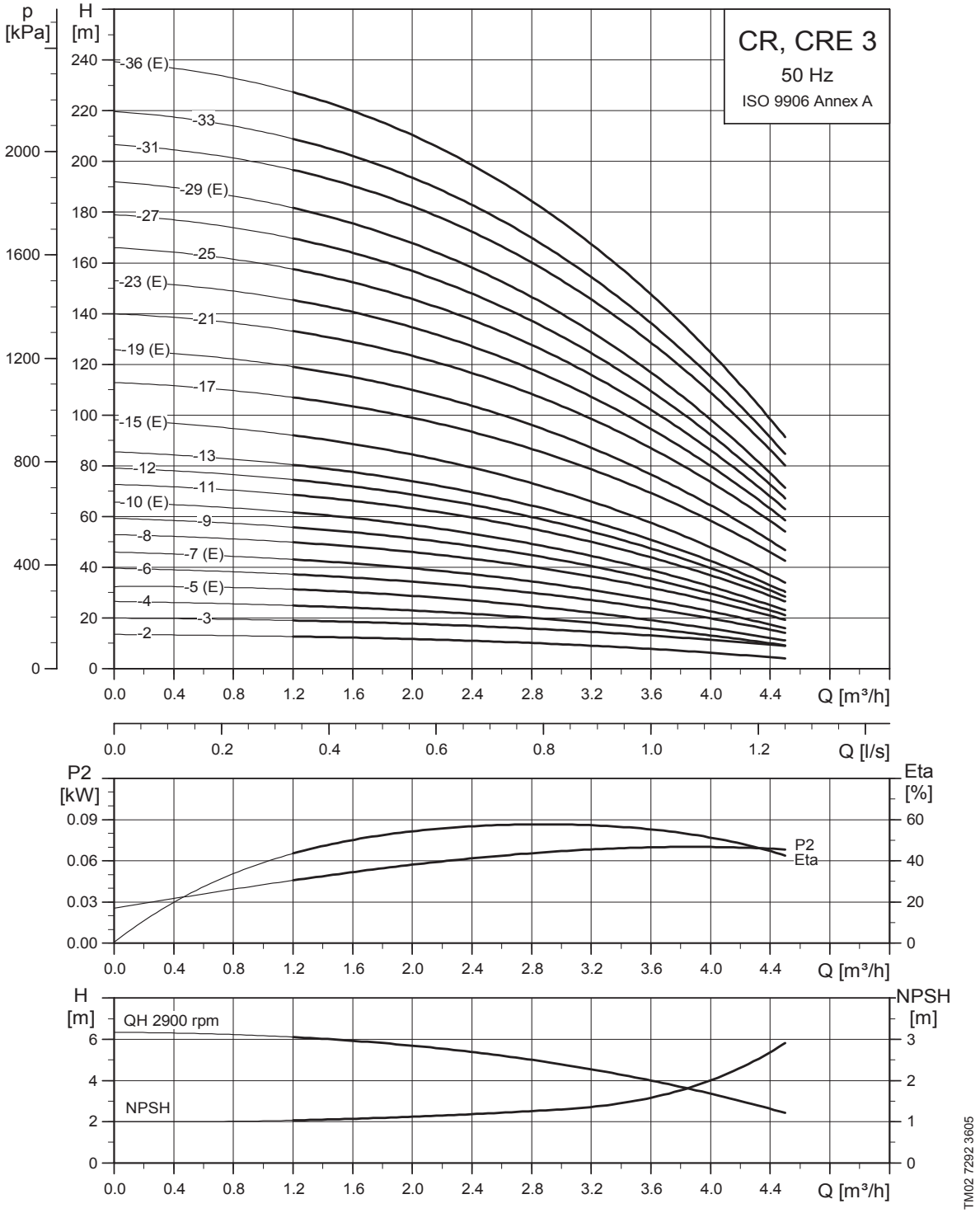


Dimensions and weights

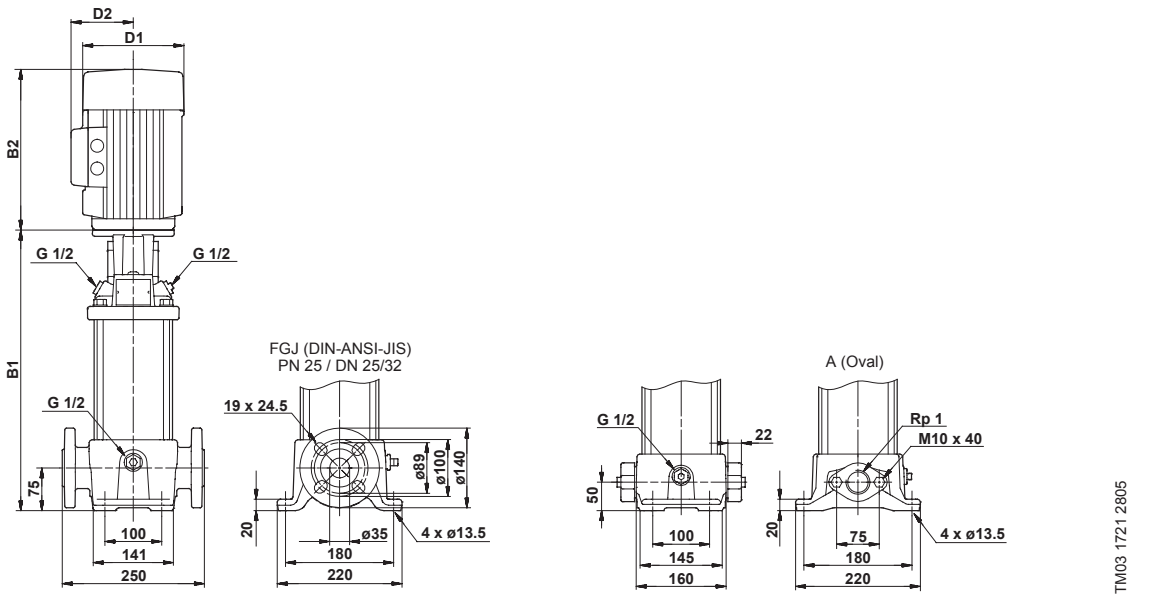
Pump type	Motor P_2 [kW]	CRI/CRN								CRIE/CRNE							
		Dimension [mm]						Net weight [kg]		Dimension [mm]						Net weight [kg]	
		PJE/CA		DIN flange		D1	D2	PJE/ CA	DIN flange	PJE/CA		DIN flange		D1	D2	PJE/ CA	DIN flange
		B1	B1+B2	B1	B1+B2					B1	B1+B2	B1	B1+B2				
CRI/CRN 1-2	0.37	257	448	282	473	141	109	16	20	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 1-3	0.37	257	448	282	473	141	109	16	21	257	448	282	473	141	140	17.0	20.6
CRI/CRN 1-4	0.37	275	466	300	491	141	109	17	21	-	-	-	-	-	-	-	-
CRI/CRN 1-5	0.37	293	484	318	509	141	109	17	21	-	-	-	-	-	-	-	-
CRI/CRN 1-6	0.37	311	502	336	527	141	109	18	22	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 1-7	0.37	329	520	354	545	141	109	18	22	329	520	354	545	141	140	18.4	22.0
CRI/CRN 1-8	0.55	347	538	372	563	141	109	19	23	-	-	-	-	-	-	-	-
CRI/CRN 1-9	0.55	365	556	390	581	141	109	20	24	-	-	-	-	-	-	-	-
CRI/CRN 1-10	0.55	383	574	408	599	141	109	20	24	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 1-11	0.55	401	592	426	617	141	109	20	24	401	592	426	617	141	140	21.2	24.8
CRI/CRN 1-12	0.75	425	656	450	681	141	109	23	27	-	-	-	-	-	-	-	-
CRI/CRN 1-13	0.75	443	674	468	699	141	109	23	28	-	-	-	-	-	-	-	-
CRI(E)/CRIN(E) 1-15	0.75	479	710	504	735	141	109	24	28	479	710	504	735	178	167	25.9	29.5
CRI/CRN 1-17	1.1	515	746	540	771	141	109	27	31	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 1-19	1.1	551	782	576	807	141	109	28	32	551	782	576	807	178	167	28.0	31.6
CRI/CRN 1-21	1.1	587	818	612	843	141	109	29	33	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 1-23	1.1	623	854	648	879	141	109	30	34	623	854	648	879	178	167	29.6	33.2
CRI/CRN 1-25	1.5	675	956	700	981	178	110	37	41	-	-	-	-	-	-	-	-
CRI/CRN 1-27	1.5	711	992	736	1017	178	110	38	42	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 1-30	1.5	765	1046	790	1071	178	110	39	43	765	1046	790	1071	178	167	44.3	47.9
CRI/CRN 1-33	2.2	819	1140	844	1165	178	110	41	45	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 1-36	2.2	873	1194	898	1219	178	110	42	46	873	1194	898	1219	178	167	51.4	55.0

Performance curves

CR, CRE 3



Dimensional sketch



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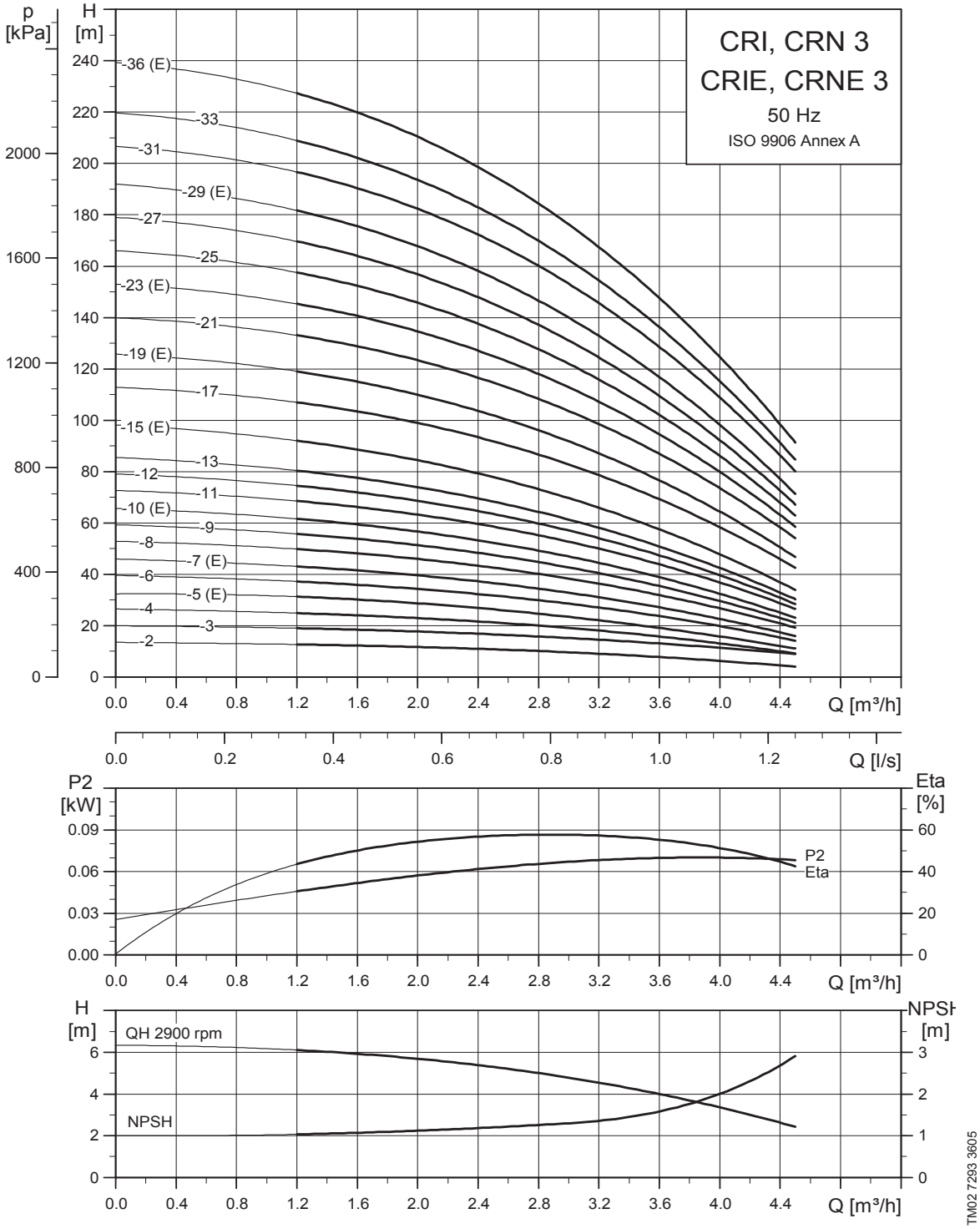
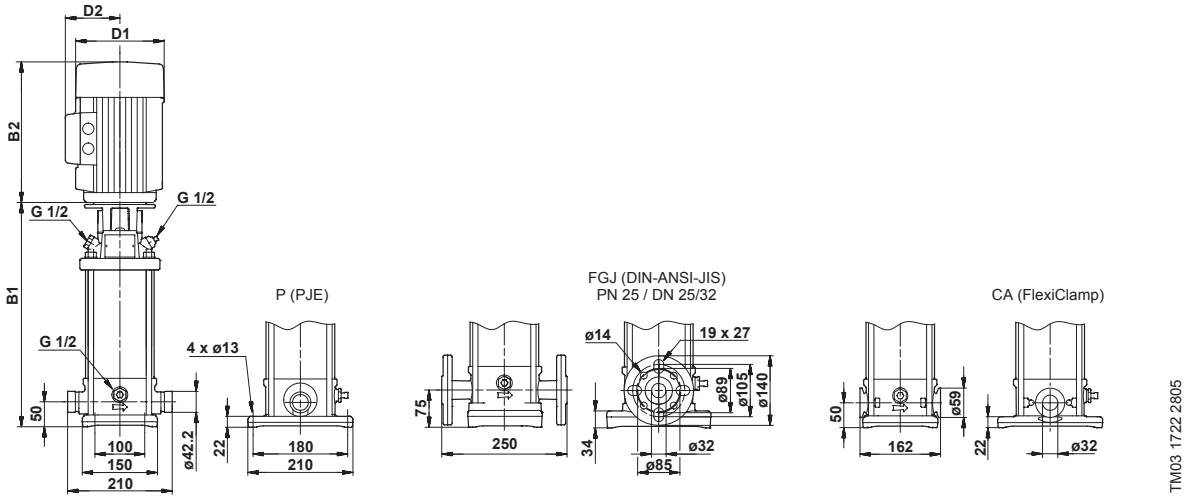
Dimensions and weights

Pump type	Motor P_2 [kW]	CR								CRE							
		Dimension [mm]						Net weight [kg]		Dimension [mm]						Net weight [kg]	
		Oval flange		DIN flange		D1	D2	Oval flange	DIN flange	Oval flange		DIN flange		D1	D2	Oval flange	DIN flange
		B1	B1+B2	B1	B1+B2					B1	B1+B2	B1	B1+B2				
CR 3-2	0.37	254	445	279	470	141	109	18	23	-	-	-	-	-	-	-	-
CR 3-3	0.37	254	445	279	470	141	109	18	23	-	-	-	-	-	-	-	-
CR 3-4	0.37	272	463	297	488	141	109	19	23	-	-	-	-	-	-	-	-
CR(E) 3-5	0.37	290	481	315	506	141	109	19	24	290	481	315	506	141	140	20.4	24.5
CR 3-6	0.55	308	499	333	524	141	109	20	25	-	-	-	-	-	-	-	-
CR(E) 3-7	0.55	326	517	351	542	141	109	21	25	326	517	351	542	141	140	21.8	25.9
CR 3-8	0.75	350	581	375	606	141	109	23	27	-	-	-	-	-	-	-	-
CR 3-9	0.75	368	599	393	624	141	109	23	28	-	-	-	-	-	-	-	-
CR(E) 3-10	0.75	386	617	411	642	141	109	24	28	386	617	411	642	178	167	26.9	31.0
CR 3-11	1.1	404	635	429	660	141	109	26	31	-	-	-	-	-	-	-	-
CR 3-12	1.1	422	653	447	678	141	109	26	31	-	-	-	-	-	-	-	-
CR 3-13	1.1	440	671	465	696	141	109	27	31	-	-	-	-	-	-	-	-
CR(E) 3-15	1.1	476	707	501	732	141	109	28	32	476	707	501	732	178	167	29.6	33.7
CR 3-17	1.5	528	809	553	834	178	110	36	40	-	-	-	-	-	-	-	-
CR(E) 3-19	1.5	564	845	589	870	178	110	37	41	564	845	589	870	178	167	42.5	46.6
CR 3-21	2.2	600	921	625	946	178	110	38	42	-	-	-	-	-	-	-	-
CR(E) 3-23	2.2	636	957	661	982	178	110	39	43	636	957	661	982	178	167	48.1	52.2
CR 3-25	2.2	-	-	697	1018	178	110	-	44	-	-	-	-	-	-	-	-
CR 3-27	2.2	-	-	733	1054	178	110	-	45	-	-	-	-	-	-	-	-
CR(E) 3-29	2.2	-	-	769	1090	178	110	-	46	-	-	769	1090	178	167	-	54.7
CR 3-31	3.0	-	-	809	1144	198	120	-	51	-	-	-	-	-	-	-	-
CR 3-33	3.0	-	-	845	1180	198	120	-	51	-	-	-	-	-	-	-	-
CR(E) 3-36	3.0	-	-	899	1234	198	120	-	53	-	-	899	1234	198	177	-	62.3

CRI, CRN, CRIE, CRNE 3



Dimensional sketch

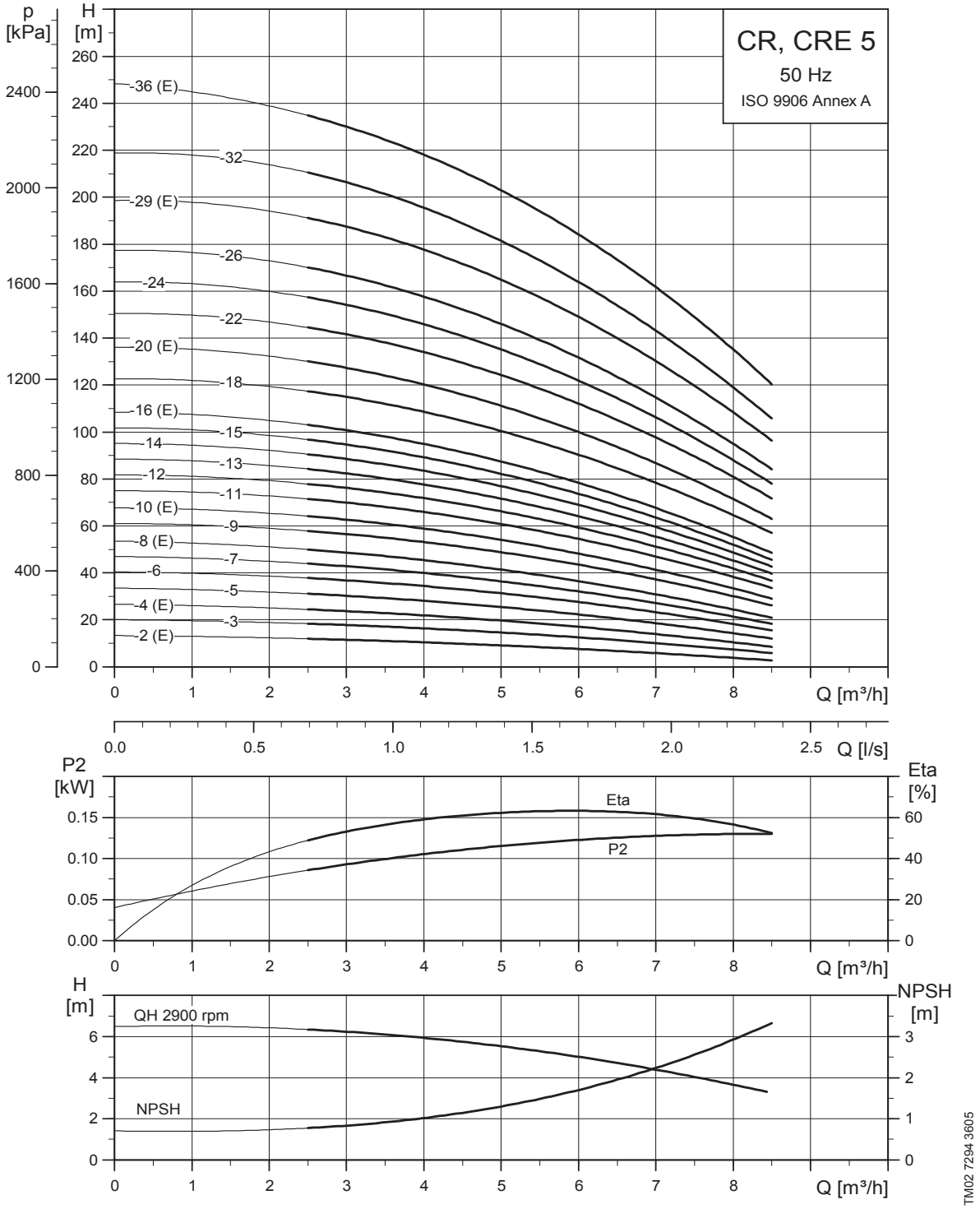


Dimensions and weights

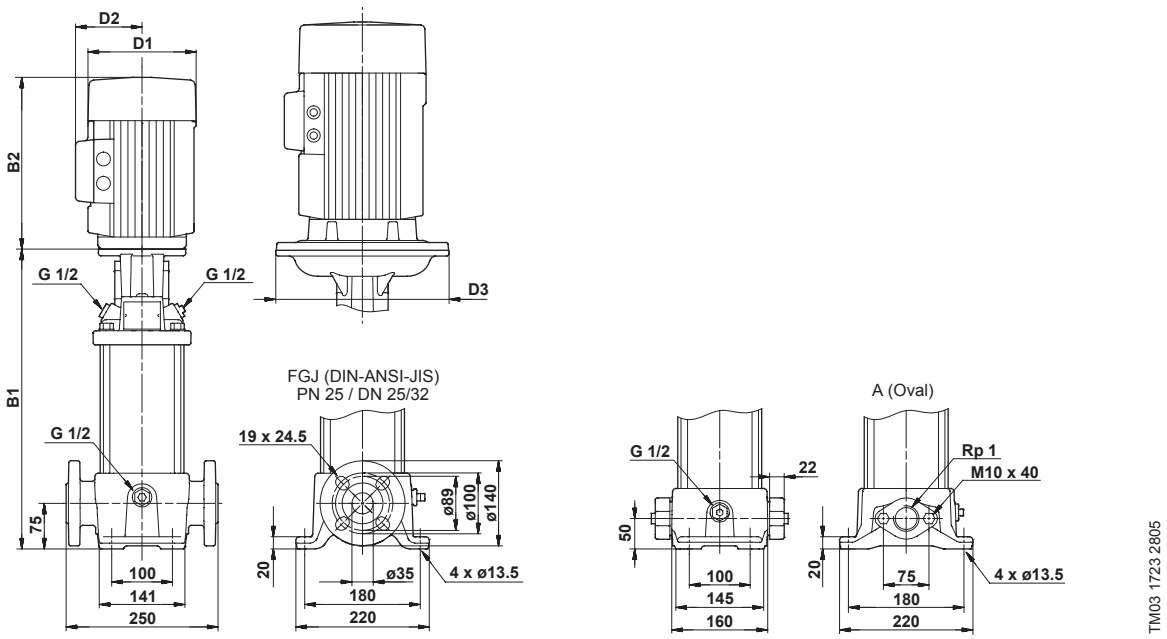
Pump type	Motor P_2 [kW]	CRI/CRN								CRIE/CRNE							
		Dimension [mm]						Net weight [kg]		Dimension [mm]						Net weight [kg]	
		PJE/CA		DIN flange		D1	D2	PJE/ CA	DIN flange	PJE/CA		DIN flange		D1	D2	PJE/ CA	DIN flange
		B1	B1+B2	B1	B1+B2					B1	B1+B2	B1	B1+B2				
CRI/CRN 3-2	0.37	257	448	282	473	141	109	16	19	-	-	-	-	-	-	-	-
CRI/CRN 3-3	0.37	257	448	282	473	141	109	16	19	-	-	-	-	-	-	-	-
CRI/CRN 3-4	0.37	275	466	300	491	141	109	17	19	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 3-5	0.37	293	484	318	509	141	109	17	20	293	484	318	509	141	140	17.6	21.2
CRI/CRN 3-6	0.55	311	502	336	527	141	109	18	21	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 3-7	0.55	329	520	354	545	141	109	19	21	329	520	354	545	141	140	19.0	22.6
CRI/CRN 3-8	0.75	353	584	378	609	141	109	21	24	-	-	-	-	-	-	-	-
CRI/CRN 3-9	0.75	371	602	396	627	141	109	22	24	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 3-10	0.75	389	620	414	645	141	109	22	25	389	620	414	645	178	167	24.1	27.7
CRI/CRN 3-11	1.1	407	638	432	663	141	109	25	27	-	-	-	-	-	-	-	-
CRI/CRN 3-12	1.1	425	656	450	681	141	109	25	28	-	-	-	-	-	-	-	-
CRI/CRN 3-13	1.1	443	674	468	699	141	109	26	28	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 3-15	1.1	479	710	504	735	141	109	26	29	479	710	504	735	178	167	26.8	30.4
CRI/CRN 3-17	1.5	531	812	556	837	178	110	34	36	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 3-19	1.5	567	848	592	873	178	110	34	37	567	848	592	873	178	167	39.7	43.3
CRI/CRN 3-21	2.2	603	924	628	949	178	110	36	38	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 3-23	2.2	639	960	664	985	178	110	37	39	639	960	664	985	178	167	45.3	48.9
CRI/CRN 3-25	2.2	675	996	700	1021	178	110	37	40	-	-	-	-	-	-	-	-
CRI/CRN 3-27	2.2	711	1032	736	1057	178	110	38	41	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 3-29	2.2	747	1068	772	1093	178	110	39	42	747	1068	772	1093	178	167	47.8	51.4
CRI/CRN 3-31	3.0	787	1122	812	1147	198	120	44	47	-	-	-	-	-	-	-	-
CRI/CRN 3-33	3.0	823	1158	848	1183	198	120	45	47	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 3-36	3.0	877	1212	902	1237	198	120	46	49	877	1212	902	1237	198	177	55.4	59.0

Performance curves

CR, CRE 5



Dimensional sketch

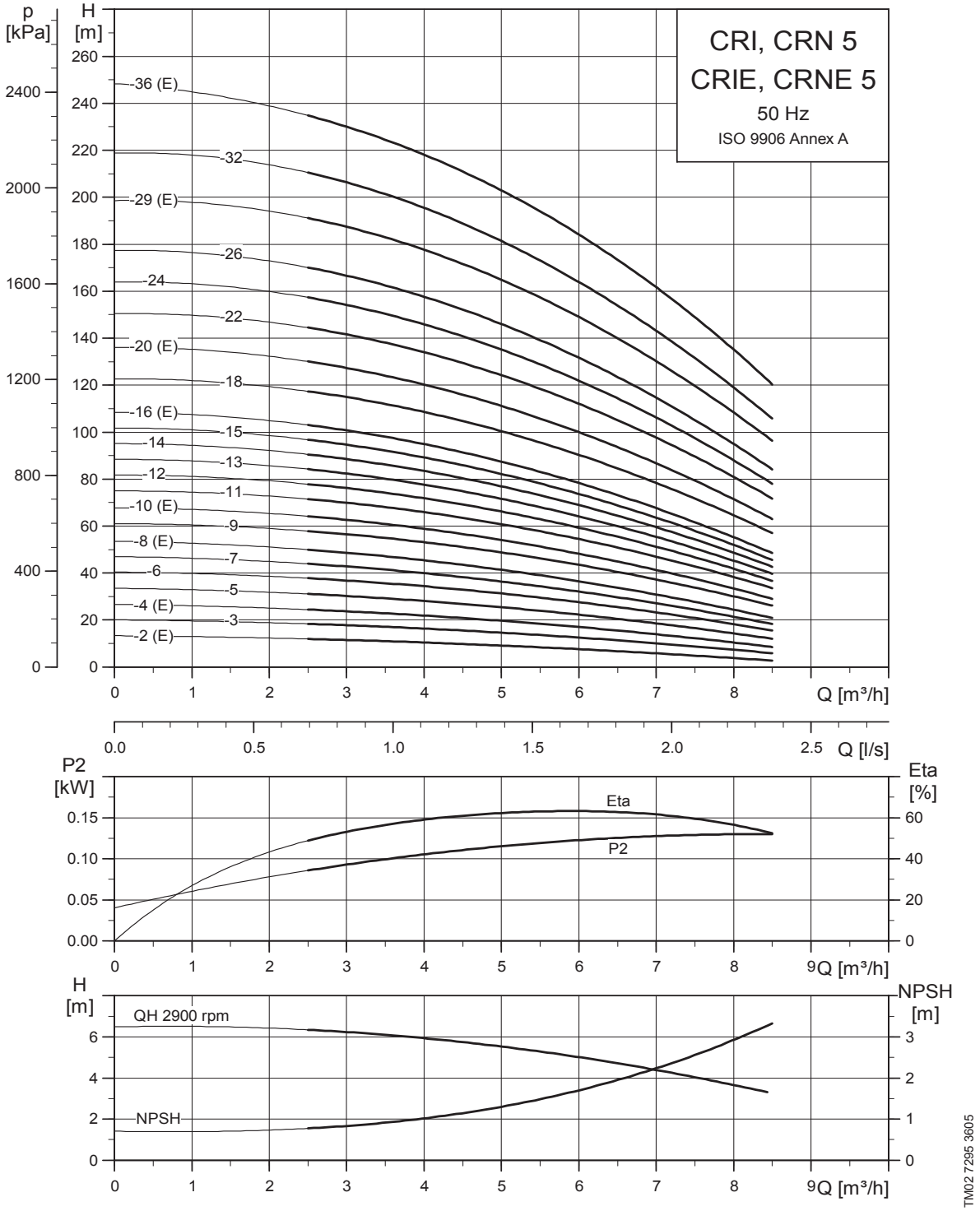


Dimensions and weights

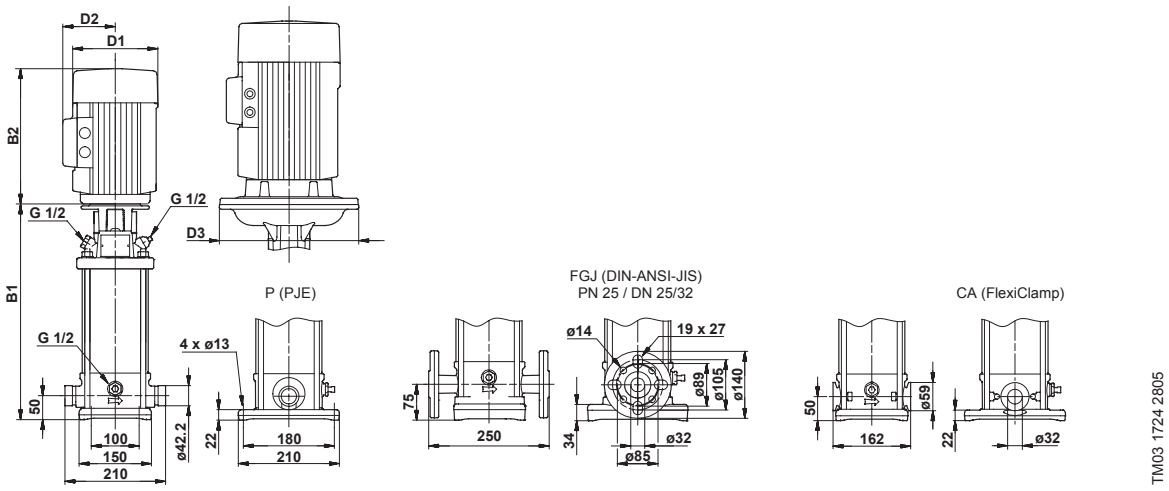
Pump type	Motor P_2 [kW]	CR									CRE								
		Dimension [mm]							Net weight [kg]		Dimension [mm]							Net weight [kg]	
		Oval flange		DIN flange		D1	D2	D3	Oval flange	DIN flange	Oval flange		DIN flange		D1	D2	D3	Oval flange	DIN flange
		B1	B1+B2	B1	B1+B2						B1	B1+B2	B1	B1+B2					
CR(E) 5-2	0.37	254	445	279	470	141	109	-	18	23	254	445	279	470	141	140	-	19.8	23.9
CR 5-3	0.55	281	472	306	497	141	109	-	20	24	-	-	-	-	-	-	-	-	-
CR(E) 5-4	0.55	308	499	333	524	141	109	-	20	25	308	499	333	524	141	140	-	21.2	25.3
CR 5-5	0.75	341	572	366	597	141	109	-	22	27	-	-	-	-	-	-	-	-	-
CR 5-6	1.1	368	599	393	624	141	109	-	25	30	-	-	-	-	-	-	-	-	-
CR 5-7	1.1	395	626	420	651	141	109	-	26	30	-	-	-	-	-	-	-	-	-
CR(E) 5-8	1.1	422	653	447	678	141	109	-	26	31	422	653	447	678	178	167	-	28.8	32.9
CR 5-9	1.5	465	746	490	771	178	110	-	34	38	-	-	-	-	-	-	-	-	-
CR(E) 5-10	1.5	492	773	517	798	178	110	-	34	39	492	773	517	798	178	167	-	41.3	45.4
CR 5-11	2.2	519	840	544	865	178	110	-	36	40	-	-	-	-	-	-	-	-	-
CR 5-12	2.2	546	867	571	892	178	110	-	36	41	-	-	-	-	-	-	-	-	-
CR 5-13	2.2	573	894	598	919	178	110	-	37	41	-	-	-	-	-	-	-	-	-
CR 5-14	2.2	600	921	625	946	178	110	-	37	42	-	-	-	-	-	-	-	-	-
CR 5-15	2.2	627	948	652	973	178	110	-	38	43	-	-	-	-	-	-	-	-	-
CR(E) 5-16	2.2	654	975	679	1000	178	110	-	38	43	654	975	679	1000	178	167	-	48.5	52.6
CR 5-18	3.0	712	1047	737	1072	198	120	-	44	48	-	-	-	-	-	-	-	-	-
CR(E) 5-20	3.0	766	1101	791	1126	198	120	-	45	50	766	1101	791	1126	198	177	-	55.1	59.2
CR 5-22	4.0	820	1194	845	1217	220	134	-	56	62	-	-	-	-	-	-	-	-	-
CR 5-24	4.0	-	-	899	1271	220	134	-	-	63	-	-	-	-	-	-	-	-	-
CR 5-26	4.0	-	-	953	1325	220	134	-	-	64	-	-	-	-	-	-	-	-	-
CR(E) 5-29	4.0	-	-	1034	1406	220	134	-	-	66	-	-	1034	1406	220	188	-	-	76.5
CR 5-32	5.5	-	-	1145	1536	220	134	300	-	82	-	-	-	-	-	-	-	-	-
CR(E) 5-36	5.5	-	-	1253	1644	220	134	300	-	84	-	-	1253	1644	220	188	-	-	95.5

Performance curves

CRI, CRN, CRIE, CRNE 5



Dimensional sketch

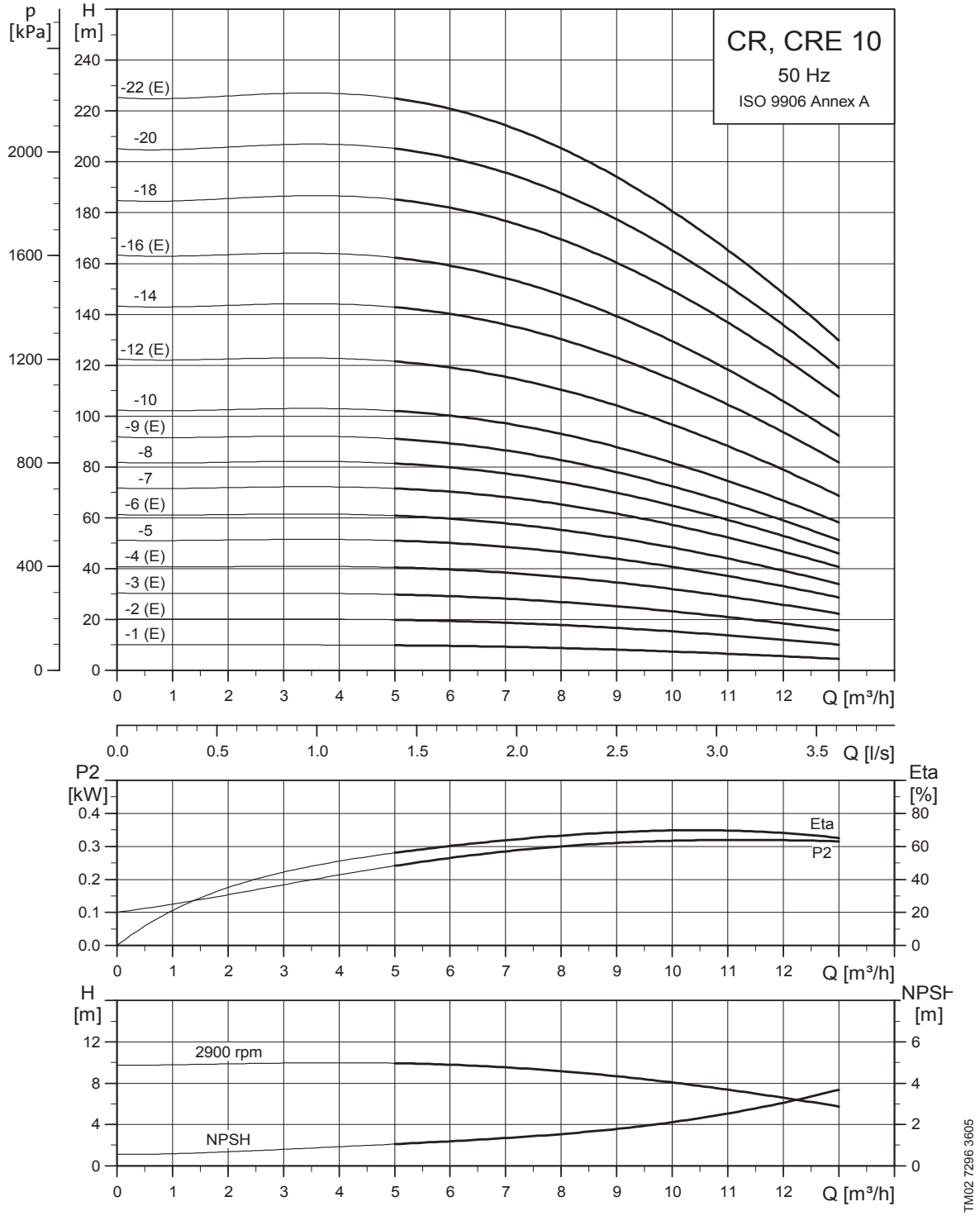


Dimensions and weights

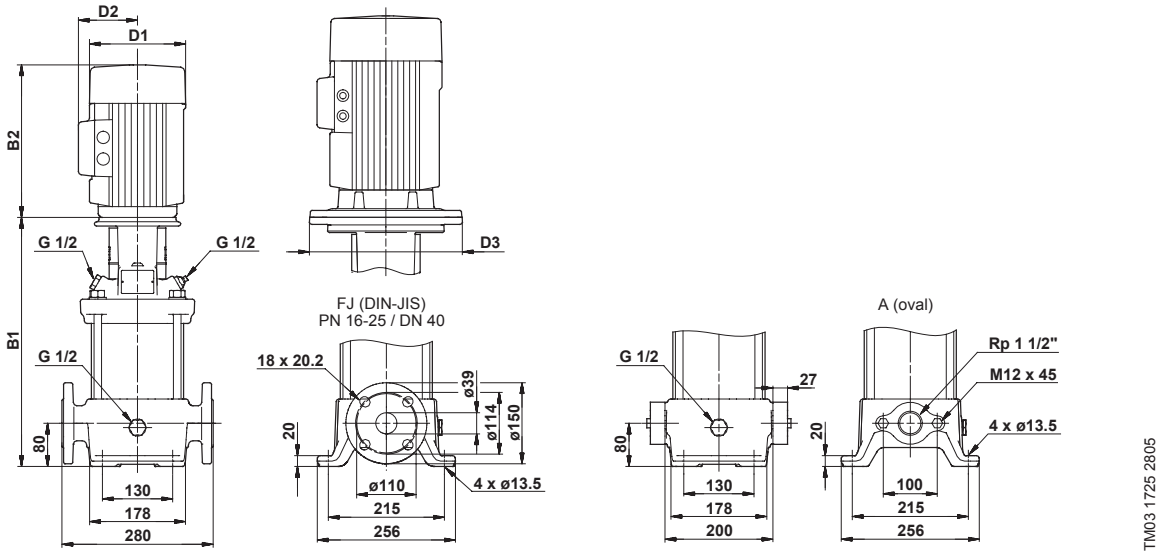
Pump type	Motor P_2 [kW]	CRI/CRN									CRIE/CRNE								
		Dimension [mm]							Net weight [kg]		Dimension [mm]							Net weight [kg]	
		PJE/CA		DIN flange		D1	D2	D3	PJE/ CA	DIN flange	PJE/CA		DIN flange		D1	D2	D3	PJE/ CA	DIN flange
		B1	B1+B2	B1	B1+B2						B1	B1+B2	B1	B1+B2					
CRI(E)/CRN(E) 5-2	0.37	257	448	282	473	141	109	-	16	21	257	448	282	473	141	140	-	17.0	20.6
CRI/CRN 5-3	0.55	284	475	309	500	141	109	-	18	22	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 5-4	0.55	311	502	336	527	141	109	-	18	22	311	502	336	527	141	140	-	18.4	22.0
CRI/CRN 5-5	0.75	344	575	369	600	141	109	-	21	25	-	-	-	-	-	-	-	-	-
CRI/CRN 5-6	1.1	371	602	396	627	141	109	-	24	28	-	-	-	-	-	-	-	-	-
CRI/CRN 5-7	1.1	398	629	423	654	141	109	-	24	28	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 5-8	1.1	425	656	450	681	141	109	-	25	29	425	656	450	681	178	167	-	26.0	29.6
CRI/CRN 5-9	1.5	468	749	493	774	178	110	-	32	36	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 5-10	1.5	495	776	520	801	178	110	-	32	37	495	776	520	801	178	167	-	38.5	42.1
CRI/CRN 5-11	2.2	522	843	547	868	178	110	-	34	38	-	-	-	-	-	-	-	-	-
CRI/CRN 5-12	2.2	549	870	574	895	178	110	-	34	38	-	-	-	-	-	-	-	-	-
CRI/CRN 5-13	2.2	576	897	601	922	178	110	-	35	39	-	-	-	-	-	-	-	-	-
CRI/CRN 5-14	2.2	603	924	628	949	178	110	-	35	40	-	-	-	-	-	-	-	-	-
CRI/CRN 5-15	2.2	630	951	655	976	178	110	-	36	40	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 5-16	2.2	657	978	682	1003	178	110	-	36	41	657	978	682	1003	178	167	-	45.7	49.3
CRI/CRN 5-18	3.0	715	1050	740	1075	198	120	-	42	46	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 5-20	3.0	769	1104	794	1129	198	120	-	43	47	769	1104	794	1129	198	177	-	52.3	55.9
CRI/CRN 5-22	4.0	823	1195	848	1220	220	134	-	55	59	-	-	-	-	-	-	-	-	-
CRI/CRN 5-24	4.0	877	1249	902	1274	220	134	-	56	61	-	-	-	-	-	-	-	-	-
CRI/CRN 5-26	4.0	931	1303	956	1328	220	134	-	58	62	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 5-29	4.0	1012	1384	1037	1409	220	134	-	59	64	1012	1384	1037	1409	220	188	-	69.6	73.2
CRI/CRN 5-32	5.5	1123	1514	1148	1539	220	134	300	75	79	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 5-36	5.5	1231	1622	1256	1647	220	134	300	77	81	1231	1622	1256	1647	220	188	-	88.6	92.2

Performance curves

CR, CRE 10



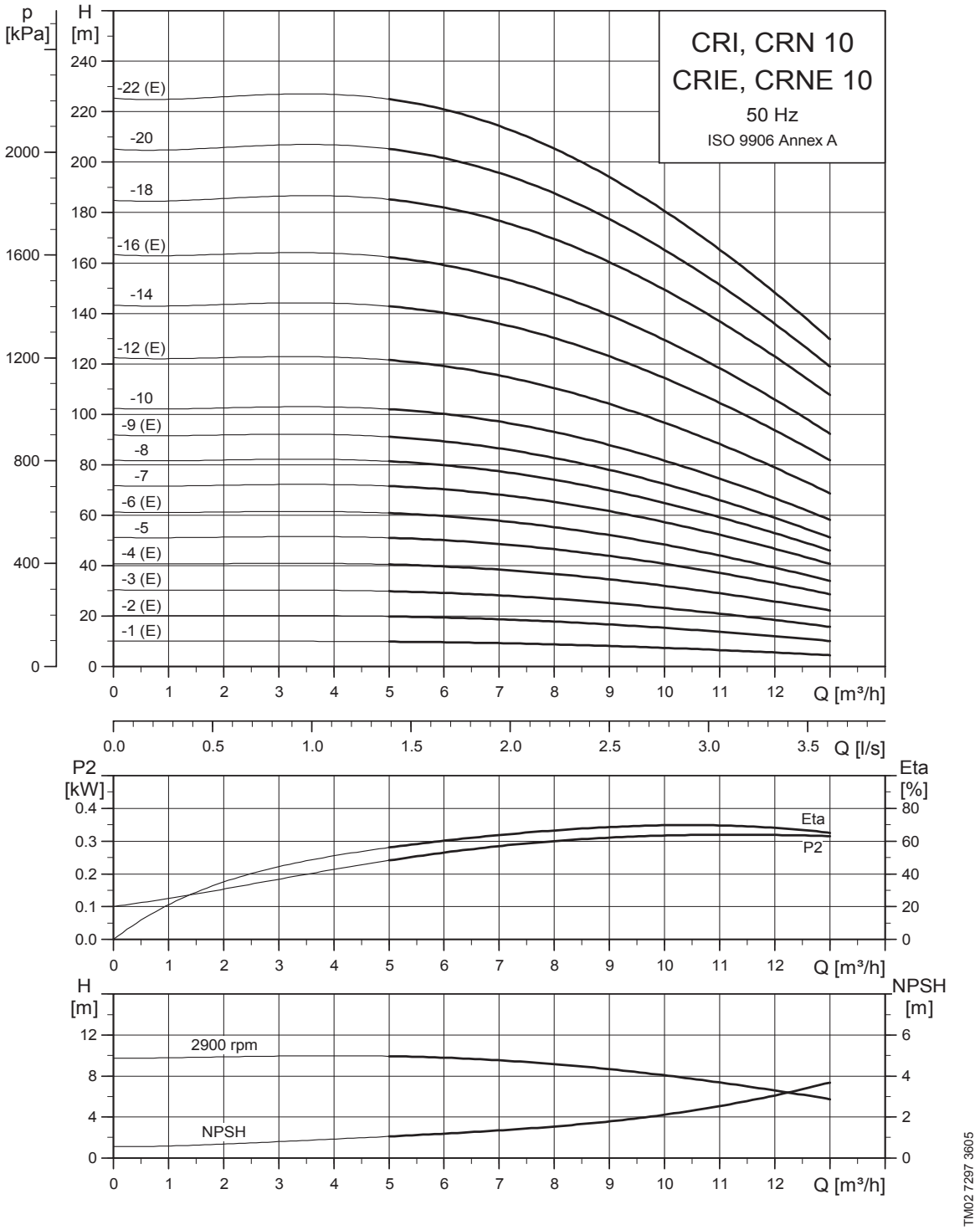
Dimensional sketch



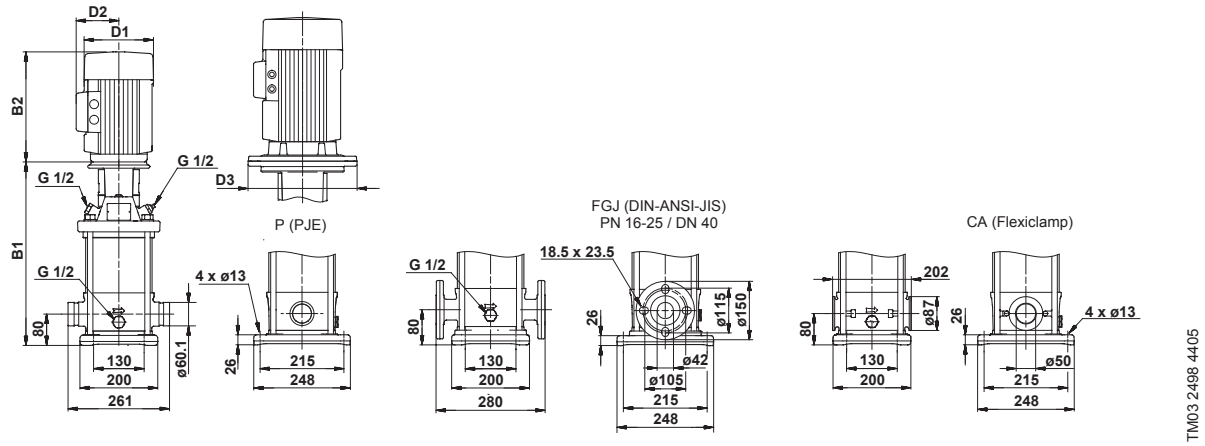
Dimensions and weights

Pump type	Motor P_2 [kW]	CR									CRE								
		Dimension [mm]							Net weight [kg]		Dimension [mm]							Net weight [kg]	
		Oval flange		DIN flange		D1	D2	D3	Oval flange	DIN flange	Oval flange		DIN flange		D1	D2	D3	Oval flange	DIN flange
		B1	B1+B2	B1	B1+B2						B1	B1+B2	B1	B1+B2					
CR(E) 10-1	0.37	343	534	343	534	141	109	-	31	34	343	534	343	534	141	140	-	32.9	35.9
CR(E) 10-2	0.75	347	578	347	578	141	109	-	34	36	347	347	347	347	178	167	-	35.2	37.2
CR(E) 10-3	1.1	377	608	377	608	141	109	-	37	39	377	608	377	608	178	167	-	32.9	35.9
CR(E) 10-4	1.5	423	704	423	704	178	110	-	45	47	423	704	423	704	178	167	-	54.5	51.5
CR 10-5	2.2	453	734	453	734	178	110	-	46	49	-	-	-	-	-	-	-	-	-
CR(E) 10-6	2.2	483	764	483	764	178	110	-	47	50	483	764	483	764	178	167	-	57.5	60.5
CR 10-7	3.0	518	853	518	853	198	120	-	52	55	-	-	-	-	-	-	-	-	-
CR 10-8	3.0	548	883	548	883	198	120	-	53	56	-	-	-	-	-	-	-	-	-
CR(E) 10-9	3.0	578	913	578	913	198	120	-	54	57	578	913	578	913	198	177	-	63.0	66.0
CR 10-10	4.0	608	980	608	980	220	134	-	66	69	-	-	-	-	-	-	-	-	-
CR(E) 10-12	4.0	668	1040	668	1040	220	134	-	69	71	668	1040	668	1040	220	188	-	78.3	81.3
CR 10-14	5.5	760	1151	760	1151	220	134	300	91	94	-	-	-	-	-	-	-	-	-
CR(E) 10-16	5.5	820	1211	820	1211	220	134	300	93	96	820	1211	820	1211	220	188	298	104.9	107.9
CR 10-18	7.5	-	-	880	1271	220	134	300	-	101	-	-	-	-	-	-	-	-	-
CR 10-20	7.5	-	-	940	1331	220	134	300	-	103	-	-	-	-	-	-	-	-	-
CR(E) 10-22	7.5	-	-	1000	1391	220	134	300	-	105	-	-	1000	1391	220	188	298	-	116.7

CRI, CRN, CRIE, CRNE 10



Dimensional sketch



Dimensions and weights

Pump type	Motor P_2 [kW]	CRI/CRN									CRIE/CRNE								
		Dimension [mm]							Net weight [kg]		Dimension [mm]							Net weight [kg]	
		PJE/CA		DIN flange		D1	D2	D3	PJE/CA	DIN flange	PJE/CA		DIN flange		D1	D2	D3	PJE/CA	DIN flange
		B1	B1+B2	B1	B1+B2						B1	B1+B2	B1	B1+B2					
CRI(E)/CRN(E) 10-1	0.37	353	544	353	544	141	109	-	28	32	353	544	353	544	141	140	-	29.9	33.9
CRI(E)/CRN(E) 10-2	0.75	357	588	357	588	141	109	-	31	34	357	588	357	588	178	167	-	32.2	35.2
CRI(E)/CRN(E) 10-3	1.1	387	618	387	618	141	109	-	34	38	387	618	387	618	178	167	-	29.9	33.9
CRI(E)/CRN(E) 10-4	1.5	433	714	433	714	178	110	-	42	46	433	714	433	714	178	167	-	48.5	52.5
CRI/CRN 10-5	2.2	463	784	463	784	178	110	-	44	47	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 10-6	2.2	493	814	493	814	178	110	-	45	48	493	814	493	814	178	167	-	55.5	58.5
CRI/CRN 10-7	3.0	528	863	528	863	198	120	-	50	54	-	-	-	-	-	-	-	-	-
CRI/CRN 10-8	3.0	558	893	558	893	198	120	-	51	55	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 10-9	3.0	588	923	588	923	198	120	-	52	56	588	923	588	923	198	177	-	61.0	65.0
CRI/CRN 10-10	4.0	618	990	618	990	220	134	-	64	68	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 10-12	4.0	678	1050	678	1050	220	134	-	66	70	678	1050	678	1050	220	188	-	76.3	79.3
CRI/CRN 10-14	5.5	770	1161	770	1161	220	134	300	88	92	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 10-16	5.5	830	1221	830	1221	220	134	300	90	94	830	1221	830	1221	220	188	300	102.9	105.9
CRI/CRN 10-18	7.5	890	1281	890	1281	220	134	300	96	99	-	-	-	-	-	-	-	-	-
CRI/CRN 10-20	7.5	950	1341	950	1341	220	134	300	98	101	-	-	-	-	-	-	-	-	-
CRI(E)/CRN(E) 10-22	7.5	1010	1401	1010	1401	220	134	300	100	104	1010	1401	1010	1401	220	188	298	110.7	114.7