

NKG

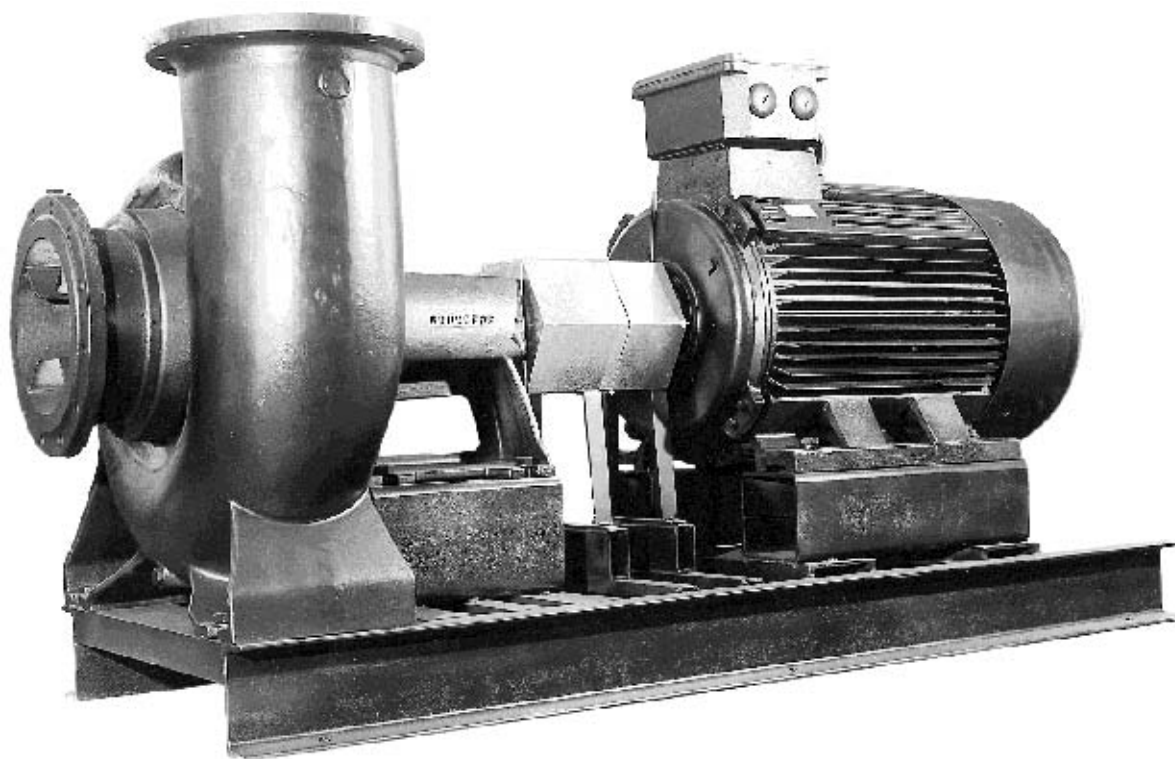
16 bar End Suction Pumps

Water supply, boosting, circulation and for liquid transfer in industry, agriculture, horticulture, fire fighting, environmental engineering etc.

In accordance with DIN 24 256 and ISO 2858.

Pump flange sizes:	DN 32-300
Maximum system pressure:	16 bar
Liquid temperature:	-40°C to +160°C

50 Hz



TM01 2241 3698

GRUNDFOS



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Performance Curves 2900 min⁻¹

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Applications

The pump is suitable for the pumping of thin, clean and non-aggressive liquids without solid particles or fibres in:

- District heating
- Water supply
- Airconditioning
- Cooling plants
- Industry
- Fire fighting
- Environment engineering

Operating Conditions

Flow	Max. 2000 m ³ /h.
Head	Max. 150 m.
Liquid Temperature	-40°C up to +160°C.
Operating Pressure	Max. 16 bar. *) Operating pressure = inlet pressure + pressure against a closed valve (Q = 0).
Inlet Pressure	Max. 9 bar. Max. 7 bar for 400 mm impellers or bigger.

*) Optional executions for 10 or 25 bar on request.

Pump

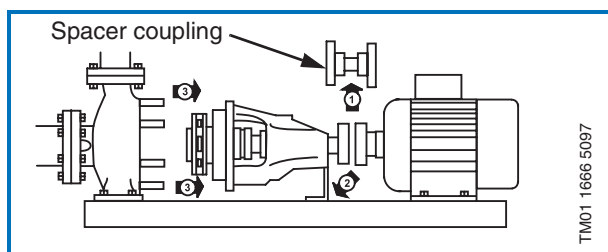
Non-self-priming single-stage centrifugal volute pump with axial suction port, radial discharge port and horizontal shaft components.

The NKG pumps have dimensions and nominal performances according to DIN 24 256 (16 bar). Types outside of the official DIN-norm (NKG 200 and up) will be called "oversize". Dimensions can differ from other suppliers.

The suction and discharge flanges are according to DIN 2501 PN 16. All pumps are dynamically balanced according to ISO 1940 class 6.3 and impellers are hydraulically balanced.

Pump and motor are mounted on a common baseplate in accordance with DIN 24 259 in all-welded steel. Oversizes have profile base frames.

Due to the pump design the complete bearing assembly including impeller and shaft seal can be dismantled without removing the volute casing from the pipe system (back-pull-out system ③).



Flexible Coupling

Standard version or a spacer coupling which allows the motor to remain in place during the abovementioned dismantling to avoid subsequent alignment.

If the pump housing, motor or the entire unit is moved, alignment is always necessary.

Bearing Assembly with Shaft

The bearing assembly includes two sturdy antifriction bearings lubricated for life. Oversize pumps with shaft d5=55mm however, have open bearings with grease nipples.

A thrower on the shaft prevents liquid from entering the bearing housing.

In stuffing box versions the shaft is protected by a stainless steel sleeve at the shaft seal.

All the NKG pumps according to DIN 24 256 are covered by only four sizes of shaft, shaft seal and bearings, and the oversizes by an additional three sizes.

Due to the ample sizes of the bearings and shaft the pump can be driven by a belt drive, belt variator or a diesel engine, if required.

Shaft Seal

The standard version is provided with a mechanical Burgmann shaft seal according to DIN 24 960, Grundfos type AQAE. Depending on pumped liquid and operating conditions other types and stuffing boxes are available.

Back-to-back double mechanical shaft seals, and "quench", are available for all variants on request.

Motor

The motor is a totally enclosed, fan-cooled squirrel-cage Grundfos MMG motor dimensioned to IEC publication 72 and complying with IEC 34 and DIN 42 950.

Mounting Designation	B3 (IM 1001)
Enclosure Class	IP 55
Insulation Class	F (100 °C)
Ambient Temperature	Max. 40°C
Voltages, 50/(60) Hz	3 x 220-240/380-415 V, (3 x 220-275/380-480 V), 3 x 380-415 Δ V, (3 x 380-480 Δ V)
Thermistor	TP 211 acc. DIN 44082 when P2 ≥ 3 kW

NKG units with 60 Hz motors and NKE units with MGE motors are also available, but are described in separate booklets.

Other brands of motors can be mounted on request.

Surface Treatment

Minimum 40 µm black water based laquer. Various RAL colors are available on request.

Type Key

For units without motor the motor data are left out, and for bare shaft pumps the coupling and motor data are left out.

Example	NKG100-200/198/AW/BAQE/1/5.5/4
Type range	100-200
Nominal diameter of discharge port	198
Nominal impeller diameter	A
Actual impeller diameter	W
Code for materials:	BAQE
A(01) = Cast iron GG 25 *)	
B(03) = GG 25 with bronze impeller *)	
C(04) = Ductile cast iron GGG 40	
G = GGG 40 with bronze impeller	
Z(07) = All bronze	
W = Neck ring(s)	
Code for shaft seal	1
Coupling type	5.5
1 = standard	
2 = spacer	
Motor power in kW	4
2, 4 or 6 pole motor	

The example describes an NKG 100-200 with 198 mm impeller, in cast iron with neck rings, with BAQE shaft seal, standard coupling and a 4-pole 5.5 kW motor.

*) Oversize pumps are not available in GG 25 cast iron.

Specification of pump materials see Pump Material List on page 14.

Codes for Stuffing Box

Position	Code	Short Description of Seal
1	S	Packing type stuffing box
Position	Code	Cooling
2	N	Uncooled stuffing box
	K	Cooled stuffing box
Position	Code	Barrier fluid
3	E	With internal liquid
	F	With external liquid
	O	Without barrier fluid

Codes for Mechanical Shaft Seal

Position	Code	Short Description of Seal
1	A	O-ring seal with fixed seal driver
	B	Rubber bellows seal
	C	O-ring seal with spring as seal driver
	D	Balanced O-ring seal
	G	Rubber bellows seal with reduced seal faces
	M	Metal bellows seal
	X	Other
Position	Code	Material
2 & 3	A	Metal-impregnated carbon
	B	Synthetic-resin-impregnated carbon
	C	Other types of carbon
	S	Chromium steel
	U	Tungsten carbide
	Q	Silicon carbide
	V	Aluminium oxide (ceramic)
	X	Other types of ceramic/carbide
Position	Code	Material
4	P	Nitrile (NBR)
	S	Silicone rubber
	T	PTFE
	E	EPDM
	V	FKM
	M	PTFE-coated O-ring

Configuration Number Key

Each of the 8 digits in the configuration number describes one or more possibilities of variation in the construction of the pump (unit).

Example: The fourth digit determines if the pump is a NK or NKG pump as well as which material version.

The number is configured from the tables shown below:

Nominal Impeller Diameter [mm]	Code
125	1
160	2
200	3
250	4
315	5
360	7
400	8
500	9
310	A
330	B

Code	NKG Pump Material
F	Cast iron GG25
G	GG25 w. Bronze impeller
H	Ductile cast iron GGG40
I	GGG40 w. Bronze impeller
J	All bronze

All models have neck ring(s)

Code	Coupling
0	Without coupling *)
1	Standard
2	Spacer

*) Bare shaft pump

Pump Type NK(G)	Code
32	1
40	2
50	3
65 0-55 kW	4
80 0-55 kW	5
100 0-90 kW	6
125 0-90 kW	7
150 0-188 kW	8
65 56-200 kW *)	A
80 56-200 kW *)	B
100 91-200 kW *)	C
125 91-188 kW *)	D
200 0-300 kW *)	E
250 0-300 kW *)	F
300 0-300 kW *)	G
150 189-495 kW *)	H

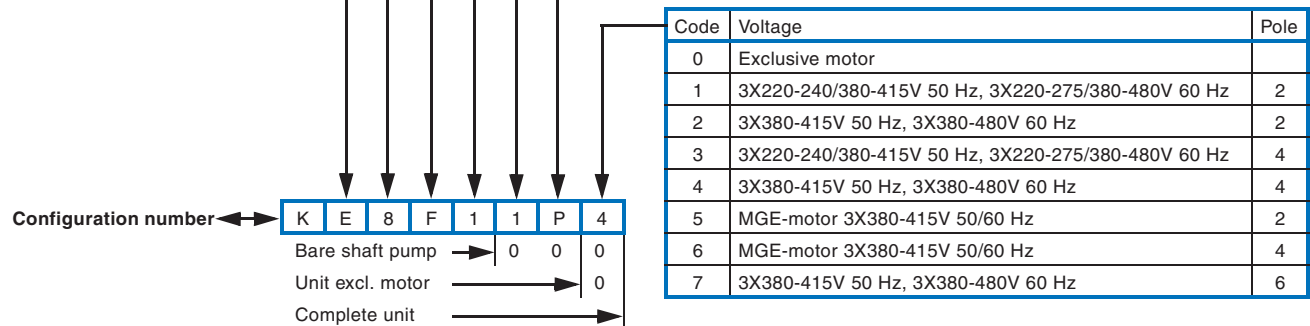
*) Oversize, not available in cast iron GG 25

Code	Single Shaft Seal
1	BAQE *)
3	DAQM *)
5	BQQV *)
7	BAQV *)
8	AQAE
9	AQAV *)
A	SNE *)
B	SNO *)
C	SNF *)
D	SKO *)
E	GQQE *)
F	GQQV *)
G	BQQE *)
H	AQQE *)
I	AQQV *)
J	DQQE *)
K	DQQV *)

Code	Double Shaft Seal
M	BAQE *)
N	DAQM *)
R	AQAE *)
V	AQQE *)
W	AQQV *)

*) Optional

Code	P2 kW max.
0	Bare shaft pump
1	0.37
2	0.55
3	0.75
4	1.1
5	1.5
6	2.2
7	3
8	4
9	5.5
A	7.5
B	11
C	15
D	18.5
E	22
F	30
G	37
H	45
K	55
L	75
M	90
N	110
P	132
Q	160
R	200
S	250
T	315
U	355



Selection of Pumps for Various Liquids

Pumped Liquids	Max. limits solution, temperature, pressure	Materials and Shaft Seal								Notes
		A (01) Cast Iron		B (03) Bronze Impeller		C (04) Sph. Graphite Cast Iron		Z (07) All Bronze		
		Stuffing Box	Mech. Seal	Stuffing Box	Mech. Seal	Stuffing Box	Mech. Seal	Stuffing Box	Mech. Seal	
Ammonia water	Max. 10%, 40°C, 16/12 bar	SNF	BAQE							Metals in pump must be all-ferrous Double seal
	16/16 bar		AQAE							
Airconditioning	0°C to 30°C, 10/7 bar	SNE/SNO	BQQE							
	16/16 bar		DAQE							
Brackish water	Max. 40°C, 10/7 bar							SNE/SNO	BQQV	Hastelloy
	16/16 bar								DQQV	
Brake fluid	Max. 40°C, 16/12 bar	SNE/SNO	BAQE							
	16/16 bar		AQAE							
Fire fighting water	16/12 bar			SNE/SNO	BAQE					
	16/16 bar		AQAE							
Fixative salt (sodium thiosulphate)	Max. 25°C, 16/12 bar	SNE/SNO	BAQV							Metals in pump must be all-ferrous
	16/16 bar		AQAV							
Glycol-water mix	-20°C to 80°C, 16/12 bar	SNE/SNO	BAQE							
	16/16 bar		AQAE							
Glycol-water mix with additives	0°C to 80°C, 10/7 bar	SNE/SNO	BQQE							If oil deposits choose Viton
	-20°C to 0°C, 10/7 bar	SNE/SNO	GQQE							
	-40°C to -20°C, 16/12 bar					SNE/SNO	AQQE			
Salt brine	Max. 15%, 0°C, 16/12 bar	SNE/SNO	BAQE							Double seal
	Max. 15%, -30 to 0°C, 10/7 bar					SNE/SNO	AQQE			
	16/16 bar						DQQV			
Other coolants	-40°C to -20°C, 16 bar					SNE/SNO	AQAE			Contact Grundfos
District heating water	Max. 120°C, 16 bar	SNE/SNO	BAQE							Nominal shaft diam. ≤ ø42mm
	Max. 120°C, 12 bar	SNE/SNO	BAQE							Nominal shaft diam. ≥ ø48mm
	Max. 120°C, 16 bar	SNE/SNO	AQAE							
	120°C to 140°C, 16 bar					SNE/SNO	AQAE			
	140°C to 160°C, 16 bar					SKO	DAQM			Cooling, Contact Grundfos
Milk of lime (calcium hydroxide)	Max. 10%, 25°C, 10/7 bar	SNF	BQQE							Flush before long standstill periods
	16/16 bar		DQQE							

Pumped Liquids	Max. limits solution, temperature, pressure	Materials and Shaft Seal								Notes	
		A (01) Cast Iron		B (03) Bronze Impeller		C (04) Sph. Graphite Cast Iron		Z (07) All Bronze			
		Stuffing Box	Mech. Seal	Stuffing Box	Mech. Seal	Stuffing Box	Mech. Seal	Stuffing Box	Mech. Seal		
Condensate	0°C to 100°C, 16/12 bar	SNE/SNO	BAQE								
	16/16 bar		AQAE								
Cooling water	0°C to 120°C, 16/12 bar	SNE/SNO	BAQE								
	16/16 bar		AQAE								
Sea water	Max. 40°C, 10/7 bar							SNE/SNO	BQQV	North Sea, Baltic Sea water.	Hastelloy
	16/16 bar								DQQV		
	Max. 25°C, 10/7 bar			SNE/SNO	BQQV						
	16/16 bar				DQQV						
Soda lye (P3)	Max. 20%, 100°C, 10/7 bar	SNE/SNO	BQQE								
	16/16 bar		DQQE								
Fuel oil, diesel oil	16/12 bar		BAQV								
	16/16 bar		AQAV								
Oil-water emulsion	16/12 bar	SNE/SNO	BAQV								
	16/16 bar		AQAV								
Clean water	16/12 bar	SNE/SNO	BAQE								
	16/16 bar		AQAV								
Raw water	10/7 bar	SNE/SNO	BQQV								
	16/16 bar		DQQV								
Swimming pool water (fresh water)	16/12 bar			SNE/SNO	BAQV						
	16/16 bar				AQAV						
Soda (sodium carbonate)	Saturated solution, 25°C, 10/7 bar	SNE/SNO	BQQE							Double seal	
	16/16 bar		DQQE								
Water from storage reservoirs	10/7 bar			SNE/SNO	BQQE						
	16/16 bar				DQQE						
Partially demineralized water	Max. 100°C, 16/12 bar	SNE/SNO	BAQE								
	16/16 bar		AQAE								
Drinking water	Max. 100°C, 16/12 bar			SNE/SNO	BAQE						
	16/16 bar				AQAE						
Contaminated water	Max. 100°C, 10/7 bar	SNF	BQQV							Contact Grundfos	
	16/16 bar		DQQV								

For liquids not mentioned in this table please contact Grundfos.

16/16 bar, 16/12 bar and 10/7 bar

The first figure is maximum pressure for nominal shaft diameters ≤ ø42mm.

The second for nominal shaft diameters ≥ ø48mm.

Nominal shaft diameter is the diameter of the pump shaft end (dimension **d5** on pages 19 - 21).

SNE/SNO

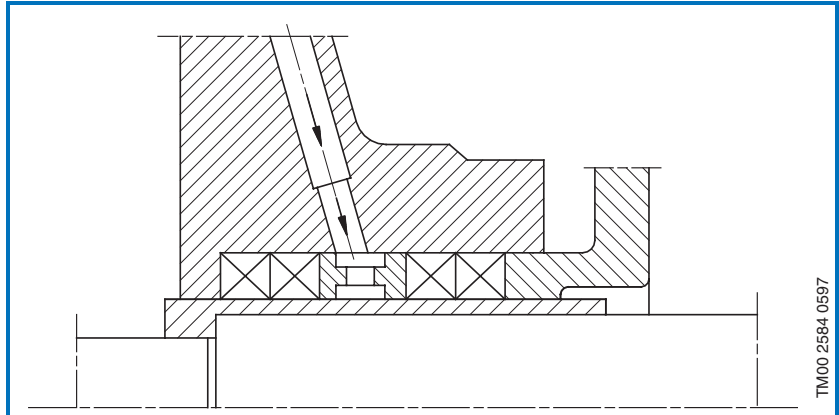
SNE for inlet pressure < 4 bar
SNO for inlet pressure > 4 bar.

Hastelloy

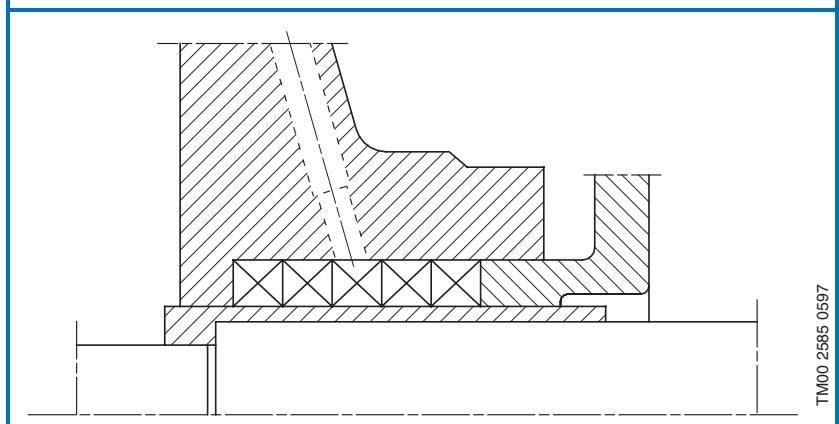
Hastelloy shaft seal metal parts for bronze pumps.

Stuffing Boxes

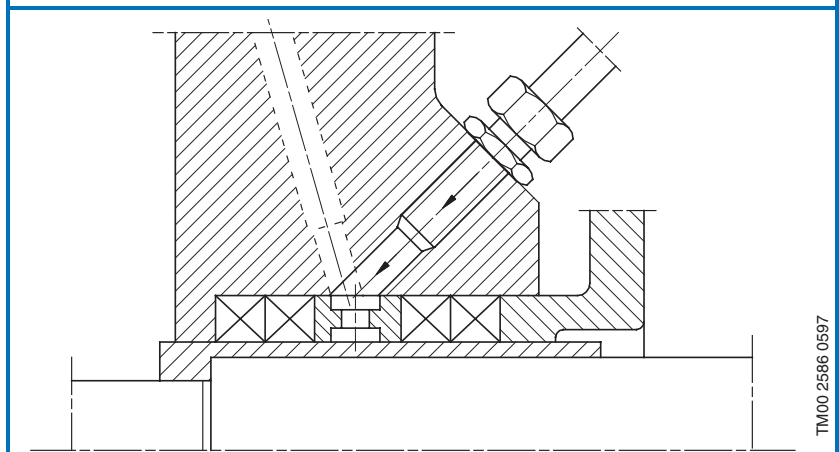
Uncooled stuffing box (**SNE**) with internal barrier fluid for the pumping of clean liquids in suction operation or at inlet pressures up to 4 bar.



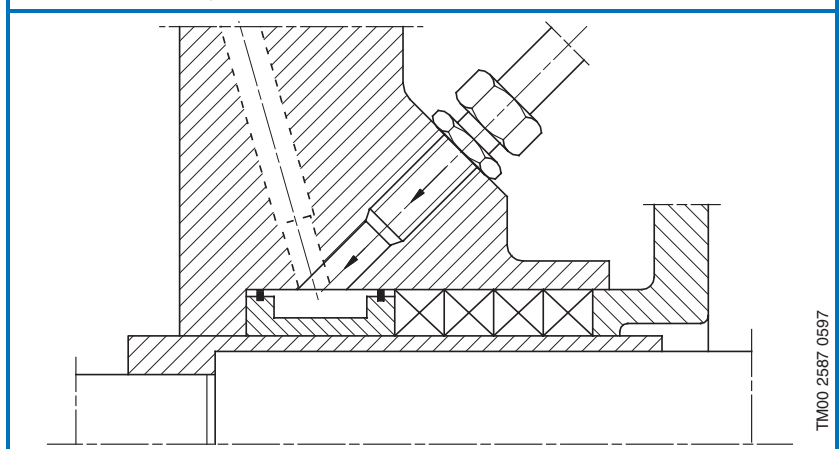
Uncooled stuffing box (**SNO**) without internal barrier fluid for the pumping of clean liquids in suction operation or at inlet pressures over 4 bar.



Uncooled stuffing box (**SNF**) with external barrier fluid for the pumping of contaminated and malodorous liquids.

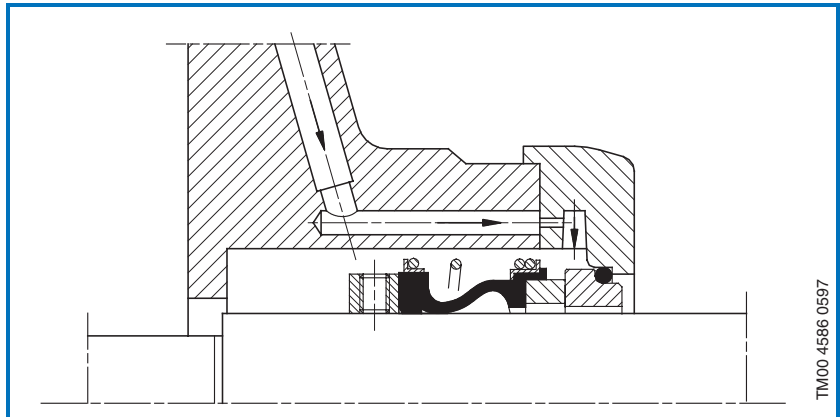


Cooled stuffing box (**SKO**) for the pumping of liquids up to 160°C.

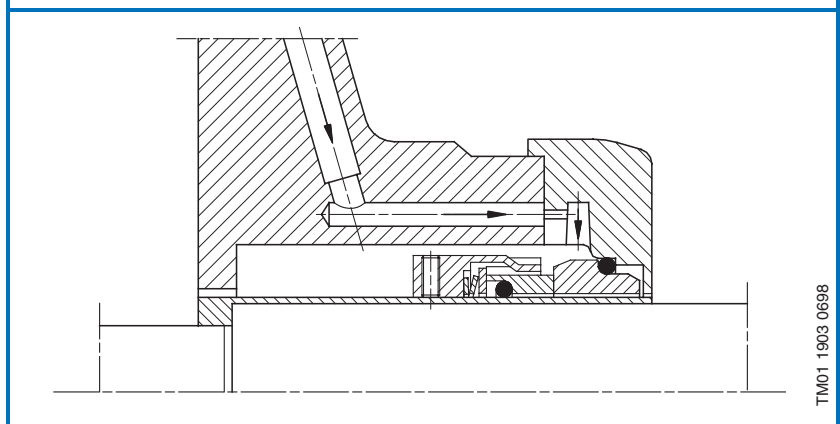


Mechanical Shaft Seals

Rubber bellows seal (**BAQE**), counteracts deposits from the pumped liquid.

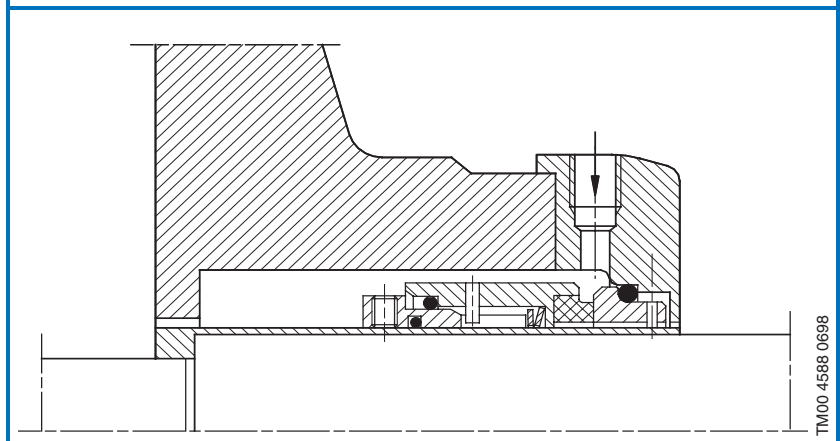


O-ring seal (**AQAE**), unbalanced, for high pressures.



O-ring seal (**DAQM**), balanced, for high pressures and temperatures 140°C to 160°C.

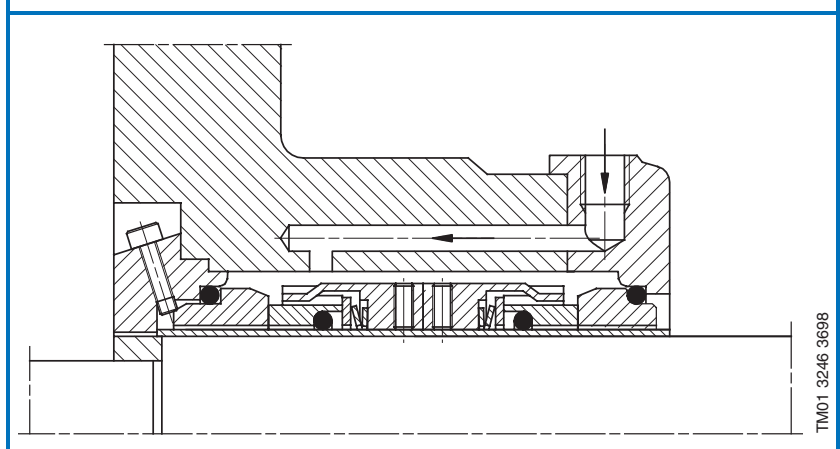
Cooled pumped liquid (120°C) is used for cooling the seal.



Double seal (**Back to back**) to protect the primary shaft seal against wear by precipitation of abrasive matters.

Quench above 80°C.

Available on request.



DIN - ISO correspondance

DIN 24256	ISO 2858
DESIGNATION	DESIGNATION
32 - 125	50 - 32 - 125
32 - 160	50 - 32 - 160
32 - 200	50 - 32 - 200
40 - 125	65 - 40 - 125
40 - 160	65 - 40 - 160
40 - 200	65 - 40 - 200
40 - 250	65 - 40 - 250
50 - 125	80 - 50 - 125
50 - 160	80 - 50 - 160
50 - 200	80 - 50 - 200
50 - 250	80 - 50 - 250
65 - 125	100 - 65 - 125
65 - 160	100 - 65 - 160
65 - 200	100 - 65 - 200
65 - 250	100 - 65 - 250
65 - 315	100 - 65 - 315
80 - 160	125 - 80 - 160
80 - 200	125 - 80 - 200
80 - 250	125 - 80 - 250
80 - 315	125 - 80 - 315
80 - 400	125 - 80 - 400
100 - 200	125 - 100 - 200
100 - 250	125 - 100 - 250
100 - 315	125 - 100 - 315
100 - 400	125 - 100 - 400
125 - 250	150 - 125 - 250
125 - 315	150 - 125 - 315
125 - 400	150 - 125 - 400
150 - 315	200 - 150 - 315
150 - 400	200 - 150 - 400

Examples of designation :

DIN 24256 50 - 250

50 = The outlet diameter in mm

250 = The Nominal Impeller diameter in mm

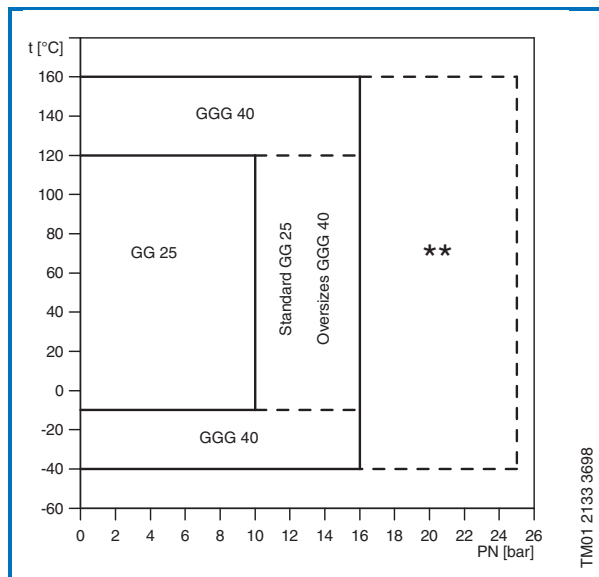
ISO 2858 80 - 50 - 250

80 = The Inlet diameter in mm

50 = The Outlet diameter in mm

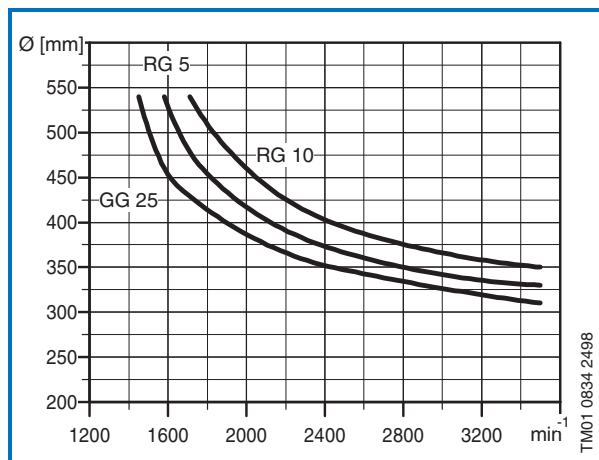
250 = The Nominal Impeller diameter in mm

Operating Range



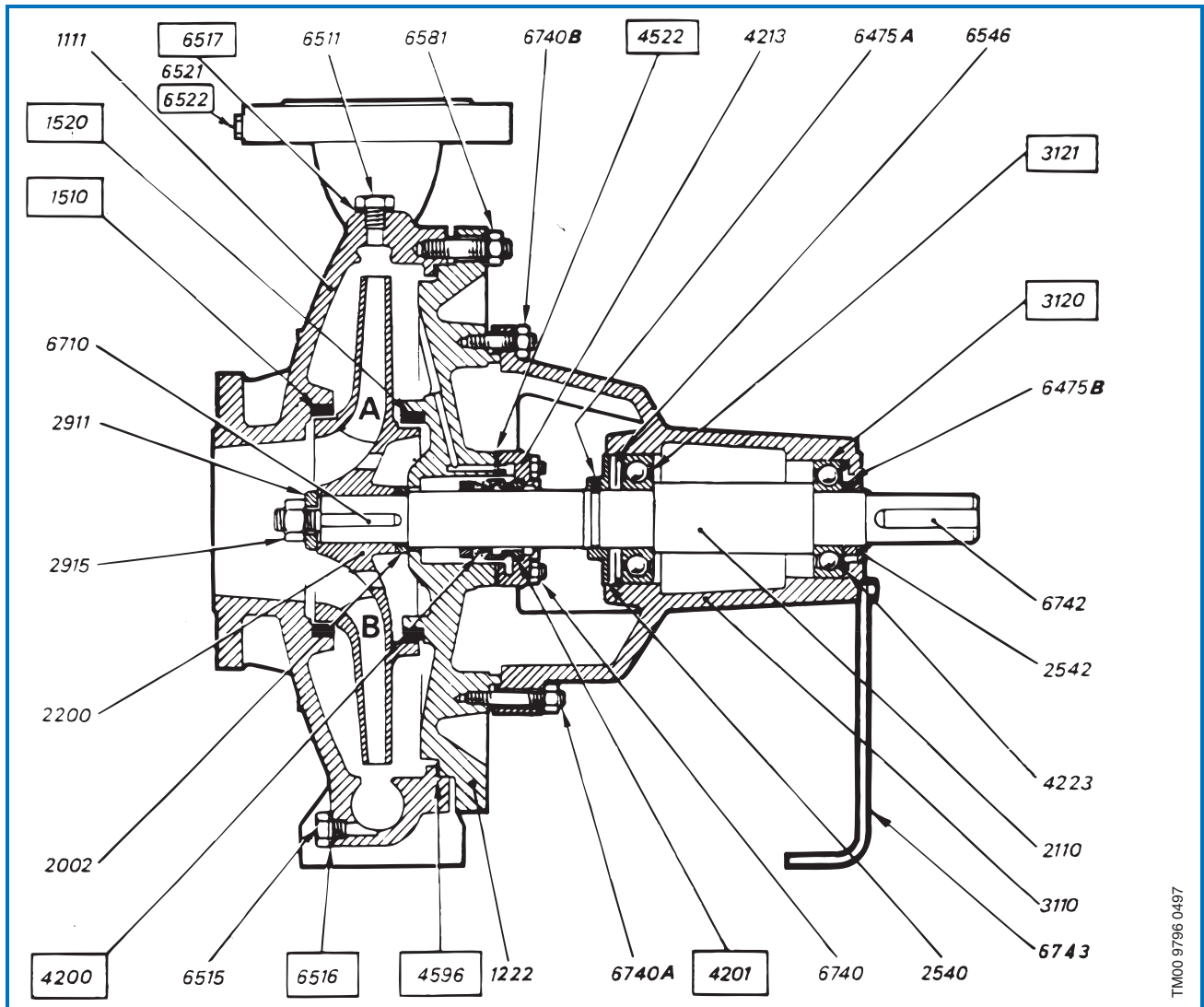
** Contact Grundfos

Impeller Speed Relative to Material and Size



Sectional Drawing

NGK 32-125 -> 150-400 and NGK 250-310



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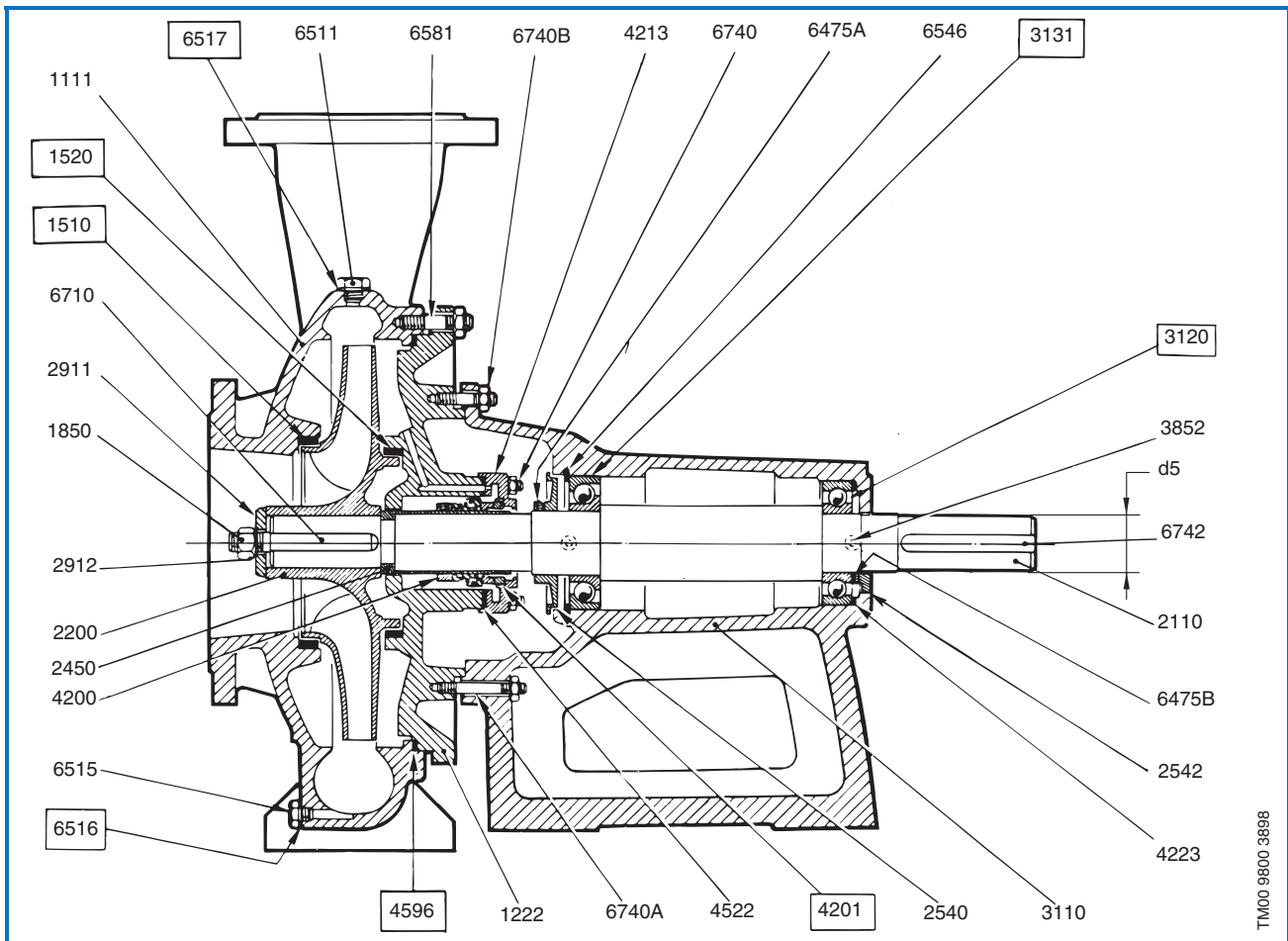
Legend: : Recommended spare part.

A/B: Different hydraulical balancing.

Pos.	Description	Pos.	Description	Pos.	Description
1111	Pump casing	3120	Ball bearing	6516	Gasket
1222	Seal box	3121	Ball bearing	6517	Gasket
1510	Neck ring	4200	Rotary seal ring	6521	Pressure tapping plug
1520	Neck ring	4201	Stationary seat	6522	Gasket
2002	Spacer ring	4213	Cover for seal	6546	Circlip
2110	Shaft	4522	Gasket for cover	6581	Stud + nut
2200	Impeller	4596	Gasket for pump	6710	Impeller key
2540	Thrower	6475A	Thrower screw	6740	Stud + nut
2542	Thrower	6475B	Thrower screw	6740A	Stud + nut
2911	Impeller washer	6511	Priming plug	6740B	Stud + nut
2915	Lock nut	6515	Drain plug	6742	Coupling key
3110	Bearing housing			6743	Foot

Sectional Drawing

“Oversizes” NKG 150-315, 200-500, 250-400, 250-500



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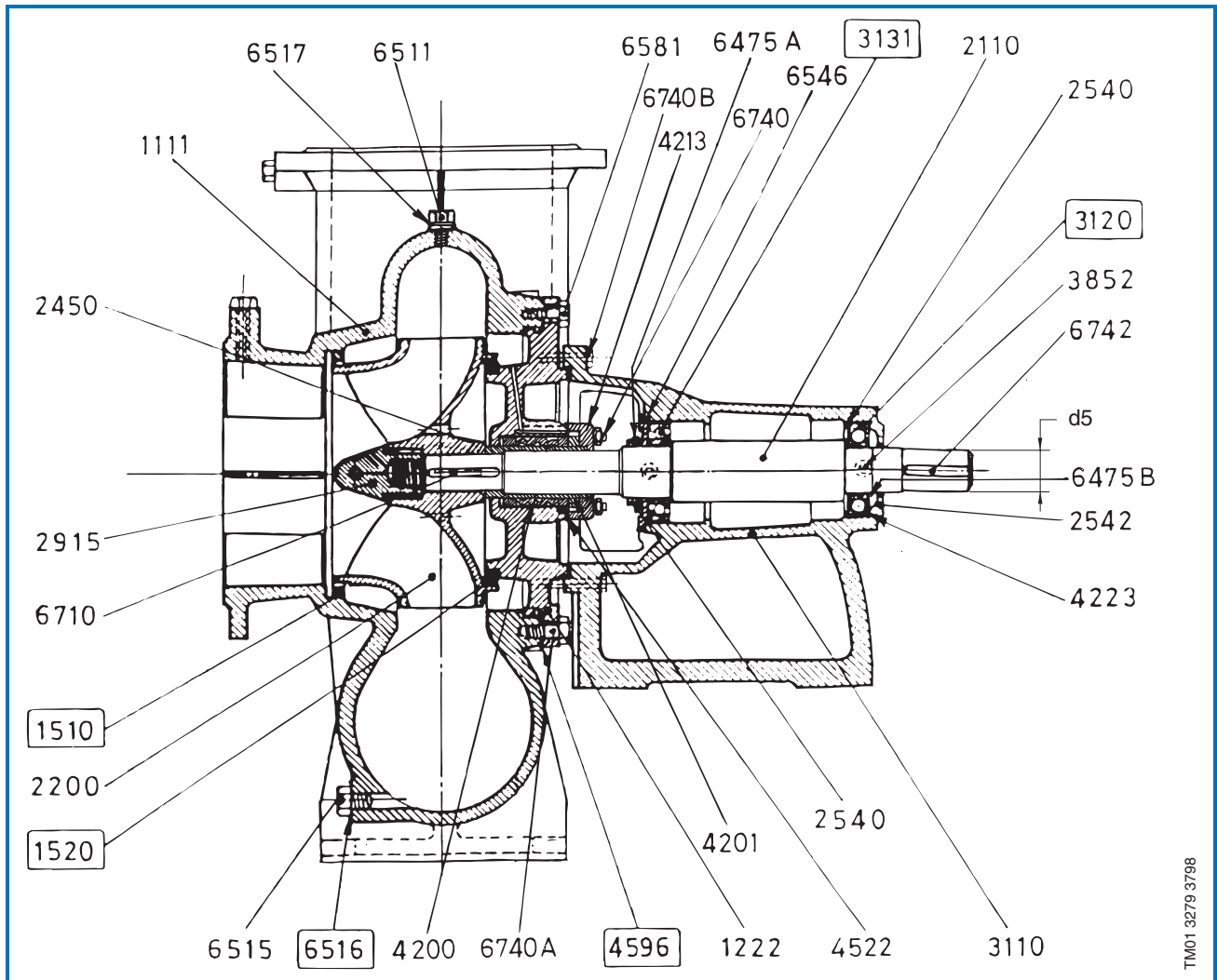
Legend:

:Recommended spare part.

Pos.	Description	Pos.	Description	Pos.	Description
1111	Pump casing	3110	Bearing housing	6511	Priming plug
1222	Seal box	3120	Ball bearing	6515	Drain plug
1510	Neck ring	3131	Ball bearing	6516	Gasket
1520	Neck ring	3852	Grease nipple	6517	Gasket
1850	Impeller counter nut	4200	Rotary seal ring	6546	Circlip
2110	Shaft	4201	Stationary seat	6581	Stud + nut
2200	Impeller	4213	Cover for seal	6710	Impeller key
2450	Shaft sleeve	4223	Elastic washer	6740	Stud + nut
2540	Thrower	4522	Gasket for cover	6740A	Stud + nut
2542	Thrower	4596	Gasket for pump	6740B	Stud + nut
2911	Impeller washer	6475A	Thrower screw	6742	Coupling key
2915	Impeller nut	6475B	Thrower screw		

Sectional Drawing

“Oversizes” NKG 200-400, 250-330, 300-360



Legend:

 : Recommended spare part.

Pos.	Description	Pos.	Description	Pos.	Description
1111	Pump casing	3110	Bearing housing	6511	Priming plug
1222	Seal box	3120	Ball bearing	6515	Drain plug
1510	Neck ring	3131	Ball bearing	6516	Gasket
1520	Neck ring	3852	Grease nipple	6517	Gasket
1850	Impeller counter nut	4200	Rotary seal ring	6546	Circlip
2110	Shaft	4201	Stationary seat	6581	Stud + nut
2200	Impeller	4213	Cover for seal	6710	Impeller key
2450	Shaft sleeve	4223	Elastic washer	6740	Stud + nut
2540	Thrower	4522	Gasket for cover	6740A	Stud + nut
2542	Thrower	4596	Gasket for pump	6740B	Stud + nut
2911	Impeller washer	6475A	Thrower screw	6742	Coupling key
2915	Impeller nut	6475B	Thrower screw		

Pump Material List

Pos.	Component	Version				
		Cast iron *)		Spheroidal graphite (ductile) cast iron		All bronze
		A	B Bronze impeller	C	G Bronze impeller	Z
1111	Pump casing	GG 25		GGG 40.3		Rg 10 (SAE 63)
1222	Seal box	G-CuPb10Sn (SAE 660)				
1510	Neck ring	G-CuPb10Sn (SAE 660)				
1520	Neck ring	G-CuPb10Sn (SAE 660)				
1850	Impeller counter nut	DIN 985 St. 42				DIN 985 SS AISI 304
2002	Spacer ring	SS AISI 420 (X35Cr14)				AISI 304 (x2CrNi18-9)
2110	Shaft	SS AISI 420 (X35Cr14)				AISI 304 (x2CrNi18-9)
2200	Impeller	GG 25	Rg 5 (SAE 40)	GG 25	Rg 10 (SAE 63)	
2540	Thrower	GG 25				
2542	Thrower	GG 25				
2911	Impeller washer	SS AISI 420 (X35Cr14)				AISI 304 (x2CrNi18-9)
2915	Lock nut	DIN 985 St.42				DIN 985 SS AISI 304
3110	Bearing housing	GG 25				
3120	Ball bearing	DIN 625 / 628 SKF - FAG - RHP - NSK				
3121		DIN 625 / 628 SKF - FAG - RHP - NSK				
3131		DIN 625 / 628 SKF - FAG - RHP - NSK				
3852	Grease nipple	DIN 71412 Form D				
4200	Rotary seal ring	Burgmann mechanical seals				
4201	Stationary seat	Burgmann mechanical seals				
4213	Cover for seal	GG 25			Rg 10 (SAE 63)	
4223	Elastic washer	High carbon finely tempered spring steel SAE 1070 - 1090				
4522	Gasket for cover	Asbestos free gaskets DIN FA 3535 and Viton				
4596	Gasket for pump	Asbestos free gaskets DIN FA 3535 and Viton				
6475A	Thrower screw	DIN 916 SS AISI 304				
6475B	Thrower screw	DIN 916 SS AISI 304				
6511	Priming plug	DIN 910			DIN 910 AISI 304 (x2CrNi18-9)	
6515	Drain plug	DIN 910			DIN 910 AISI 304 (x2CrNi18-9)	
6516	Gasket	Copper				
6517	Gasket	Copper				
6521	Pressure tapping plug	DIN 910			DIN 910 AISI 304 (x2CrNi18-9)	
6522	Gasket	Copper				
6546	Circlip	DIN 472				
6581	Stud + nut	ISO 8.8 34Cr4 + DIN 934			DIN 910 AISI 304 (x2CrNi18-9)	
6710	Impeller key	DIN 6885 CK 45 K			DIN 6885 1.4571	
6740	Stud + nut	ISO 8.8 34Cr4 + DIN 934			ISO 8.8 AISI 304 (x2CrNi18-9)	
6740A	Stud + nut	ISO 8.8 34Cr4 + DIN 934			ISO 8.8 AISI 304 (x2CrNi18-9)	
6740B	Stud + nut	ISO 8.8 34Cr4 + DIN 934			ISO 8.8 AISI 304 (x2CrNi18-9)	
6742	Coupling key	DIN 6885 CK 45 K			DIN 6885 1.4571	
6743	Foot	DIN 17100 / Sf 37.2				
2450	Shaft Sleeve **)	SS AISI 420 (x 35 Cr 14)			AISI 304 (x2CrNi18-8)	
4134	Lantern Ring	Rg 10 SAE 63				
6855	Gland Washer	SS AISI 420 (x 35 Cr 14)			AISI 304 (x2CrNi18-8)	
4120	Gland	GG 25			Rg10 (SAE 63)	

*) Oversize pumps are not available in cast iron.

***) Only stuffing box or nominal shaft diameters (d5) ≥ ø48mm.

Motors

Selection of Motors

The power required to achieve the requested duty point can be found by means of the power chart below the performance chart (see pages 36-107). Find the power curve corresponding to the required QH-value (or interpolate between curves).

Before deciding the motor size, add a safety margin according to the table below and select the next motor above the resulting value.

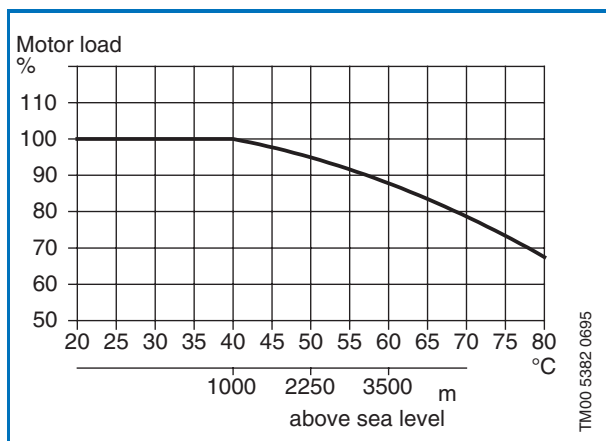
Safety Margins According to ISO 5199

Motor Power	Safety Margin
Up to 1.5 kW	approx. 50%
2.2 - 4.0 kW	approx. 25%
5.5 - 7.5 kW	approx. 20%
11.0 - 37.0 kW	approx. 15%
From 45 kW and upwards	approx. 10%

Ambient Temperature

-30°C to +40°C.

Due to the low density and consequent low cooling effect of the air, operation at an ambient temperature above 40°C or at an altitude exceeding 1000 m above sea level requires a reduction of the rated motor load.



Spare Parts

Available Spare Parts Kits

- 1 Mechanical shaft seal complete
- 2 Soft packing rings
- 3 Bearings
- 4 Casing gaskets (standard or Viton)
- 5 Impeller
- 6 Shaft
- 7 Coupling complete (standard or spacer)
- 8 Rubber joints and pins for couplings
- 9 Neck rings
- 10 Nut, spacer and impeller key.
- 11 Service kit containing the above items 1 - 4 (acc. to pump version). (The service kit items will cover service for two years of normal operation).

2-pole Electrical Data

3x220-240Δ/380-415Y

Motor [kW]	I _n [A]	Cos φ	η _{max} [%]	n [min ⁻¹]	I _{st} /I _n [%]
0.37	1.78-1.65/1.03-0.96	0.81-0.78	67.2-69.1	2670-2730	450-500
0.55	2.44-2.29/1.41-1.32	0.82-0.79	72.2-73.6	2710-2760	550-600
0.75	3.20-2.98/1.85-1.72	0.83-0.80	74.0-75.8	2830-2860	550-600
1.1	4.49-4.24/2.59-2.45	0.84-0.80	76.5-78.0	2820-2850	550-650
1.5	6.01-5.53/3.47-3.19	0.84-0.80	78.0-79.5	2830-2860	600-660
2.2	8.39-7.88/4.84-4.55	0.86-0.83	80.0-81.0	2820-2860	610-670
3.0	10.91-10.25/6.3-5.92	0.88-0.85	82.0-83.0	2840-2870	620-680
4.0	14.2-13.3/8.2-7.7	0.90-0.87	82.0-83.0	2870-2890	710-870
5.5	19.2-17.5/11.1-10.1	0.88-0.87	85.5-86.2	2900-2930	700-875
7.5	26.0-23.4/15.0-13.5	0.88-0.87	86.2-86.3	2900-2920	700-860
11	37.8-36.0/21.8-20.8	0.88-0.84	87.2-87.6	2930-2940	700-800
15	50.9-47.8/29.4-27.6	0.88-0.86	88.2-87.8	2930-2940	700-810
18.5	61.5-56.4/35.5-32.6	0.89-0.89	89.0-88.2	2930-2940	700-810
22	73.1-72.3/42.2-41.7	0.89-0.83	89.0-88.4	2940-2960	700-750
30	98.6-94.6/56.9-54.6	0.89-0.86	90.0-89.3	2950-2965	700-725
37	120.9-113.5/69.8-65.5	0.89-0.88	90.5-89.5	2950-2965	700-710
45	145.5-135.0/84.0-78.0	0.89-0.88	91.5-90.5	2970-2975	700-640
55	177.7-167.0/102.6-97.0	0.89-0.85	91.5-92.4	2970-2975	700-645
75	242.5-233.0/140.0-134.5	0.89-0.85	92.0-91.5	2970-2980	700-720
90	289.3-260.0/167.0-150.0	0.89-0.90	92.5-92.7	2970-2975	700-560
110	351.0-321.0/203.0-186.0	0.89-0.89	92.5-92.5	2970-2980	700-680
132	418.0-411.0/242.0-237.0	0.89-0.83	93.0-93.0	2970-2975	700-680
160	506.0-490.0/292.0-283.0	0.89-0.86	93.5-93.0	2970-2980	680-725
200	632.0-636.0/365.0-367.0	0.89-0.82	93.5-93.0	2970-2975	680-630
250	On request	-	-	-	-
315	On request	-	-	-	-

3x380-415Δ

Motor [kW]	I _n [A]	Cos φ	η _{max} [%]	n [min ⁻¹]	I _{st} /I _n [%]
0.37	1.09-1.07	0.77-0.70	70.0-69.0	2760-2800	550-600
0.55	1.42-1.33	0.82-0.77	74.0-75.0	2750-2800	570-650
0.75	1.93-1.83	0.82-0.78	74.0-75.0	2820-2850	550-650
1.1	2.65-2.45	0.84-0.82	76.0-77.0	2800-2840	550-650
1.5	3.57-3.30	0.84-0.81	77.0-79.0	2810-2850	550-650
2.2	4.85-4.45	0.85-0.83	81.0-82.0	2815-2850	620-750
3.0	6.55-6.10	0.87-0.84	80.0-81.0	2850-2870	650-800
4.0	8.12-7.49	0.89-0.87	84.1-85.4	2870-2890	650-750
5.5	11.1-10.1	0.88-0.88	85.5-85.9	2900-2930	700-830
7.5	15.0-13.4	0.88-0.90	86.2-86.2	2900-2920	700-820
11	21.8-20.5	0.88-0.85	87.2-87.5	2930-2940	700-780
15	29.4-27.1	0.88-0.88	88.2-87.9	2930-2940	700-780
18.5	35.5-32.6	0.89-0.89	89.0-88.3	2930-2940	700-810
22	42.2-40.4	0.89-0.86	89.0-88.4	2940-2950	700-730
30	56.9-54.1	0.89-0.86	90.5-89.3	2950-2960	700-710
37	69.8-66.0	0.89-0.87	90.3-89.6	2950-2960	700-760
45	84.0-78.7	0.89-0.88	91.5-90.5	2970-2975	700-660
55	103.0-101.0	0.89-0.82	91.5-92.0	2970-2975	700-670
75	140.0-133.0	0.89-0.86	92.0-92.0	2970-2985	700-700
90	167.0-160.0	0.89-0.86	92.5-92.5	2970-2975	700-730
110	203.0-196.0	0.89-0.84	92.5-92.5	2980-2985	730-680
132	242.0-226.0	0.89-0.88	93.0-93.0	2980-2985	710-680
160	292.0-279.0	0.89-0.87	93.5-92.7	2980-2985	680-710
200	365.0-340.0	0.89-0.88	93.5-93.1	2980-2985	680-710
250	On request	-	-	-	-
315	On request	-	-	-	-

4-pole Electrical Data

3x220-240Δ/380-415Y

Motor [kW]	I _n [A]	Cos φ	η _{max} [%]	n [min ⁻¹]	I _{st} /I _n [%]
0.37	1.96-1.79/1.13-1.03	0.76-0.74	65.2-67.3	1285-1330	540-580
0.55	2.70-2.50/1.56-1.44	0.76-0.74	70.0-71.5	1380-1400	570-620
0.75	3.53-3.23/2.04-1.86	0.77-0.76	72.5-73.5	1375-1395	600-680
1.1	5.04-4.66/2.91-2.69	0.77-0.75	74.4-75.6	1375-1400	630-700
1.5	6.47-6.02/3.74-3.48	0.79-0.77	77.0-77.8	1380-1405	660-720
2.2	8.97-8.30/5.18-4.80	0.81-0.79	79.5-80.5	1405-1425	700-780
3.0	11.8-10.9/6.78-6.29	0.82-0.80	81.7-82.5	1405-1420	730-800
4.0	15.8-14.9/9.1-8.6	0.81-0.78	82.0-83.0	1430-1440	610-750
5.5	20.1-19.1/11.6-11.1	0.84-0.79	85.5-87.2	1440-1450	700-740
7.5	26.7-25.3/15.4-14.6	0.85-0.81	87.0-88.1	1440-1460	700-820
11	39.1-36.4/22.6-21.0	0.84-0.81	88.0-89.2	1460-1470	700-755
15	52.5-51.4/30.3-29.7	0.85-0.84	88.5-89.6	1460-1460	700-725
18.5	62.8-62.2/36.2-35.9	0.86-0.79	91.0-90.3	1470-1480	700-820
22	73.6-71.3/42.5-41.2	0.86-0.82	91.5-90.7	1470-1480	700-810
30	98.4-93.6/56.8-54.0	0.87-0.85	92.2-90.8	1470-1480	700-770
37	121.9-117.0/70.4-67.5	0.87-0.83	91.8-92.0	1480-1485	700-770
45	145.8-138.0/84.2-79.6	0.88-0.88	92.3-92.2	1480-1485	700-670
55	177.5-162.0/102.5-93.5	0.88-0.88	92.6-92.7	1480-1480	700-700
75	242.0-251.0/140.0-145.0	0.88-0.78	92.8-92.7	1480-1485	700-780
90	284.0-263.0/164.0-152.0	0.89-0.88	93.5-93.4	1480-1485	700-750
110	347.0-327.0/201.0-189.0	0.88-0.86	93.5-93.5	1480-1485	700-680
132	415.0-388.0/240.0-224.0	0.89-0.88	94.0-94.0	1480-1485	720-680
160	501.0-469.0/289.0-271.0	0.89-0.87	94.5-94.3	1480-1485	680-720
200	625.0-572.0/361.0-351.0	0.89-0.89	94.5-94.4	1480-1485	680-680
250	On request	-	-	-	-
315	On request	-	-	-	-

3x380-415Δ

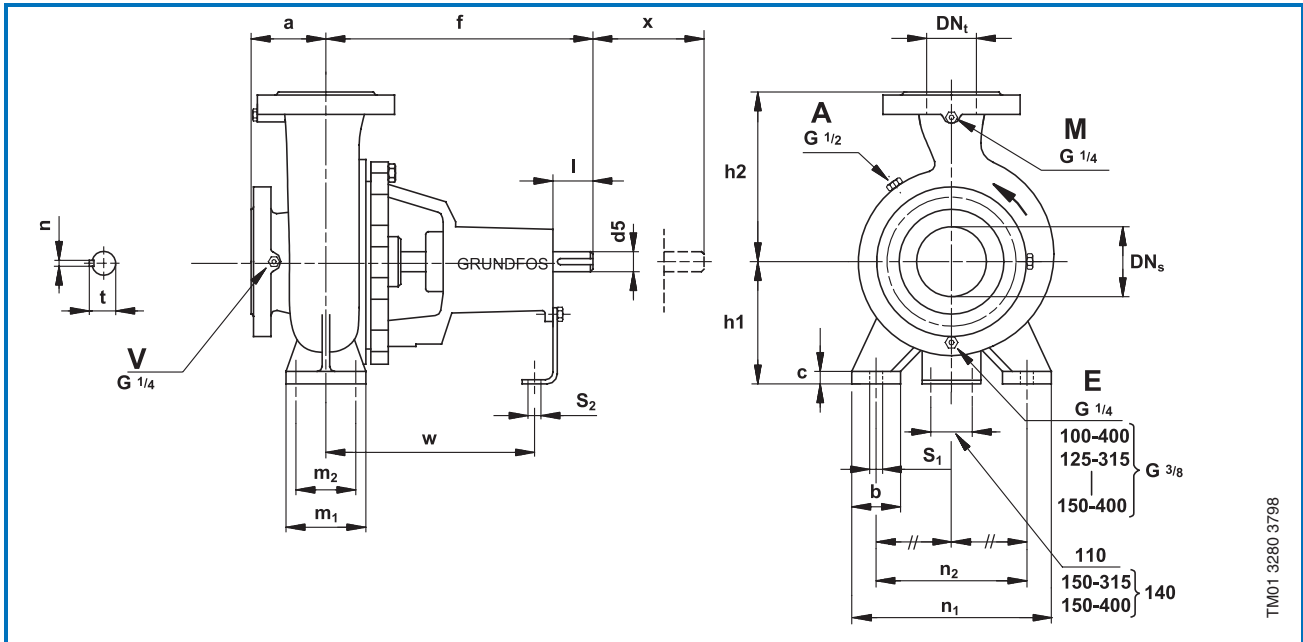
Motor [kW]	I _n [A]	Cos φ	η _{max} [%]	n [min ⁻¹]	I _{st} /I _n [%]
0.37	1.19-1.15	0.73-0.68	65.0-67.0	1320-1350	400-450
0.55	1.59-1.56	0.75-0.69	70.0-71.0	1380-1400	450-540
0.75	2.08-2.04	0.76-0.70	71.0-72.0	1380-1400	470-550
1.1	2.97-2.80	0.77-0.73	73.0-75.0	1370-1400	500-550
1.5	3.80-3.67	0.78-0.73	75.0-76.0	1380-1410	500-600
2.2	5.29-5.03	0.81-0.76	78.0-80.0	1400-1420	550-600
3.0	7.12-6.82	0.81-0.76	79.0-80.0	1410-1430	600-700
4.0	8.84-8.35	0.82-0.79	83.5-84.4	1430-1440	550-650
5.5	11.6-10.9	0.84-0.80	85.5-87.3	1440-1450	700-740
7.5	15.4-14.4	0.85-0.82	87.0-88.2	1440-1460	700-805
11	22.6-20.9	0.84-0.82	88.0-89.2	1460-1470	700-735
15	30.3-28.1	0.85-0.83	88.5-89.7	1460-1470	700-760
18.5	35.9-35.0	0.86-0.82	91.0-90.4	1470-1475	700-790
22	42.5-40.8	0.86-0.83	91.5-90.8	1470-1475	700-790
30	56.8-54.4	0.87-0.85	92.2-90.5	1470-1480	700-780
37	70.4-66.2	0.87-0.85	91.8-92.1	1480-1485	700-740
45	84.2-78.6	0.88-0.86	92.3-92.3	1480-1485	700-725
55	103.0-95.8	0.88-0.85	92.6-92.8	1480-1485	700-785
75	140.0-131.0	0.88-0.86	92.7-92.7	1480-1485	700-720
90	164.0-155.0	0.89-0.87	93.5-93.5	1480-1490	700-800
110	201.0-192.0	0.89-0.85	93.5-93.5	1480-1485	700-680
132	240.0-222.0	0.89-0.88	94.0-94.0	1480-1490	700-680
160	289.0-273.0	0.89-0.87	94.5-94.3	1480-1485	680-730
200	361.0-337.0	0.89-0.88	94.5-94.4	1480-1485	680-730
250	On request	-	-	-	-
315	On request	-	-	-	-

6-pole Electrical Data

3x380-415Δ

Motor [kW]	I_n [A]	Cos ϕ	η_{max} [%]	n [min ⁻¹]	I_{st}/I_n [%]
1.5	4.08-3.74	0.74	75	932	460
2.2	5.69-5.21	0.75	78	932	470
3.0	7.51-6.87	0.77	81	939	570
4.0	9.59-8.78	0.77	82	963	610
5.5	12.7-11.7	0.78	84	964	650
7.5	17.3-15.8	0.76	87	966	630
11	24.7-22.6	0.76	89	970	660
15	31.6-28.4	0.81	89	976	630
18.5	38.2-35.0	0.82	90	979	610
22	44.0-40.3	0.84	90	978	620
30	59.6-54.6	0.83	91	983	600
37	70.5-64.5	0.87	92	980	670
45	85.6-78.4	0.86	92	985	690
55	104.9-96.1	0.86	93	986	700
75	144.8-132.6	0.83	94	991	610
90	174.7-160.0	0.84	94	987	590
110	207.2-189.7	0.85	94	991	770
132	248.4-227.5	0.85	95	992	720

Pump Dimensions and Weights

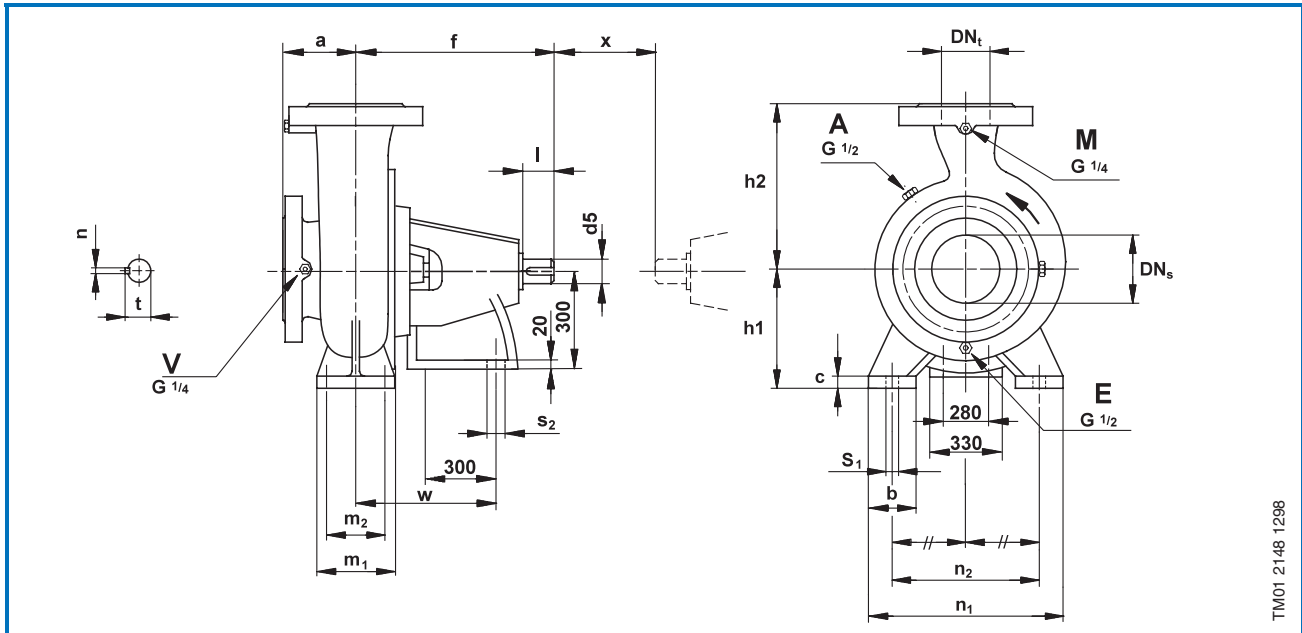


TM01 3280 3798

A	Priming plug
E	Drain plug
M	Pressure gauge tapping
V	Pressure/vacuum gauge tapping

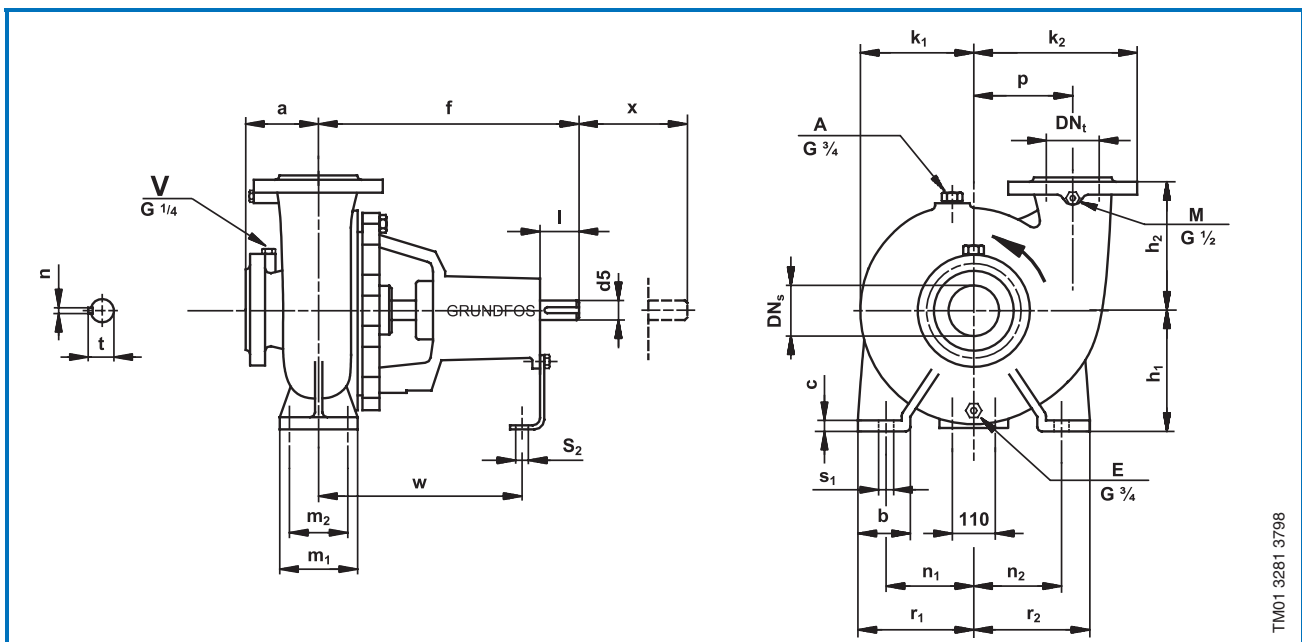
Type	Dimensions [mm]				Supporting Feet [mm]								Shaft [mm]						Weight [kg]			
	DN _s	DN _t	a	f	h ₁	h ₂	b	c	m ₁	m ₂	n ₁	n ₂	s ₁	s ₂	w	d5	l	t		n	x	
32-125	50	32	80	385	112	140	50	12	100	70	190	140	12	12	285	24	50	27	8	100	36	
32-160					132	160					240	190									39	
32-200					160	180					240	190									49	
40-125	65	40	80	385	112	140	50	12	100	70	210	160	12	12	285	24	50	27	8	100	36	
40-160			80	385	132	160	50		100	70	240	190			285	24	50	27	8		41	
40-200			100	385	160	180	50		100	70	265	212			285	24	50	27	8		51	
40-250			100	500	180	225	65		125	95	320	250			370	32	80	35	10		67	
50-125	80	50	100	385	132	160	50	12	100	70	240	190	12	12	285	24	50	27	8	100	36	
50-160			100	385	160	180	50		100	70	265	212			285	24	50	27	8		44	
50-200			100	385	160	200	50		100	70	265	212			285	24	50	27	8		58	
50-250			125	500	180	225	65		125	95	320	250			370	32	80	35	10		70	
65-125	100	65	100	385	160	180	65	12	125	95	280	212	12	12	285	24	50	27	8	100	43	
65-160			100	500	160	200	65	12	125	95	280	212	12		370	32	80	35	10		100	49
65-200			100	500	180	225	65	12	125	95	320	250	12		370	32	80	35	10		140	58
65-250			125	500	200	250	80	14	160	120	360	280	16		370	32	80	35	10		140	92
65-315			125	530	225	280	80	15	160	120	400	315	16		370	42	110	45	12		140	136
80-160	125	80	500	180	225	65	12	125	95	320	250	12	12	12	32	80	35	10	140	58		
80-200			500	180	250	65	12	125	95	345	280	12			32	80	35	10		76		
80-250			500	225	280	65	14	125	95	400	315	16			370	32	80	35		10	96	
80-315			530	250	315	80	16	160	120	400	315	16			42	110	45	12		142		
80-400			530	280	355	80	16	160	120	435	355	16			42	110	45	12		198		
100-200	125	100	125	500	200	280	80	14	160	120	360	280	16	12	12	32	80	35	10	140	86	
100-250			140	530	225	280	80	15	160	120	400	315	16			42	80	45	12		125	
100-315			140	530	250	315	80	16	160	150	400	315	16			42	80	45	12		151	
100-400			140	530	280	355	100	16	200	150	500	400	20			42	110	45	12		180	
125-250	150	125	140	530	250	355	80	16	200	150	400	315	16	12	12	42	110	45	12	140	140	
125-315			530	280	355	100	16	200	150	500	400	20	42			110	45	12	170			
125-400			530	315	400	100	20	200	150	500	400	20	42			110	45	12	194			
150-315	200	150	160	670	315	400	100	20	200	150	550	450	20	16	16	500	48	110	51,5	14	180	240
150-400			450	450	450	100	20	200	150	550	450	20	42			110	45	12	250			

Pump Dimensions and Weights



TM01 2148 1298

Type	Dimensions [mm]					Supporting Feet [mm]										Shaft [mm]					Weight [kg]
	DN _s	DN _t	a	f	h ₁	h ₂	b	c	m ₁	m ₂	n ₁	n ₂	s ₁	s ₂	w	d5	l	t	n	x	
*150-315	200	150	160	700	300	400	100	20	200	150	550	450	20		515					120	235
*200-500	250	200	250	750	410	675		22	250		790	660			536						480
*250-400	300	250	200	740	400	600	140	20	250	190	700	580	28	24	530	55	140	59	16	180	415
*250-500			300	750	410	660		23			790	660			536						507

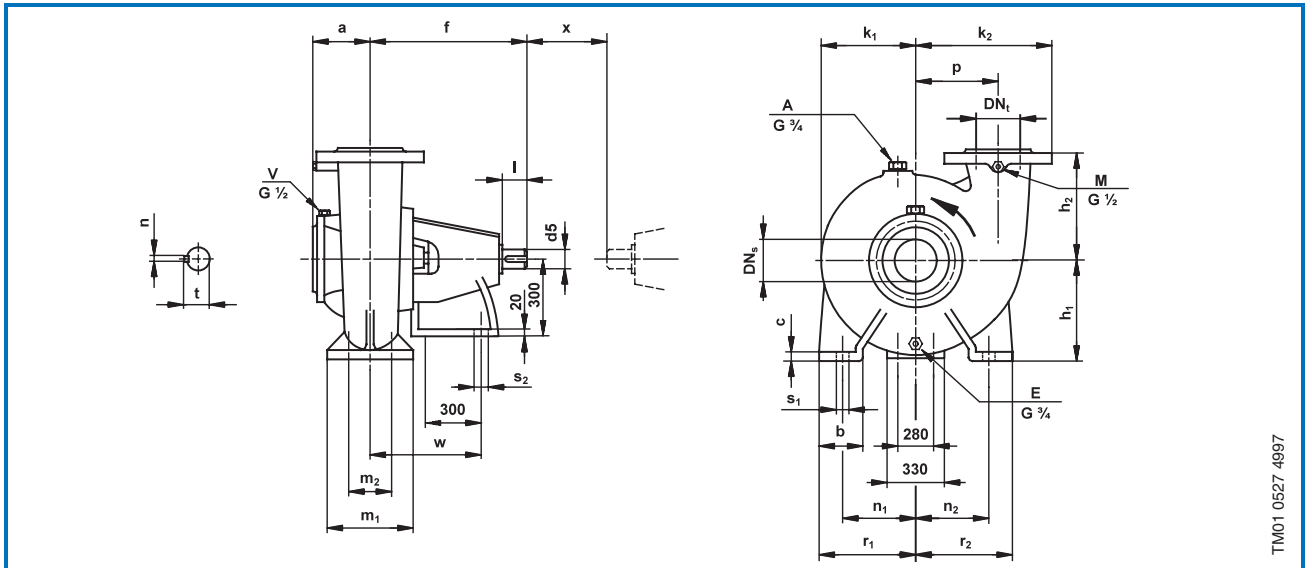


TM01 3281 3798

Type	Dimensions [mm]								Supporting Feet [mm]										Shaft [mm]					Weight [kg]		
	DN _s	DN _t	a	f	h ₁	h ₂	k ₁	k ₂	p	b	c	m ₁	m ₂	n ₁	n ₂	r ₁	r ₂	s ₁	s ₂	w	d5	l	t		n	x
*250-310	300	250	250	565	400	400	358	498	295	140	22	300	250	330	330	400	400	28	20	289	42	110	45	12	180	350

*) Oversize.

Pump Dimensions and Weights



TM01 0527 4997

Type	Dimensions [mm]								Supporting Feet [mm]								Shaft [mm]						Weight [kg]			
	DN _s	DN _t	a	f	h ₁	h ₂	k ₁	k ₂	p	b	c	m ₁	m ₂	n ₁	n ₂	r ₁	r ₂	s ₁	s ₂	w	d5	l		t	n	x
*200-400	250	200	180	730	400	400	268	460	290	130	25	300	230	155	215	220	280	28	24	600	55	140	59	16	200	400
*250-330	250	250	250	740	450	400	338	545	345	130	25	350	280	245	325	310	390	34	24	600	55	140	59	16	200	430
*300-360	300	300	300	760	520	440	410	580	355	160	25	320	270	337	337	420	420	26	24	540	55	140	59	16	280	560

*) Oversize

Flange Dimensions [mm]

	DIN 2501 PN 16										
	Nominal diameter (DN)										
		32	40	50	65	80	100	125	150	200	250
D ₁	32	40	50	65	80	100	125	150	200	250	300
D ₂	100	110	125	145	160	180	210	240	295	355	410
D ₃	140	150	165	185	200	220	250	285	340	405	460
S	4x18	4 x 18	4 x 18	4 x 18	8 x 18	8 x 18	8 x 18	8 x 22	12 x 22	12 x 26	12 x 26

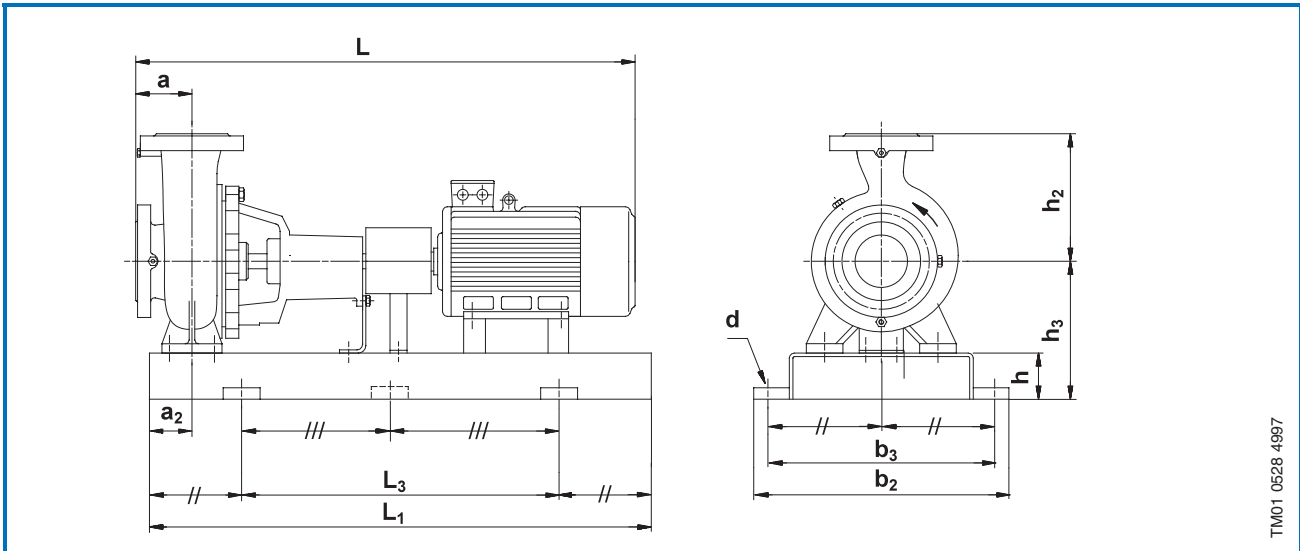
Oversizes

The DIN 24 256 describes only the standard types mentioned in the table on page 19.

The NKG range is extended with bigger models (over-sizes) for higher flows and pressures.

As a consequence bracket sizes, flange dimensions etc. for the oversize pumps can be different from other suppliers.

Unit Dimensions and Weights



TM01 0528 4997

The standard baseplate has only four holes for foundation bolts.

Type	Motor [kW]	Motor Size	2900 min ⁻¹ (2-pole motors)																					
			Common			With Standard Coupling								With Spacer Coupling										
			[mm]			[mm]								[mm]								Weight [kg]		
a	a ₂	h ₂	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	Weight [kg]	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	Weight [kg]				
32-125	0.55	71	80	60	140	700	65	177	800	540	360	320	19	69	795	65	177	800	540	360	320	19	72	840
	0.75-1.1	80				792								83	892								88	
	1.5	90S				798								97	894								98	
	2.2	90L				798								97	894								98	
32-160	0.75-1.1	80	80	60	160	740	65	197	800	540	360	320	19	85	840	65	197	900	600	390	350	19	91	892
	1.5	90S				792								105	894								96	
	2.2	90L				798								110	931								106	
	3	100L				835								145	954								128	
	4	112M				858								157	1053								146	
	5.5	132S				926								168	1053								178	
32-200	3	100L	80	60	180	835	65	225	900	600	390	350	19	120	931	80	240	1000	660	450	400	24	133	954
	4	112M				858								177	1053								141	
	5.5	132S				926								177	1053								187	
	7.5	132M				966								177	1093								194	
40-125	0.75-1.1	80	80	60	140	740	65	177	800	540	360	320	19	82	840	65	177	900	600	390	350	19	92	892
	1.5	90S				792								97	894								95	
	2.2	90L				798								97	894								99	
	3	100L				835								102	931								115	
40-160	2.2	90L	80	60	160	798	65	197	900	600	390	350	19	102	894	65	197	900	600	390	350	19	102	894
	3	100L				835								107	931								120	
	4	112M				858								120	954								133	
	5.5	132S				926								157	1053								169	
	7.5	132M				966								157	1093								178	
	11-15	160M				1105								222	1232								237	
40-200	3	100L	100	60	180	855	65	225	900	600	390	350	19	117	951	80	240	1000	660	450	400	24	130	974
	4	112M				878								130	974								143	
	5.5	132S				946								169	1073								178	
	7.5	132M				986								169	1113								178	
	11-15	160M				1105								222	1232								237	
40-250	5.5	132S	100	75	225	1046	80	260	1120	740	490	440	24	190	1186	80	260	1250	840	540	490	24	210	1226
	7.5	132M				1086								255	1345								283	
	11-15	160M				1205								273	1390								308	
	18.5	160L				1250								311	1423								334	
	22	180M				1283								311	1423								334	
50-125	1.5	90S	100	60	160	812	65	197	800	540	360	320	19	88	912	65	197	900	600	390	350	19	97	908
	2.2	90L				812								103	951								104	
	3	100L				855								116	974								117	
	4	112M				878								116	974								130	
	5.5	132S				946								147	1073								161	
	7.5	132M				986								147	1113								161	

*) Oversize

2900 min ⁻¹ (2-pole motors)																							
Type	Motor [kW]	Motor Size	Common			With Standard Coupling								With Spacer Coupling									
			[mm]			[mm]								Weight [kg]	[mm]								Weight [kg]
			a	a ₂	h ₂	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d		L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	
50-160	3	100L	100	60	180	855	65	225	900	600	390	350	19	111	951	80	240	1000	660	450	400	24	130
	4	112M				878								124	974								143
	5.5	132S				946	80	240	1000	660	450	400	24	162	1073			170					
	7.5	132M				986								1113	224								
	11	160M				1105			1120	740	490	440	212	1232	224								
50-200	5.5	132S	100	60	200	946	80	240	1000	660	450	400	24	174	1073	80	240	1120	740	490	440	24	196
	7.5	132M				986								1113	254								
	11-15	160M				1105	80	260	1120	740	490	440	24	231	1232	254							
	18.5	160L				1150								252	1277	294							
	22	180M				1180			1250	840	540	490	302	1307	325								
50-250	11-15	160M	125	75	225	1230	80	260	1250	840	540	490	24	263	1370	100	280	1400	940	610	550	28	299
	18.5	160L				1275								283	1415								306
	22	180M				1305	308	1445	337														
	30	200L				1385	100	280	1400	940	610	550	28	394	1525			421					
65-125	4	112M	100	75	180	878	65	225	900	600	390	350	19	126	974	80	240	1000	660	450	400	24	144
	5.5	132S				946								80	240								1000
	7.5	132M				986	1113	239															
	11	160M				1105	1120	740	490	440	214	1232	239										
65-160	5.5	132S	100	75	200	1046	80	240	1120	740	490	440	24	189	1186	80	240	1250	840	540	490	24	212
	7.5	132M				1086								1226	285								
	11-15	160M				1205	80	260	1250	840	540	490	24	237	1345	285							
	18.5	160L				1250								262	1390	285							
65-200	7.5	132M	100	75	225	1086	80	260	1120	740	490	440	24	203	1226	80	260	1250	840	540	490	24	231
	11-15	160M				1205								251	1345								319
	22	180M				1280	100	280	1400	940	610	550	28	302	1420	385							
	30	200L				1363								100	300	1400	940	610	550	28	388	1503	402
65-250	18.5	160L	125	90	250	1275	80	280	1250	840	540	490	24	297	1415	100	300	1400	940	610	550	28	187
	22	180M				1305								300	1445								359
	30-37	200L				1388	100	325	1400	940	610	550	28	424	1525			445					
	45	225M				1370	325	1507	508	1507	325	1600	1060	660	600			513					
65-315	37	200L	125	90	280	1415	100	325	1400	940	610	550	28	497	1555	100	325	1600	1060	660	600	28	495
	45	225M				1397								571	1537								571
	55	250M				1567	100	350	1600	1060	660	600	28	649	1707	655							
	75	280S				1592	100	380	1800	1200	730	670	28	781	1732	786							
	90	280M				1627								832	1767	860							
80-160	7.5	132S	125	75	225	1071	80	260	1120	740	490	440	24	165	1211	80	260	1250	840	540	490	24	194
	11-15	160M				1230								258	1370								274
	18.5	160L				1275	100	280	1250	840	540	490	24	281	1415	301							
	22	180M				1305								327	1445	337							
	30	200L				1388								100	300	1400	940	610	550	28	382		1525
80-200	15	160M	125	75	250	1230	80	260	1250	840	540	490	24	250	1370	100	280	1400	940	610	550	28	316
	18.5	160L				1275								338	1415								336
	22	180M				1305	100	280	1400	940	610	550	28	341	1445	377							
	30-37	200L				1388								300	1525	435							
	45	225M				1370								325	1600	1060	660	600	28	492	1507		497
80-250	18.5	160L	125	90	280	1275	100	300	1400	940	610	550	28	356	1415	100	300	1400	940	610	550	28	356
	22	180M				1305								368	1445								397
	30-37	200L				1388	100	325	1600	1060	660	600	28	429	1525	465							
	45	225M				1370								514	1507	517							
	55	250M				1544								350	1677	615							
	75	280S				1569								380	1800	1200	730	670	380	1702	758		
80-315	45	225M	125	90	315	1397	100	350	1600	1060	660	600	28	603	1537	100	350	1600	1060	660	600	28	589
	55	250M				1557								678	1707								683
	75	280S				1582	100	380	1800	1200	730	670	28	787	1722	792							
	90	280M				1627								840	1767	866							
	110	315S				1813								315	1171	1953	1224						
	132	315M				1868								120	435	2000	1340	910	830	1272	2008		1302
100-200	22	180M	125	90	280	1305	100	300	1400	940	610	550	28	359	1445	100	300	1600	1060	660	600	28	376
	30-37	200L				1388								438	1525								445
	45	225M				1370	325	1507	515														
	55	250M				1544	350	1677	624														
	75	280S				1569	380	1800	1200	730	670	380	1702	736									

*) Oversize

2900 min ⁻¹ (2-pole motors)																							
Type	Motor [kW]	Motor Size	Common			With Standard Coupling								With Spacer Coupling									
			[mm]			[mm]								[mm]								Weight [kg]	
			a	a ₂	h ₂	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d		Weight [kg]
100-250	37	200L	140	90	280	1430	100	325	1600	1060	660	600	28	492	1570	100	325	1600	1060	660	600	28	516
	45	225M				1412								542	1552								590
	55	250M				1582								634	1722								656
	75	280S				1607								794	1747								794
	90	280M				1642								834	1782								857
	110	315S				1828								1204	1968								1214
100-315	55	250M	140	90	315	1582	100	350	1600	1060	660	600	28	651	1722	100	350	1800	1200	730	670	28	697
	75	280S				1607								821	1747								851
	90	280M				1642								921	1782								974
	110	315S				1828								1203	1967								1233
	132	315M				1883								1329	2022								1359
	160-200	315L				1967								1529	2107								1527
125-250	37	200L	140	90	355	1430	100	350	1600	1060	660	600	28	501	1560	100	350	1600	1060	660	600	28	501
	45	225M				1412								587	1552								687
	55	250M				1582								666	1722								663
	75	280S				1607								806	1747								806
	90	280M				1642								857	1782								885
	110	315S				1828								1192	1968								1221
150-315	90	280M	160	110	400	1803	120	400	2000	1340	910	830	28	966	1943	120	400	2000	1340	910	830	28	964
	110	315S				1989								1325	2129								1325
	132	315M				2044								1403	2184								1403
	160	315Lk				2129								1537	2269								1586
	200	315L				2159								1607	2299								1624
	315	355M				2216								2003	2356								2010
150-315 ^{*)}																							2188

*) Oversize

1450 min ⁻¹ (4-pole motors)																							
Type	Motor [kW]	Motor Size	Common			With Standard Coupling								With Spacer Coupling									
			[mm]			[mm]								[mm]								Weight [kg]	
			a	a ₂	h ₂	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d		Weight [kg]
32-125	0.37	71	80	60	140	700	65	177	800	540	360	320	19	69	795	65	177	800	540	360	320	19	72
32-160	0.37	71	80	60	160	700	65	197	800	540	360	320	19	73	795	65	197	900	600	390	350	19	74
	0.55-0.75	80				740								85	840								92
32-200	0.37	71	80	60	180	700	65	225	800	540	360	320	19	83	795	65	225	900	600	390	350	19	86
	0.55-0.75	80				740								95	840								102
	1.1	90S				792								101	892								108
40-125	0.37	71	80	60	140	700	65	177	800	540	360	320	19	70	795	65	177	800	540	360	320	19	73
40-160	0.37	71	80	60	160	700	65	197	800	540	360	320	19	75	795	65	197	900	600	390	350	19	82
	0.55-0.75	80				740								87	840								94
	1.1	90S				792								93	892								100
40-200	0.55-0.75	80	100	60	180	760	65	225	900	600	390	350	19	102	860	65	225	900	600	390	350	19	104
	1.1	90S				812								107	912								108
	1.5	90L				812								112	912								114
40-250	0.75	80	100	75	225	875	80	260	1000	660	450	400	24	129	975	80	260	1000	660	450	400	24	131
	1.1	90S				927								135	1027								137
	1.5	90L				927								139	1027								141
	2.2-3	100L				964								147	1060								155
50-125	0.37	71	100	60	160	715	65	197	800	540	360	320	19	70	815	65	197	900	600	390	350	19	78
	0.55-0.75	80				760								82	860								89
50-160	0.55-0.75	80	100	60	180	760	65	225	900	600	390	350	19	95	860	65	225	900	600	390	350	19	98
	1.1	90S				812								102	912								104
	1.5	90L				812								105	912								107
50-200	0.75	80	100	60	200	760	65	225	900	600	390	350	19	109	860	65	225	900	600	390	350	19	111
	1.1	90S				812								115	912								117
	1.5	90L				812								119	912								121
	2.2-3	100L				855								128	951								142
	1.1	90S				962								138	1062								143
50-250	1.5	90L	125	75	225	952	80	260	1000	660	450	400	24	142	1052	80	260	1000	660	450	400	24	154
	2.2-3	100L				989								148	1089								162
	4	112M				1012								163	1112								172
	0.55-0.75	80				760								94	860								96
65-125	1.1	90S	100	75	180	812	65	225	900	600	390	350	19	100	912	65	225	900	600	390	350	19	102
	1.5	90L				812								104	912								106

*) Oversize

1450 min ⁻¹ (4-pole motors)																							
Type	Motor [kW]	Motor Size	Common			With Standard Coupling								With Spacer Coupling									
			[mm]			[mm]								[mm]								Weight [kg]	
			a	a ₂	h ₂	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d		Weight [kg]
65-160	0.75	80	100	75	200	875	65	225	900	600	390	350	19	100	975	80	240	1000	660	450	400	24	123
	1.1	90S				927	80	240	1000	660	450	400	24	117	1027								119
	1.5	90L				927								121	1027								123
	2.2-3	100L				965								130	1065								132
65-200	1.1	90S	100	75	225	927	80	260	1000	660	450	400	24	126	1027	80	260	1000	660	450	400	24	128
	1.5	90L				927								130	1027								135
	2.2-3	100L				965								148	1065								151
	4	112M				988								163	1088								165
65-250	2.2-3	100L	125	90	250	989	80	280	1120	740	490	440	24	182	1089	80	280	1120	740	490	440	24	187
	4	112M				1012								196	1112								197
	5.5	132S				1071								213	1211								231
	7.5	132M				1111								224	1251								257
65-315	4	112M	125	90	280	1042	80	305	1250	840	540	490	24	256	1142	80	305	1250	840	540	490	24	258
	5.5	132S				1101								278	1241								283
	7.5	132M				1141								283	1281								303
	11	160M				1260								323	1400								359
80-160	1.1	90S	125	75	225	1305	100	325	1400	940	610	550	28	369	1445	100	325	1600	1060	660	600	28	381
	1.5	90L				952	80	260	1000	660	450	400	24	135	1052								142
	2.2-3	100L				952	80	260	1120	740	490	440	24	139	1052								146
	2.2-3	100L				989	80	260	1120	740	490	440	24	148	1089								151
80-200	2.2-3	100L	125	75	250	989	80	260	1120	740	490	440	24	166	1089	80	260	1120	740	490	440	24	169
	4	112M				1012								198	1112								178
	5.5	132S				1071								198	1211								200
	7.5	132M				1111								208	1251								225
80-250	3	100L	125	90	280	989	80	280	1250	840	540	490	24	202	1089	80	280	1250	840	540	490	24	204
	4	112M				1012								208	1112								215
	5.5	132S				1071								248	1211								251
	7.5	132M				1111								258	1251								261
80-315	11	160M	125	90	315	1230	100	350	1400	940	610	550	28	298	1370	100	300	1400	940	610	550	28	321
	15	160L				1101								274	1241								281
	18.5	180M				1141								285	1281								312
	5.5	132S				1260								339	1400								345
80-400	11	160M	170	125	355	1305	100	350	1400	940	610	550	28	406	1475	100	350	1600	1060	660	600	28	421
	15	160L				1335								466	1514								474
	18.5	180M				1259								410	1399								440
	22	180L				1304								431	1444								440
	30	200L				1334								463	1474								474
	37	225S				1374								484	1514								492
100-200	3	100L	125	90	280	1414	80	290	1120	740	490	440	24	545	1554	80	280	1120	740	490	440	24	559
	4	112M				1522								602	1662								602
	5.5	132S				989								175	1089								175
	7.5	132M				1012								186	1112								186
	11	160M				1071								213	1211								231
100-250	7.5	132M	140	90	280	1111	80	305	1250	840	540	490	24	233	1251	100	325	1250	840	540	490	24	251
	11	160M				1116								254	1256								264
	15	160L				1156								268	1296								280
	18.5	180M				1275								319	1415								346
	22	180L				1320								339	1460								358
	30	200L				1350								406	1490								436
100-315	37	225S	140	90	315	1374	100	325	1400	940	610	550	28	414	1530	100	350	1600	1060	660	600	28	477
	45	225M				1414								476	1530								492
	55	250M				1390								507	1570								513
	75	280S				1430								570	1570								513
	15	160L				1156								291	1296								314
	18.5	180M				1275								343	1415								366
100-400	22	180L	140	110	355	1320	100	380	1600	1060	660	600	28	383	1460	100	380	1600	1060	660	600	28	398
	30	200L				1350								415	1490								430
	37	225S				1390								476	1530								492
	45	225M				1430								507	1570								513
	55	250M				1442								570	1570								513
	75	280S				1582								745	1722								749
	15	160L				1320								430	1460								435
	18.5	180M				1350								462	1490								467
22	180L	1390	480	1530	485																		
30	200L	1430	565	1570	570																		
37	225S	1538	620	1678	586																		
45	225M	1442	640	1582	664																		
55	250M	1582	745	1722	749																		
75	280S	1607	850	1747	855																		

*) Oversize

1450 min ⁻¹ (4-pole motors)																								
Type	Motor [kW]	Motor Size	Common			With Standard Coupling										With Spacer Coupling								
			[mm]			[mm]										[mm]								Weight [kg]
			a	a ₂	h ₂	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	Weight [kg]	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	Weight [kg]	
125-250	5.5	132S	140	90	355	1116	80	330	1250	840	540	490	24	272	1256	100	350	1400	940	610	550	28	279	
	7.5	132M				1156								283	1296								330	
	11	160M				1275								306	1415								350	
	15	160L				1320								383	1460								387	
	18.5	180M				1350								422	1490								437	
	22	180L				1391								422	1531								437	
125-315	11	160M	140	110	355	1275	100	380	1600	1060	660	600	28	397	1415	100	380	1600	1060	660	600	28	400	
	15	160L				1320								417	1460								420	
	18.5	180M				1350								475	1490								478	
	22	180L				1390								505	1530								528	
	30	200L				1430								555	1570								532	
125-400	15	160L	140	110	400	1320	100	415	1600	1060	660	600	28	450	1462	100	415	1600	1060	600	600	28	454	
	18.5	180M				1350								482	1492								482	
	22	180L				1390								500	1532								504	
	30	200L				1430								556	1572								560	
	37	225S				1538								597	1680								621	
	45	225M				1442								628	1579								652	
	55	250M				1582								685	1719								709	
	75	280S				1607								905	1744								869	
150-315	11	160M	160	110	400	1435	100	380	1600	1060	660	600	28	450	1575	100	380	1800	1200	730	670	28	455	
	15	160L				1480								490	1620								475	
	18.5	180M				1510								519	1650								525	
	22	180L				1550								555	1690								560	
	30	200L				1590								605	1730								610	
	37	225S				1698								685	1838								690	
	45	225M				1602								694	1742								699	
150-400	22	180L	160	110	450	1550	100	415	1800	1200	730	670	28	556	1690	100	415	1800	1200	730	670	28	561	
	30	200L				1590								612	1730								617	
	37	225S				1698								653	1838								660	
	45	225M				1602								686	1742								694	
	55	250M				1742								765	1882								789	
	75	280S				1767								921	1907								949	
	90	280M				1802								1126	1942								1156	
	110	315S				2018								1306	2158								1338	
	200-400 *)	45				225M								180	255								400	1683
55		250M	1823	942	2023	950																		
75		280S	1848	1006	2048	1108																		
90		280M	1883	1190	2083	1196																		
110		315S	2099	1488	2299	1499																		
132		315M	2154	1639	2354	1650																		
55		250M	1913	1046	2113	1054																		
200-500 *)	75	280S	250	175	675	1938	180	490	2000	1700	945	880	18	1200	2138	180	490	2000	1700	945	880	18	1210	
	90	280M				1973								1301	2173								1312	
	110	315S				2184								1579	2384								1590	
	132	315M				2244								2633	2444								1744	
	160	315Lk				2329								1837	2529								1858	
	200	315L				2329								1970	2529								1986	
	250	355S				2484								2262	2684								2283	
	30	200L				1577								630	1777								660	
250-310 *)	37	225S	250	195	400	1685	140	505	1700	1500	950	830	18	680	1910	160	505	1800	1600	950	820	18	690	
	45	225M				1589								750	1789								765	
	55	250M				1729								820	1929								810	
	75	280S				1754								900	1954								920	
	55	250M				1904								940	2104								942	
250-330 *)	75	280S	250	220	400	1928	120	570	2000	1340	910	830	28	1085	2128	160	460	2100	1800	850	790	18	1195	
	90	280M				1963								1185	2163								1280	
	110	315S				2179								1470	2379								1580	
	55	250M				1853								1004	2053								1012	
250-400 *)	75	280S	200	175	600	1878	180	480	2000	1700	860	795	18	1158	2078	180	480	2000	1700	860	795	18	1170	
	90	280M				1913								1258	2113								1270	
	110	315S				2179								1536	2379								1547	
	132	315M				2234								1690	2434								1701	
	160	315Lk				2319								1806	2519								1822	
	200	315L				2319								1906	2519								1920	

*) Oversize

1450 min ⁻¹ (4-pole motors)																								
Type	Motor [kW]	Motor Size	Common			With Standard Coupling							With Spacer Coupling											
			[mm]			[mm]							[mm]							Weight [kg]				
			a	a ₂	h ₂	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	L	h	h ₃	L ₁	L ₃	b ₂		b ₃	d	Weight [kg]	
250-500 *)	90	280M	300	175	185	660	2023	180	490	2000	1700	945	800	18	1416	2223	180	490	2000	1700	945	800	18	1432
	110	315S		2239			495	2100	1800	955	885	1694	2439		495	2100		1800	955	885	1710			
	132	315M		2294			515					1830	2494		515						1845			
	160	315Lk		2379			200	2030	2578	220	535	2200	1900		965	890		1945						
	200	315L		2379			220	535	2200	1900	965	890	2030		2578	220		535	2200	1900	965	890		2045
	250	355S		132			2534	240	595	2300	2000	975	890		2268	240		595	2300	2000	975	890		2289
	315	355M		134			2534	240	615	2400	2100	985	900		2460	2734		240	615	2400	2100	985		900
300-360 *)	55	250M	300	180	440	1974	180	700	2200	1900	860	795	22	1150	2254	180	700	2200	1900	860	795	22	1170	
	75	280S				1999			2300	2000				1310	2279			2300	2000				1330	
	90	280M				2034			2400	2100				1390	2314			2400	2100				1410	
	110	315S				2250			2400	2100				1690	2530			2400	2100				1710	
	132	315M				2305			2400	2100				1840	2585			2400	2100				1860	

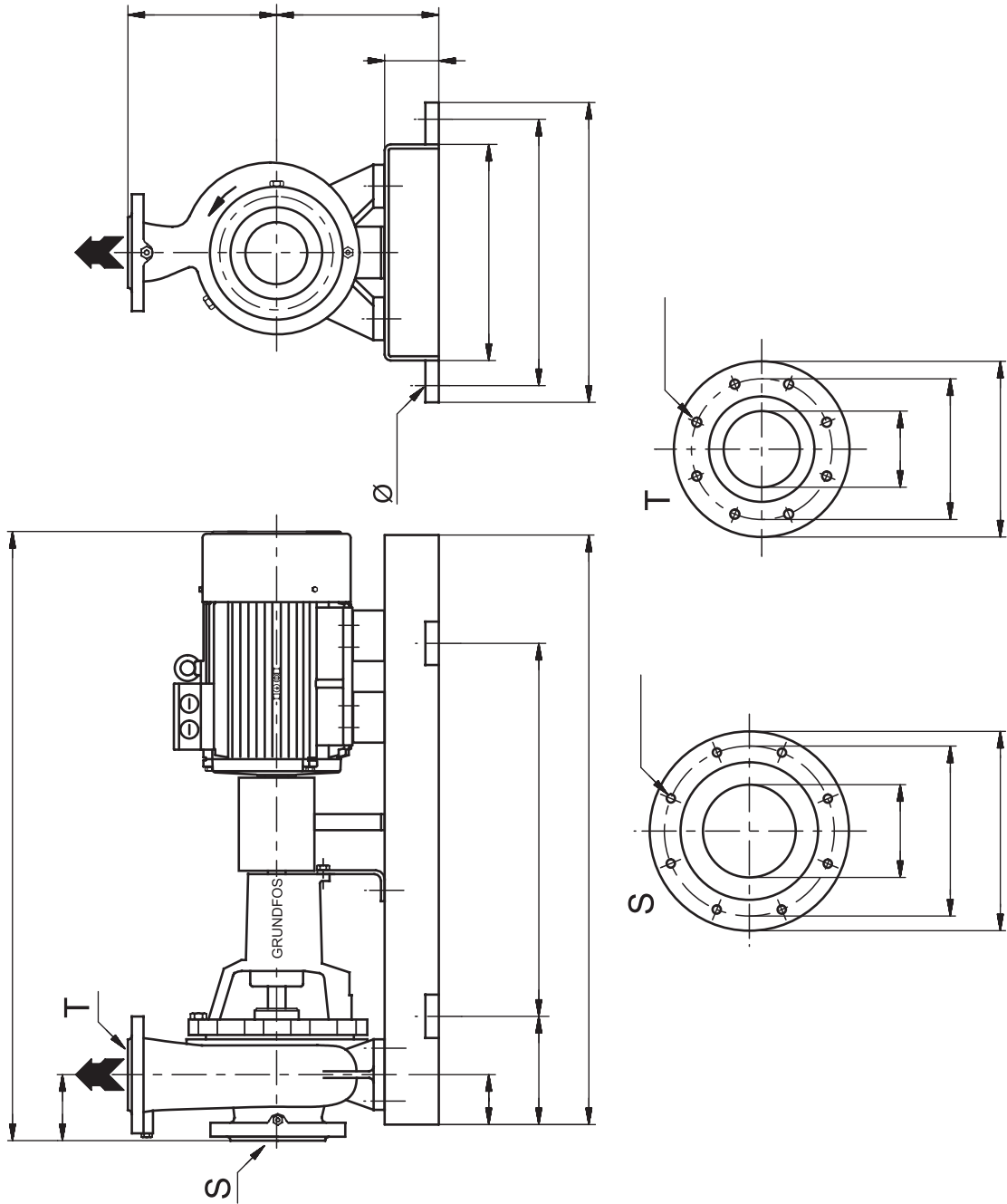
*) Oversize


970 min ⁻¹ (6-pole motors)																							
Type	Motor [kW]	Motor Size	Common			With Standard Coupling							With Spacer Coupling										
			[mm]			[mm]							[mm]							Weight [kg]			
			a	a ₂	h ₂	L	h	h ₃	L ₁	L ₃	b ₂	b ₃	d	L	h	h ₃	L ₁	L ₃	b ₂		b ₃	d	Weight [kg]
100-200	1,5	100L	125	90	280	987	80	280	1120	740	490	440	24	170	1087	80	280	1120	740	490	440	24	170
	2,2	112M				1019								182	1119								182
	3	132S				1118								200	1258								212
	4	132M				1118								200	1258								212
125-250	2,2	112M	140	90	355	1064	80	330	1250	840	540	490	24	232	1164	80	330	1250	840	540	490	24	232
	3	132S				250								250									
	4	132M				260								1303	260								271
	5,5	132M				271								306	1427								271
	7,5	160M				306								1427	306								1427
150-315	5,5	132M	160	110	400	1323	100	380	1600	1060	660	600	28	395	1463	100	380	1600	1060	660	600	28	395
	7,5	160M				420								1587	420								1587
	11	160L				447								1632	447								1632
	15	180L				1582								527	1722								527
200-400 *)	18,5	200L	180	200	400	1677	100	500	1800	1200	730	670	28	751	1877	100	500	1800	1200	730	670	28	750
	22	200L				781								1877	781								1877
	30	225M				827								1904	827								1904
	37	250M				1838								2038	1838								2038
200-500 *)	30	225M	250	175	675	1793	160	480	1900	1600	945	885	18	960	1993	160	480	2000	1700	945	885	18	960
	37	250M				1928								2128	1928			2128					
	45	280S				1908								2108	1908			2108					
	55	280M				1265								2143	1265			2143					
	75	280M				1943								2143	1943			2143					
250-310 *)	11	160L	250	200	400	1477	140	480	1700	1400	950	890	18	560	1677	140	480	1700	1400	950	890	18	560
	15	180L				1567								1767	1567			1767					
	18,5	200L				1582								1782	1582			1782					
250-330 *)	18,5	200L	250	225	400	1757	120	570	2000	1340	910	830	28	800	1957	120	570	2000	1340	910	830	28	800
	22	200L				830								1984	830			1984					
	30	225M				874								1984	874			1984					
250-400 *)	18,5	200L	200	175	600	1707	160	470	1800	1500	850	790	18	814	1907	160	470	1900	1600	850	790	18	818
	22	200L				844								1934	844			1934					
	30	225M				890								2069	890			2069					
	37	250M				1017								2069	1017			2069					
	45	280S				1150								2049	1150			2049					
250-500 *)	45	280S	300	175	660	1959	180	490	2000	1700	945	880	18	1240	2159	180	490	2200	1900	945	880	18	1255
	55	280M				1994								2194	1994			2194					
	75	315S				1700								2194	1700			2194					
	90	315M				1827								2630	1827			2630					
	110	315L				1897								2630	1897			2630					
300-360 *)	22	200L	300	180	440	1827	180	530	1800	1500	860	795	18	991	2107	180	530	2000	1700	860	795	18	1000
	30	225M				1854								2134	1854			2134					
	37	250M				1989								2269	1989			2269					
	45	280S				1969								2249	1969			2249					
	55	280M				2004								2284	2004			2284					

*) Oversize

Quotation Drawing

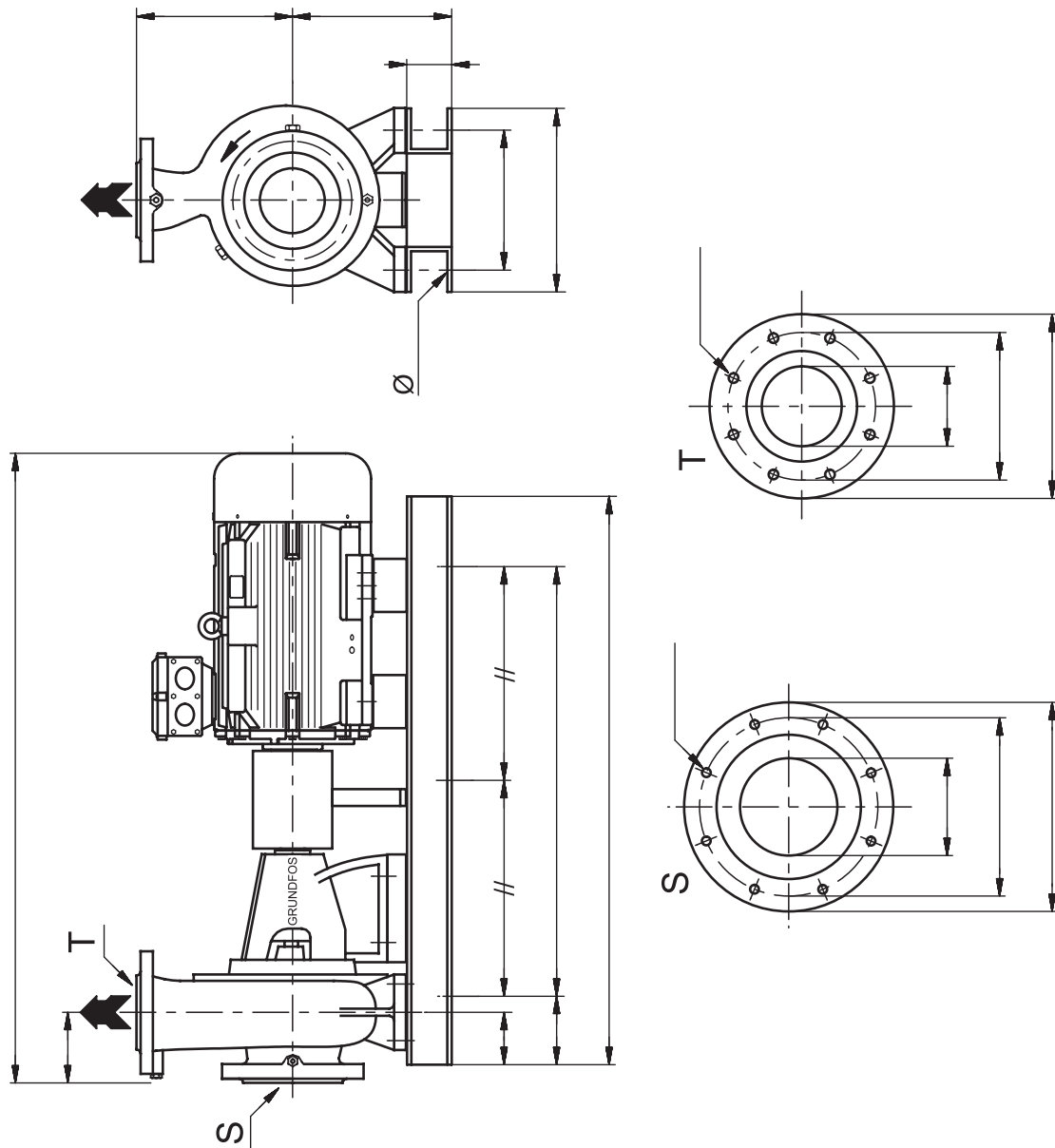
NKG 32-125 -> 150-400





 <p>GRUNDFOS DK-8850 BJERRINGBRO DENMARK</p>	Pump type:	Drawing No.: TM01 3486 4298
		Projection: 

Quotation Drawing

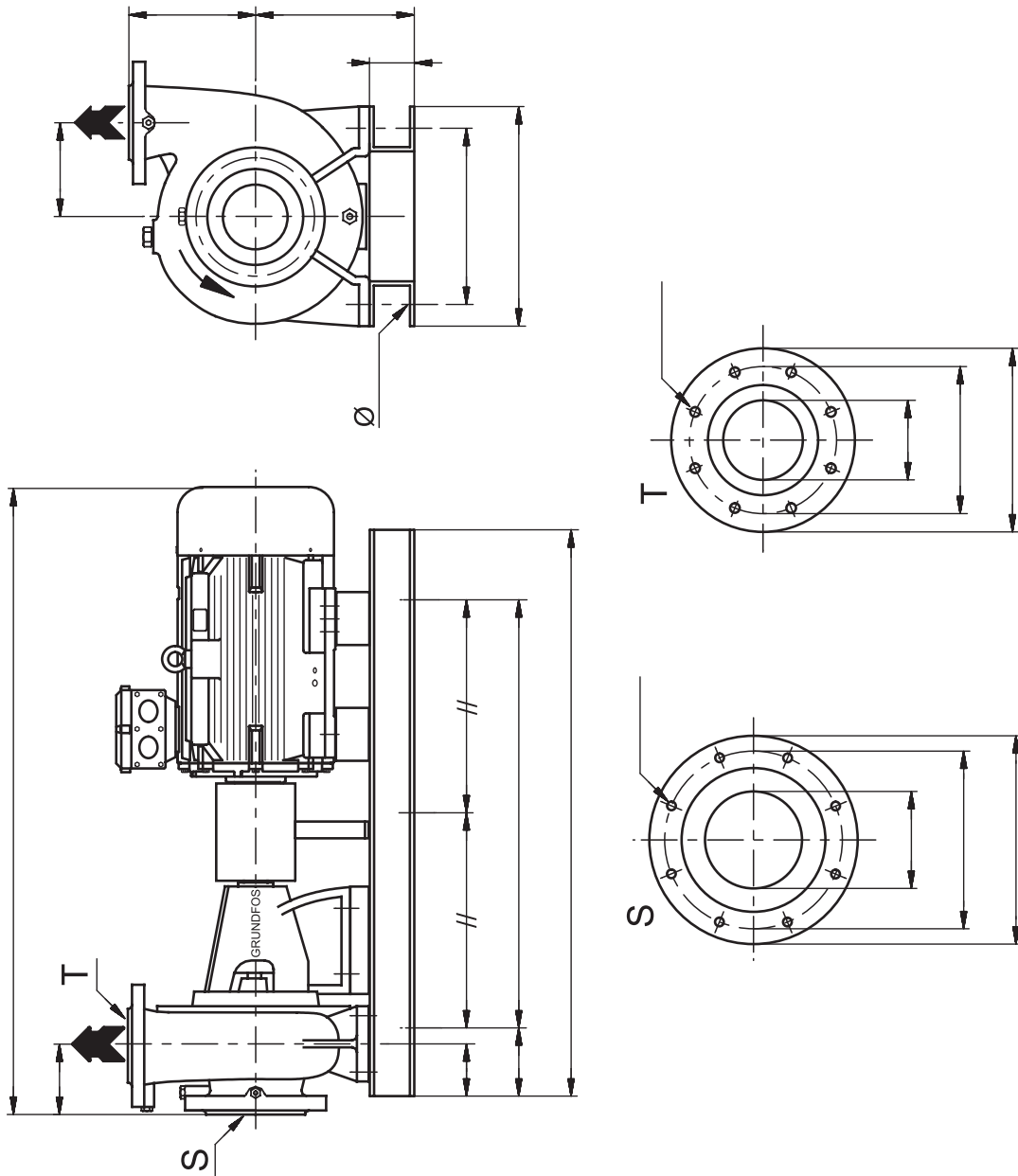
“Oversizes” NKG 150-315, 200-500, 250-400, 250-500


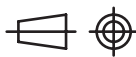


 <p>GRUNDFOS DK-8850 BJERRINGBRO DENMARK</p>	Pump type:	Drawing No.: TM01 3487 4298
		Projection: 

Quotation Drawing

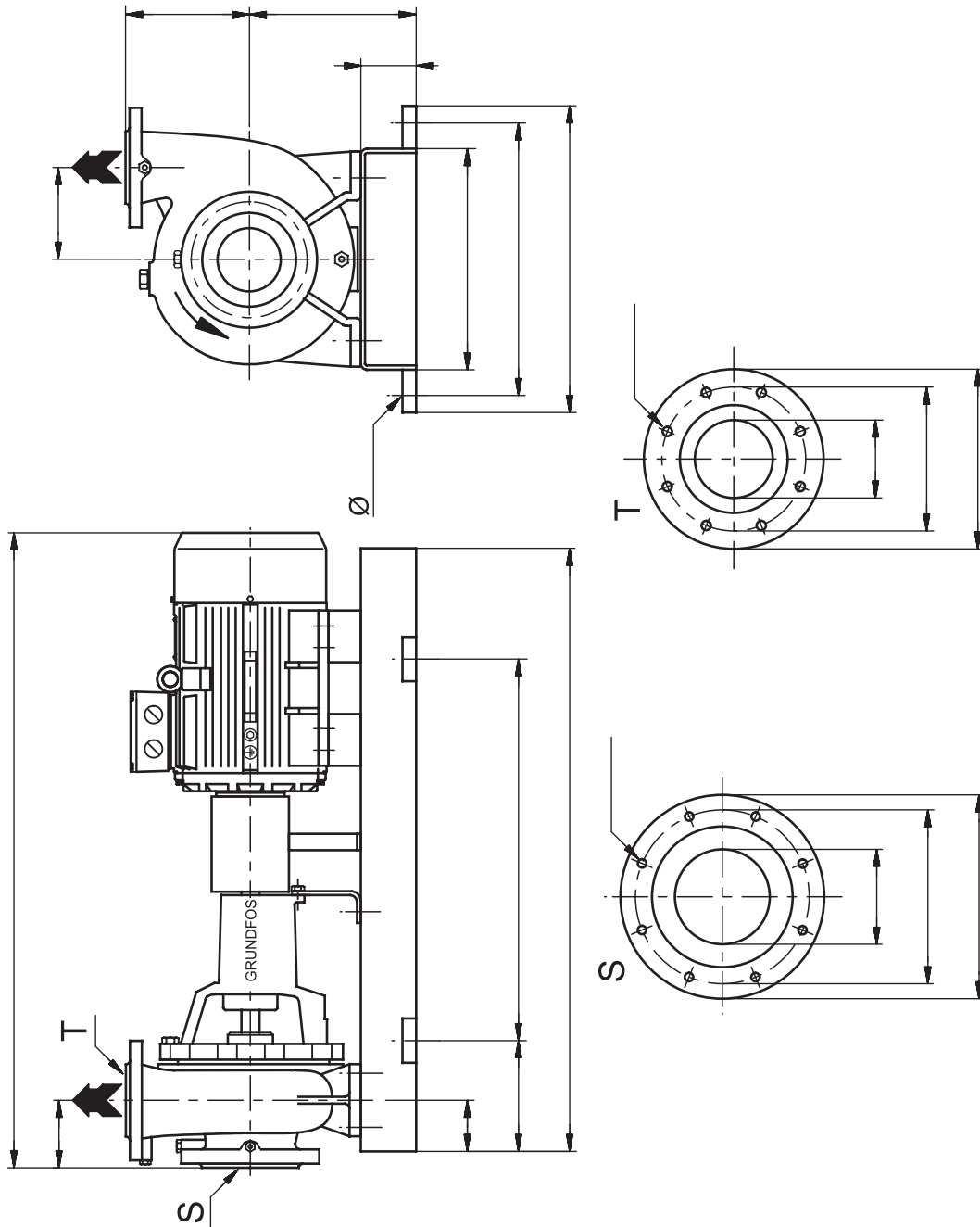
“Oversizes” NKG 200-400, 250-330, 300-360





 <p>GRUNDFOS DK-8850 BJERRINGBRO DENMARK</p>	Pump type:	Drawing No.: TM01 3488 4298
		Projection: 

Quotation Drawing

“Oversizes” NKG 250-310



 <p>GRUNDFOS DK-8850 BJERRINGBRO DENMARK</p>	Pump type:	Drawing No.: TM01 3489 4298
		Projection: 

Curve Conditions

Selection of Pumps

The guidelines below apply to the curves shown in the performance charts on pages 36 - 107.

- Tolerances according to:
ISO 2548, Class C, annex B.
The curves show pump performance with different impeller diameters at the nominal speed.
- The bold part of the curves show the **recommended** operating range.
The thin parts show the **possible** operating range but the lower efficiency here might suggest the selection of a smaller/larger pump type.
Due to the risk of overheating, a flow rate equal to 10% of the flow rate at maximum efficiency is needed at all times.
- The curves apply to the pumping of water at a temperature of +20°C and a kinematic viscosity of 1 mm²/s (1 cSt).
- ETA: The dashed lines show values of the hydraulic efficiency of the pump.
- NPSH: The curves show average values measured under the same conditions as the performance curves.
When dimensioning the pump, add a safety margin of at least 0.5 m.

Performance Tests

The requested duty point for every pump is tested according to ISO 2548, class C, annex B and without certification.

In case of pumps ordered with impeller diameter only (no requested duty point), the pump will be tested at a duty point which is 2/3 of the maximum flow of the published performance curve which is related to the ordered impeller diameter (according to ISO 2548, class C, annex B).

If the customer requires either more points on the curve to be checked or certain minimum performances or certificates, individual measurements must be made.

Certificates

Certificates have to be confirmed for every order and are available on request as follows:

According to EN 10204

- Certificate for compliance with the order EN 10204-2.1
- Pump certificate EN 10204-2.2
- Works certificate EN 10204-2.3
- Inspection certificate EN 10204-3.1 B
- Inspection certificate EN 10204-3.1 C

According to ISO 2548, Class C, annex B

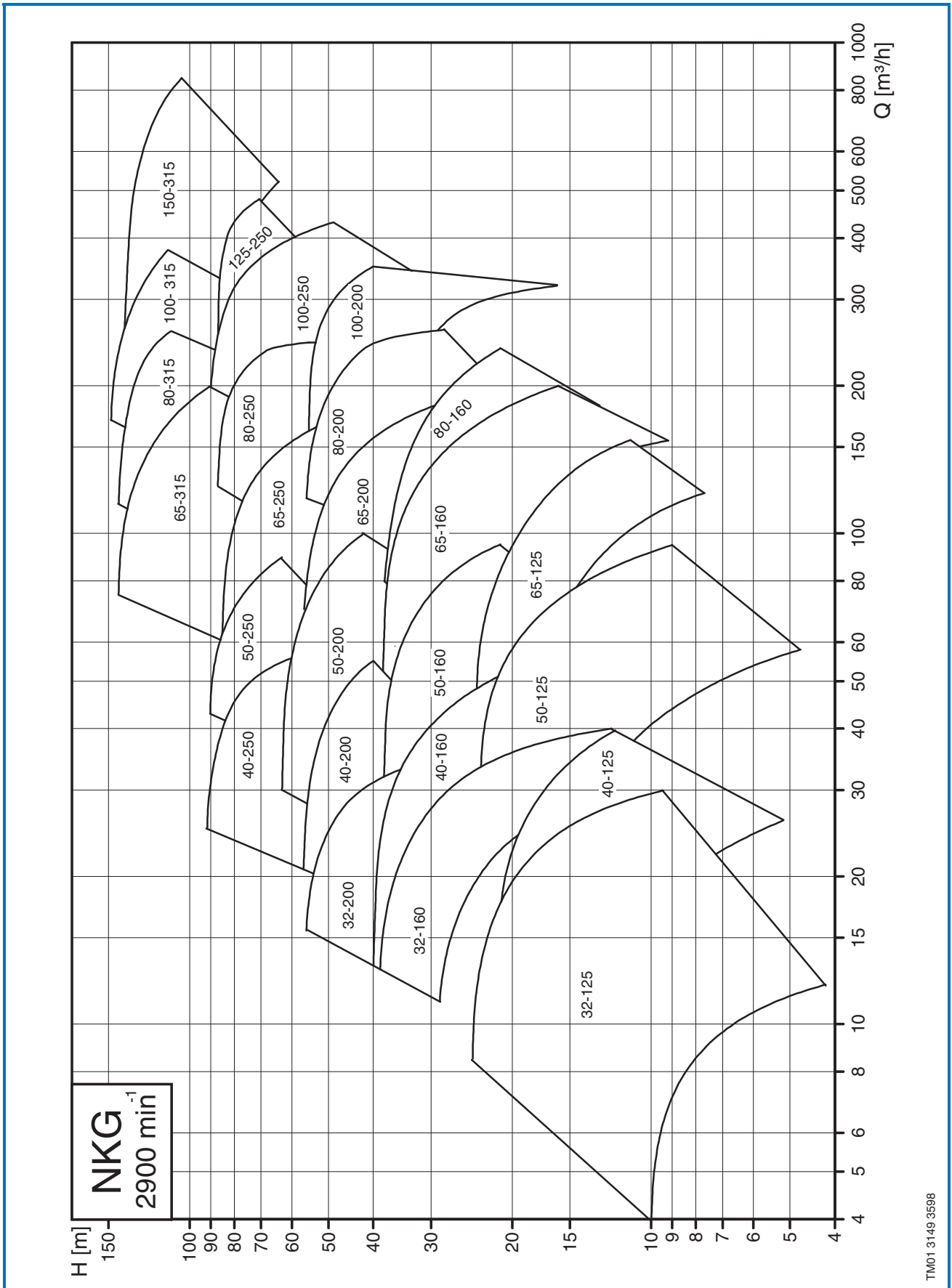
- Certificate A
- Certificate A with approval of official inspector

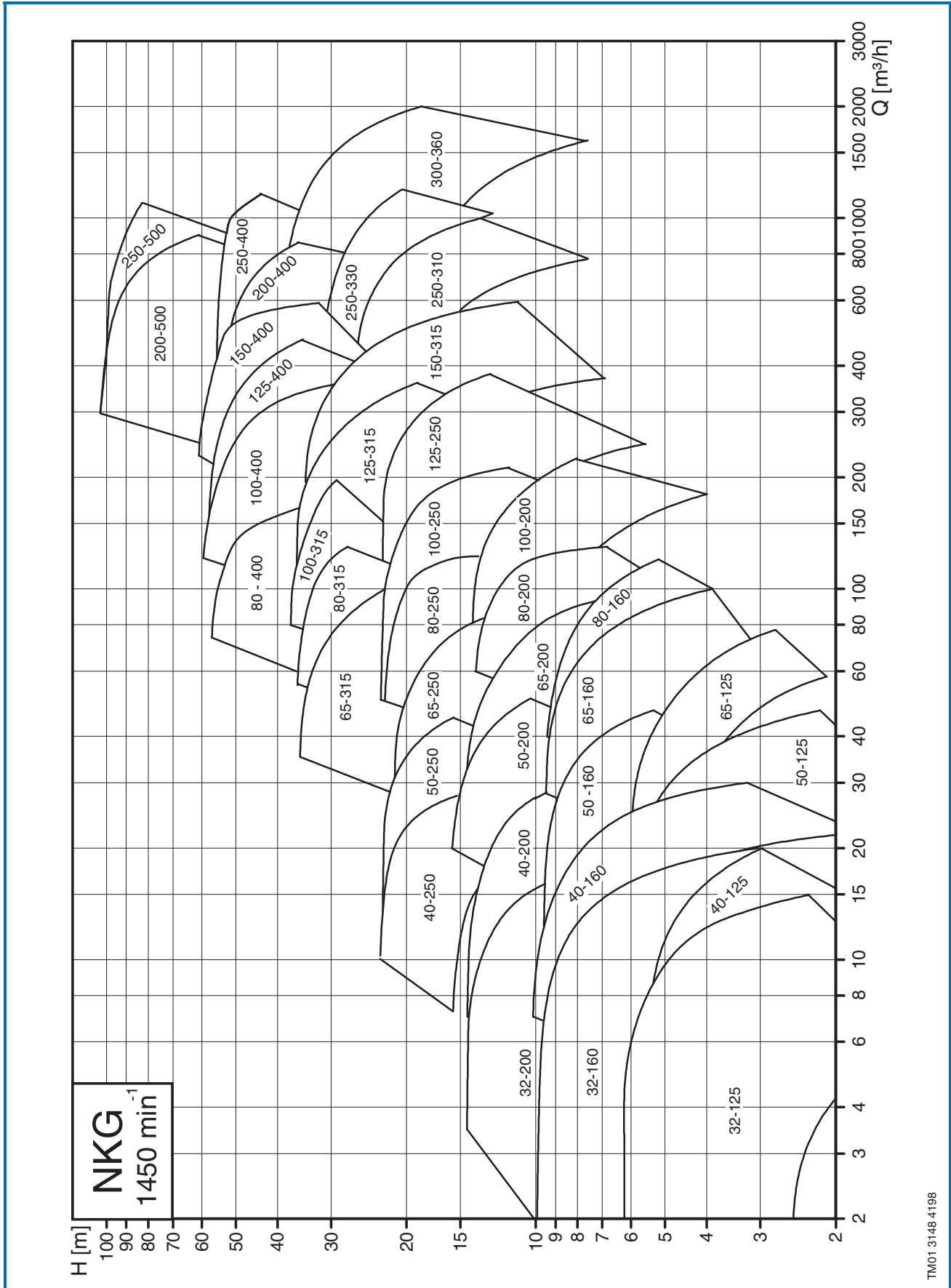
According to ISO 3555, Class B

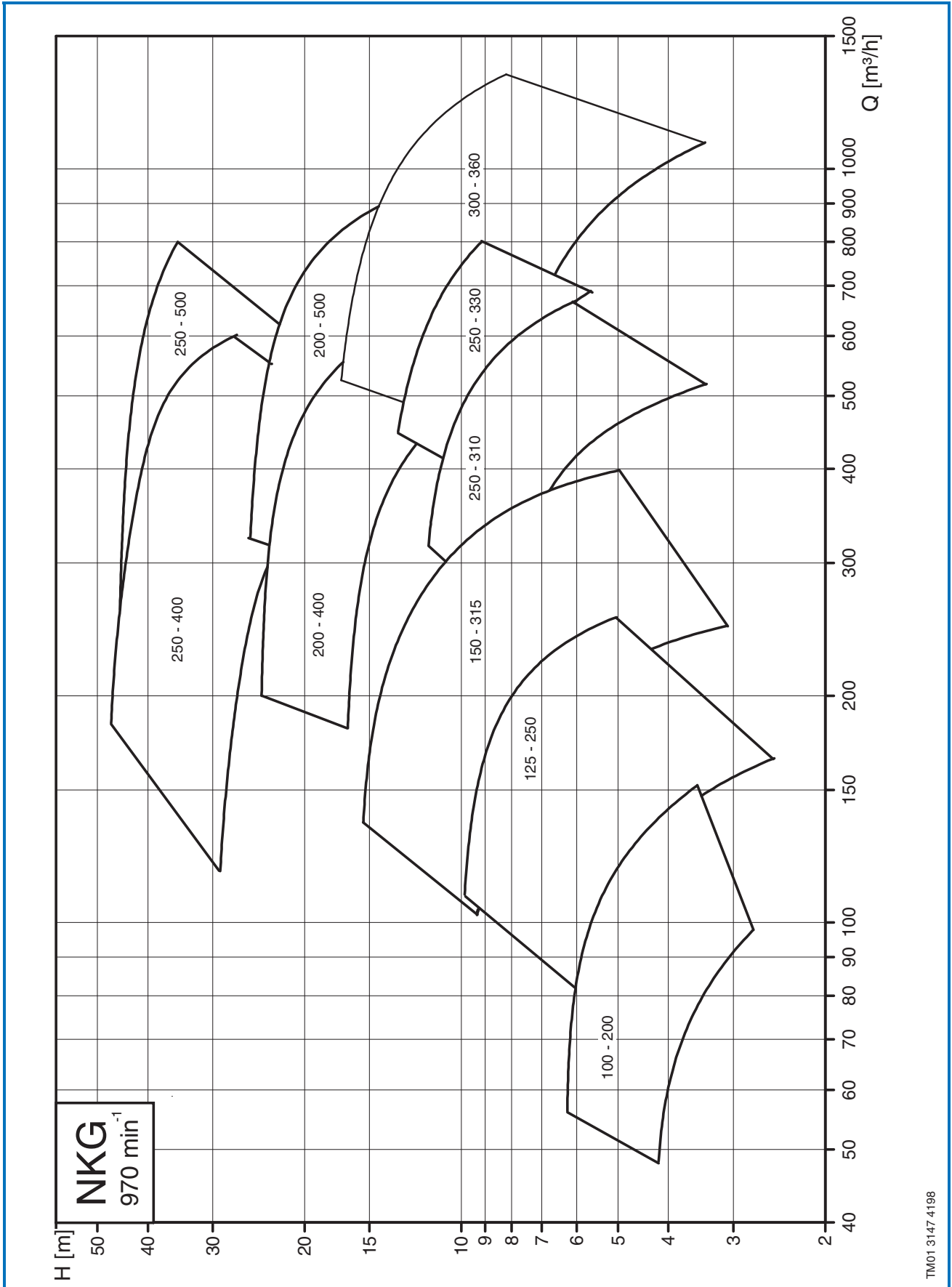
- Certificate A
- Certificate A with approval of official inspector

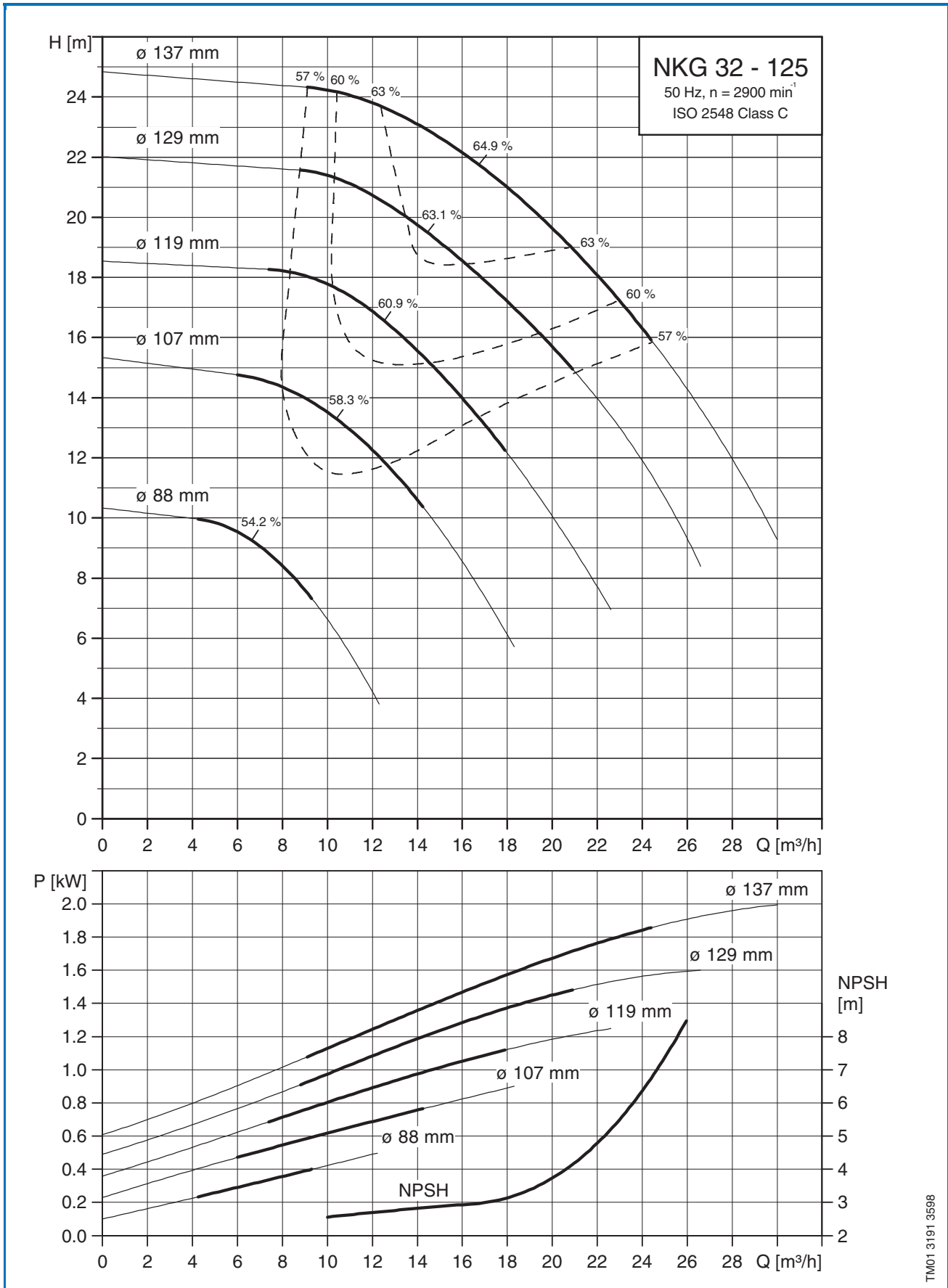
Performance Ranges

NKG
Standard Pumps

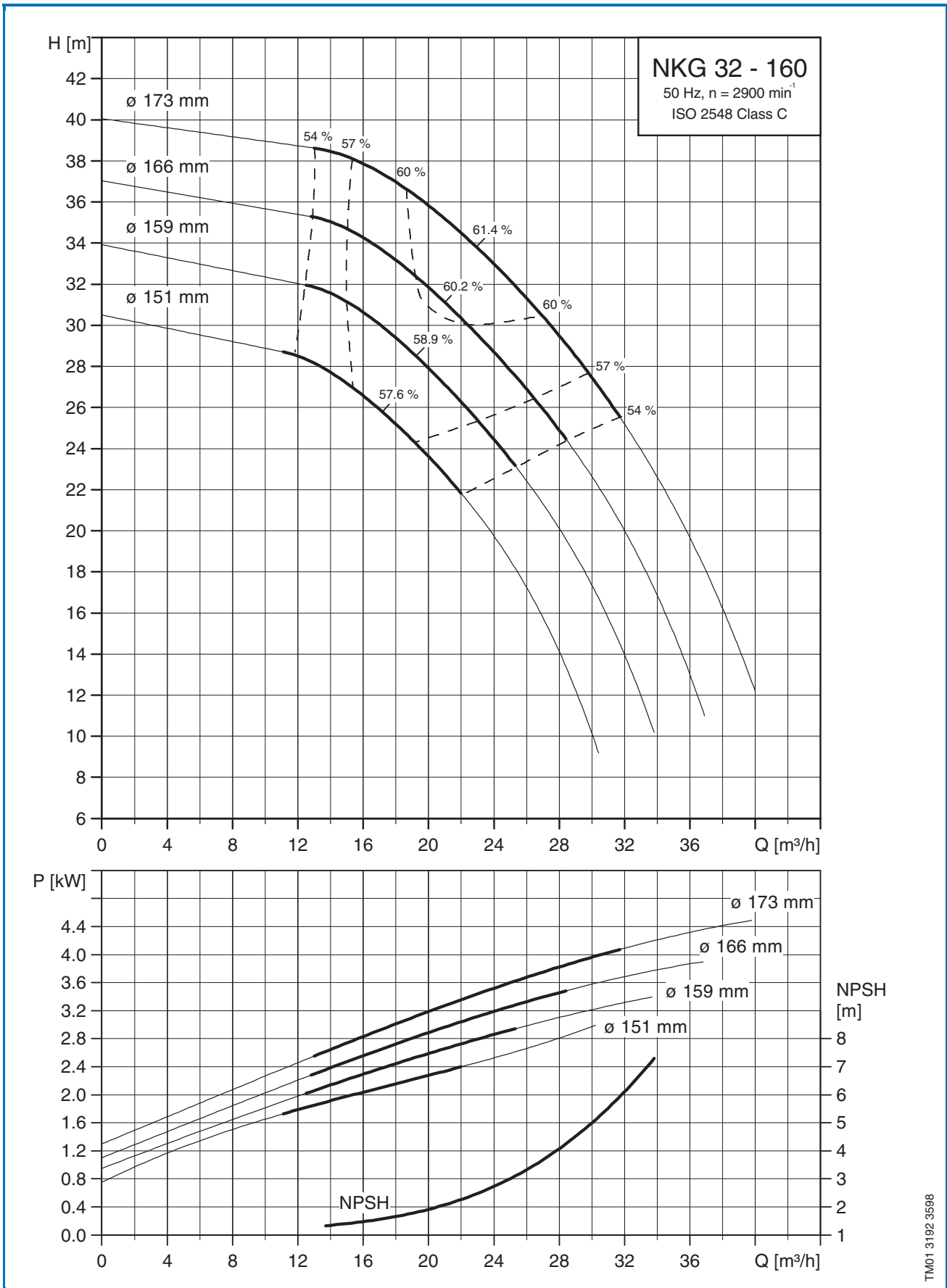




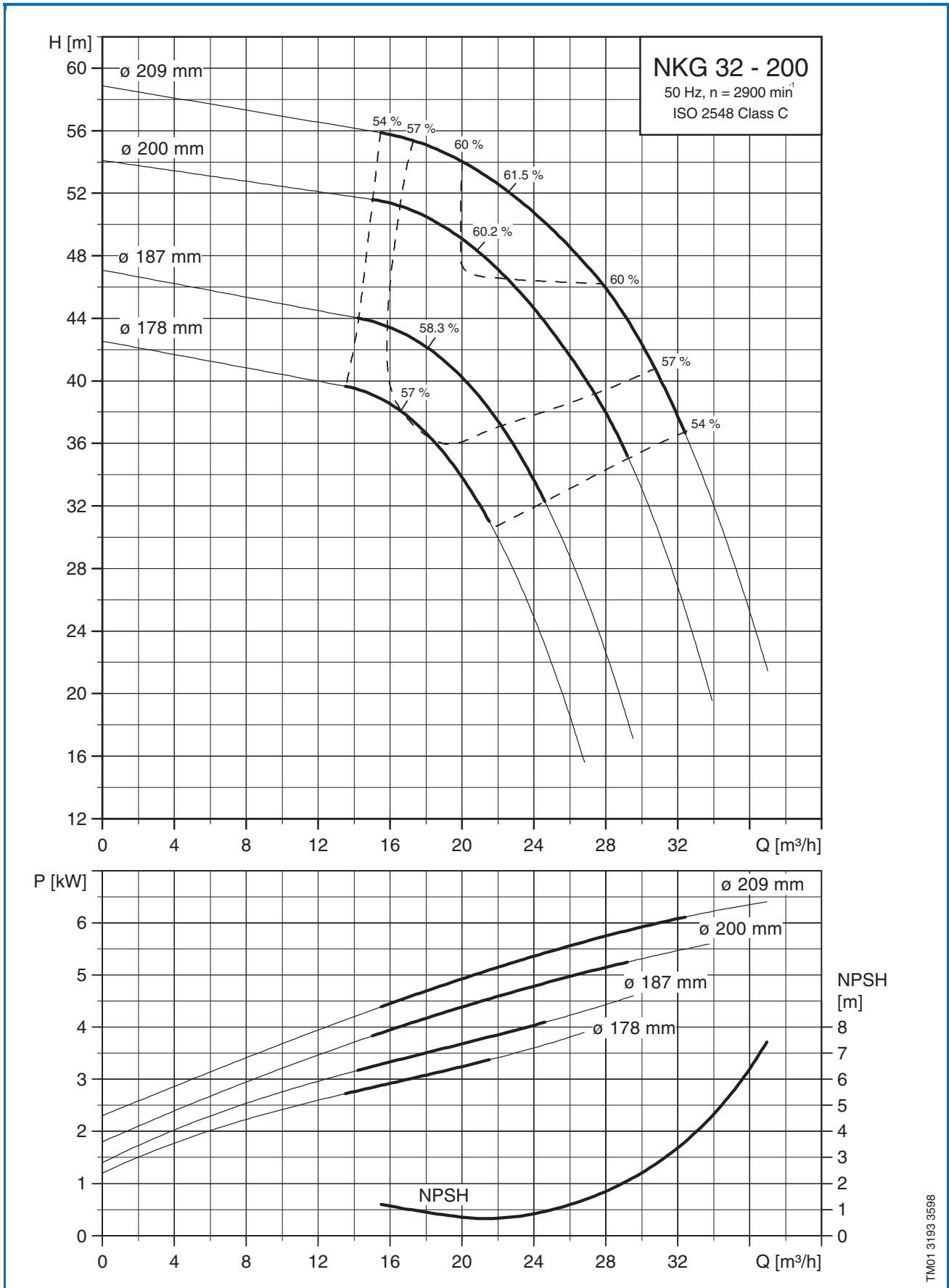




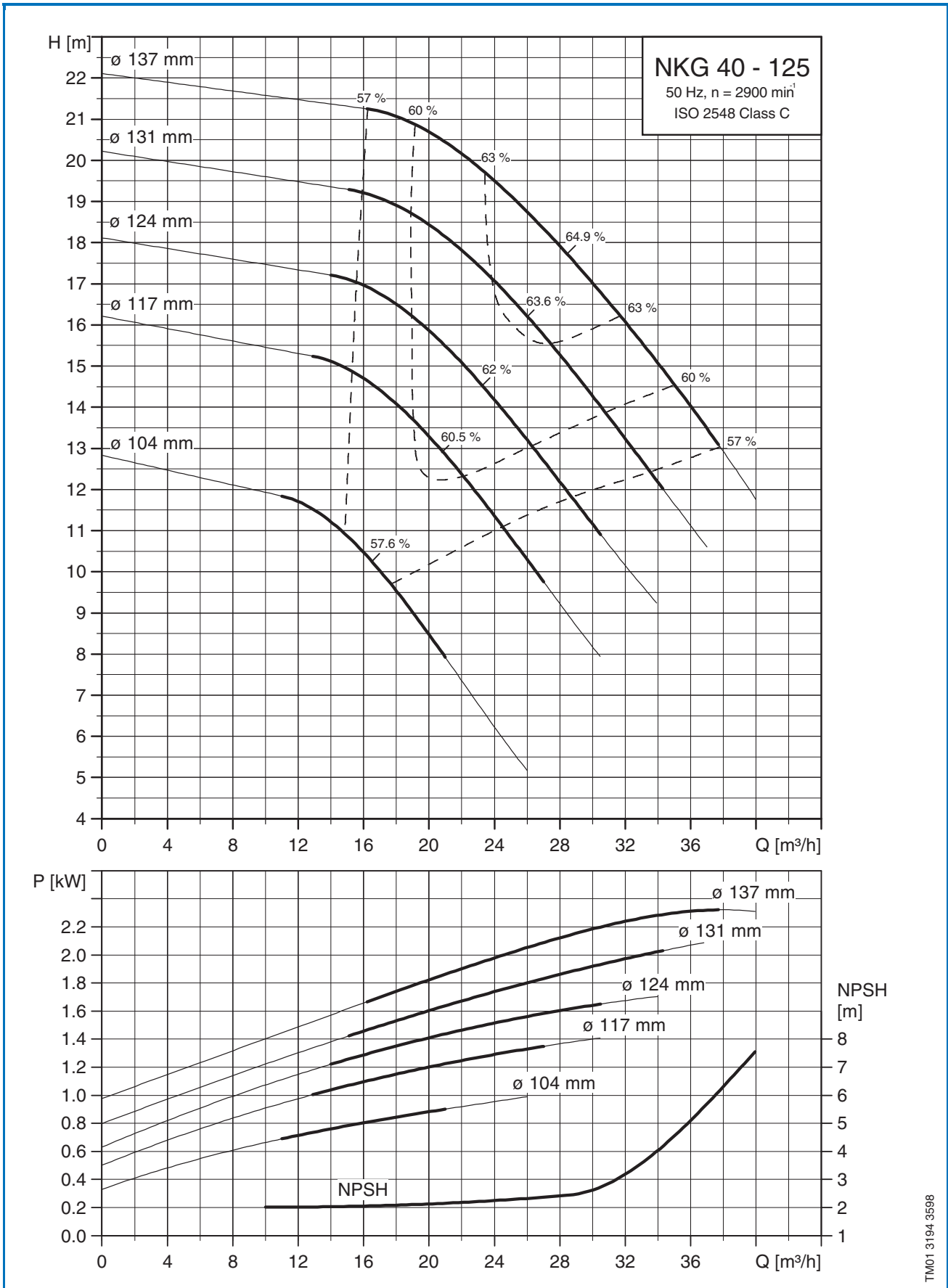
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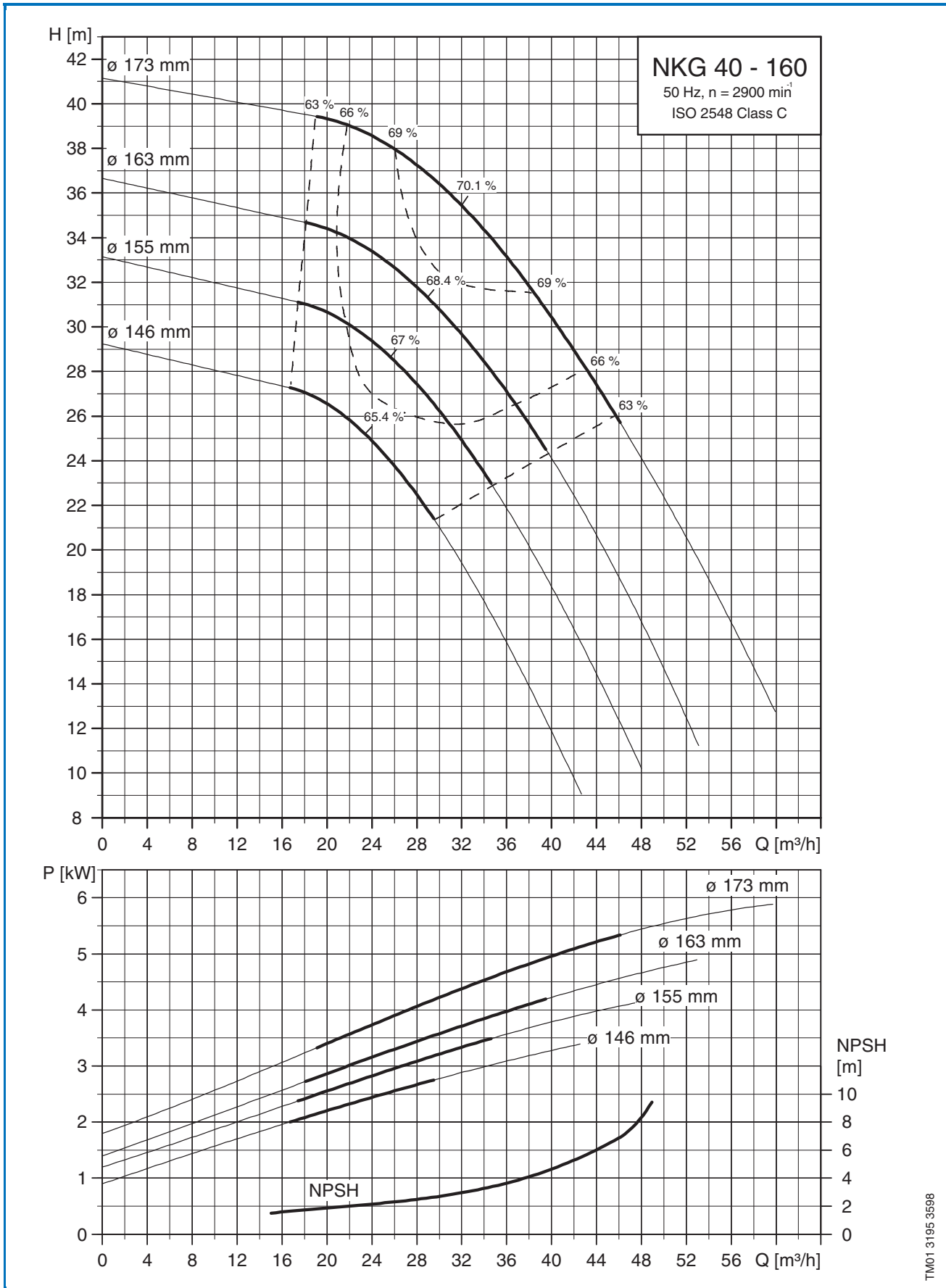
TM01 3192-3598



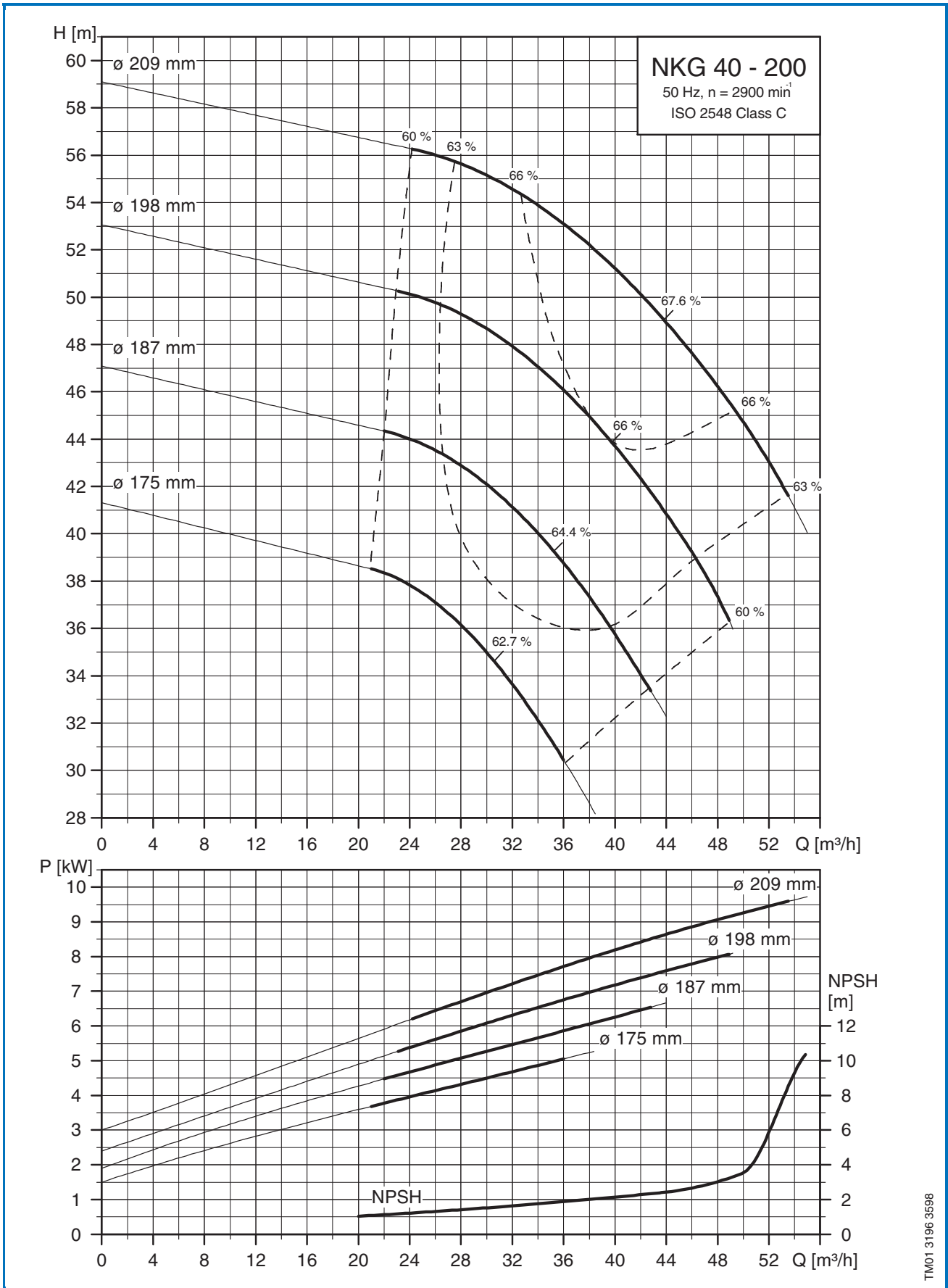
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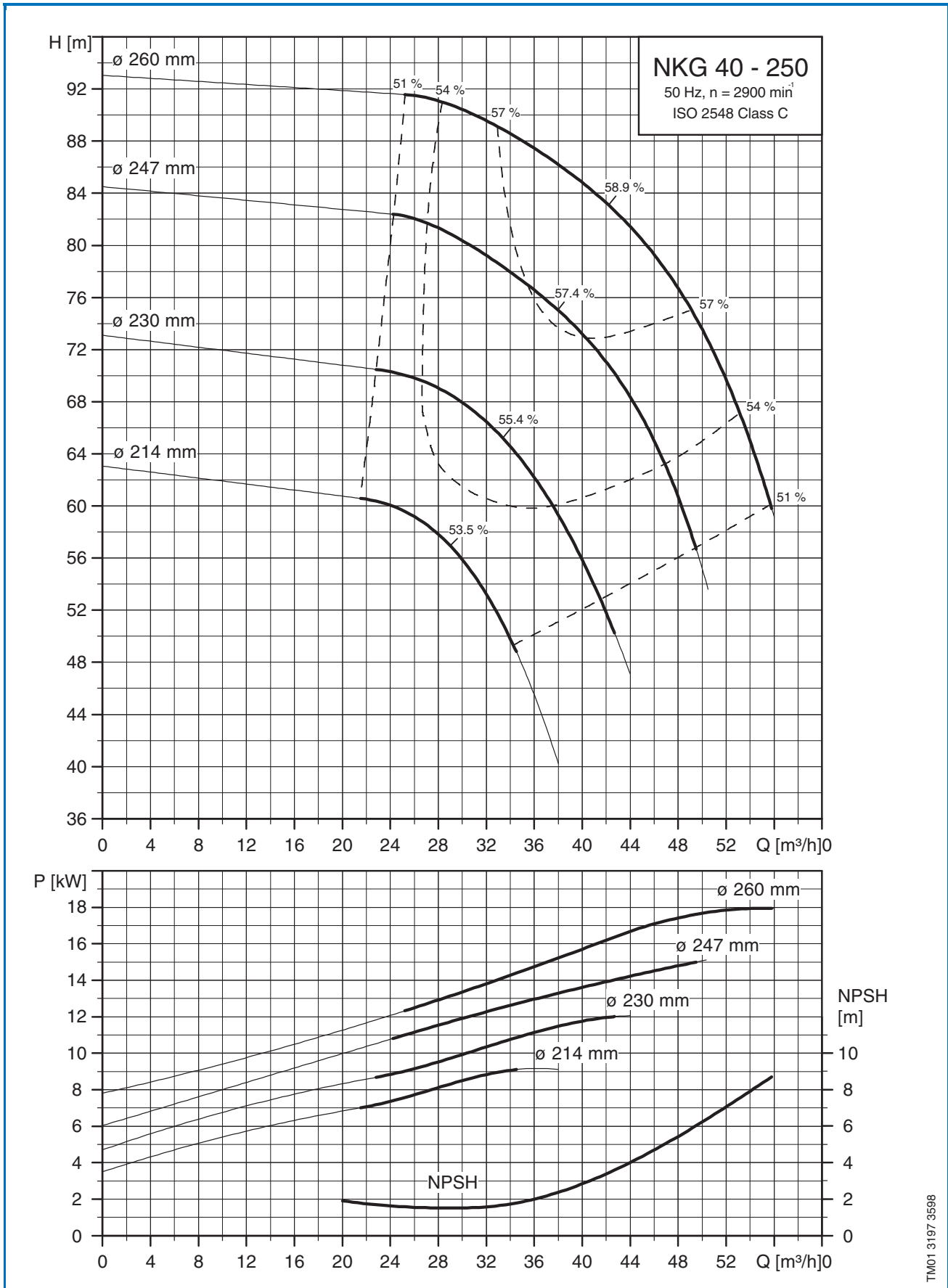
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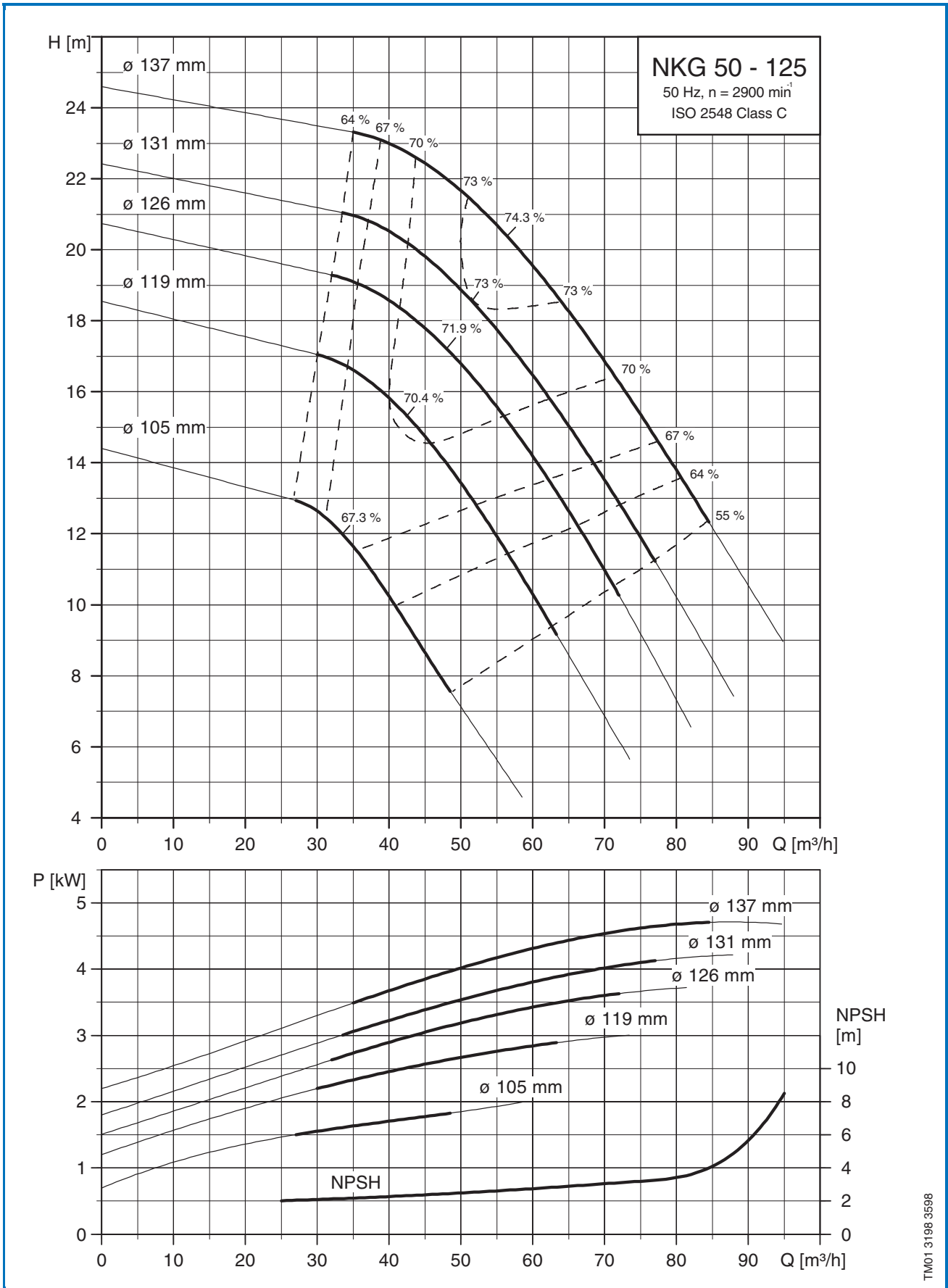
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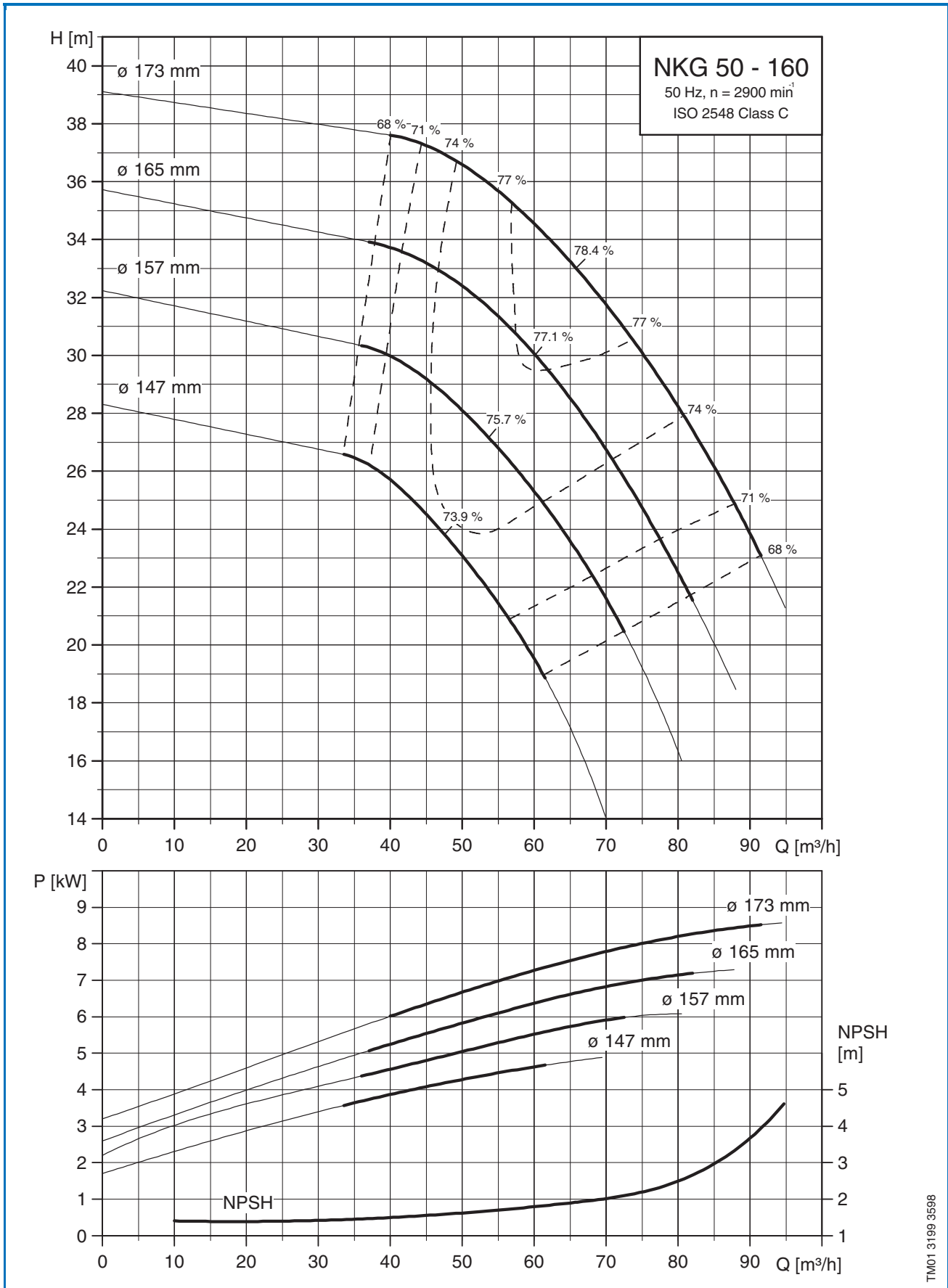


TM01 3196 3598

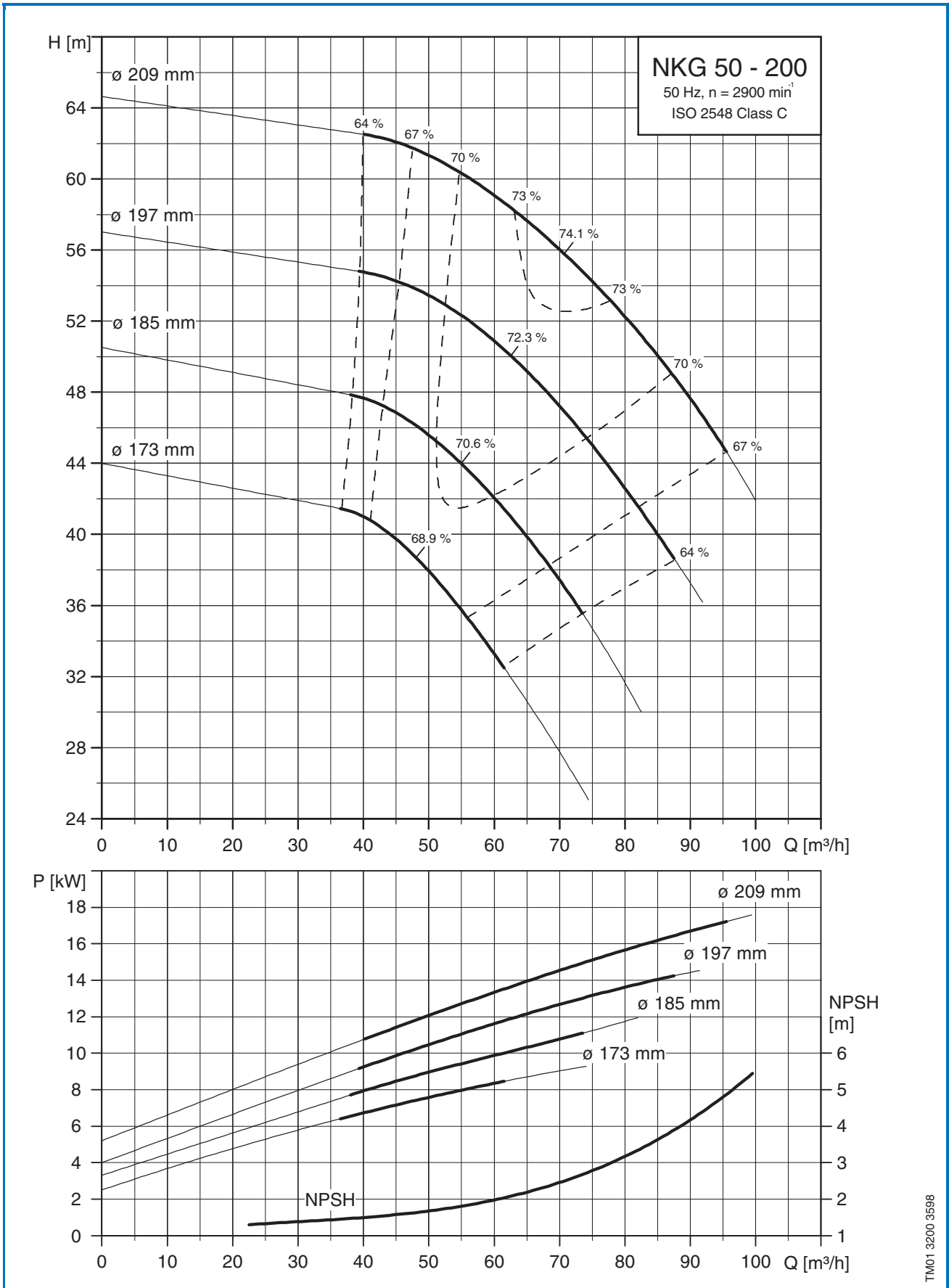


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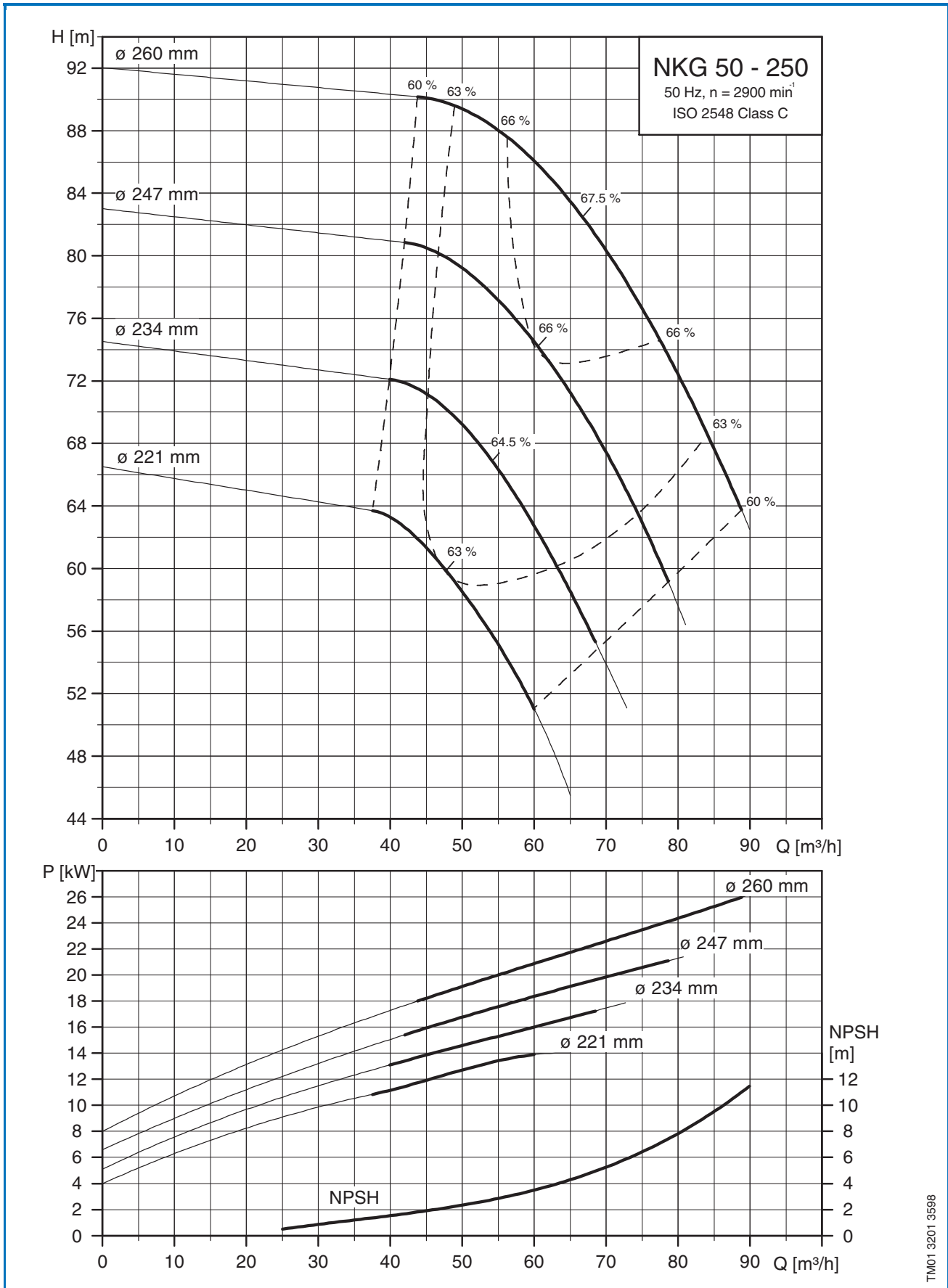




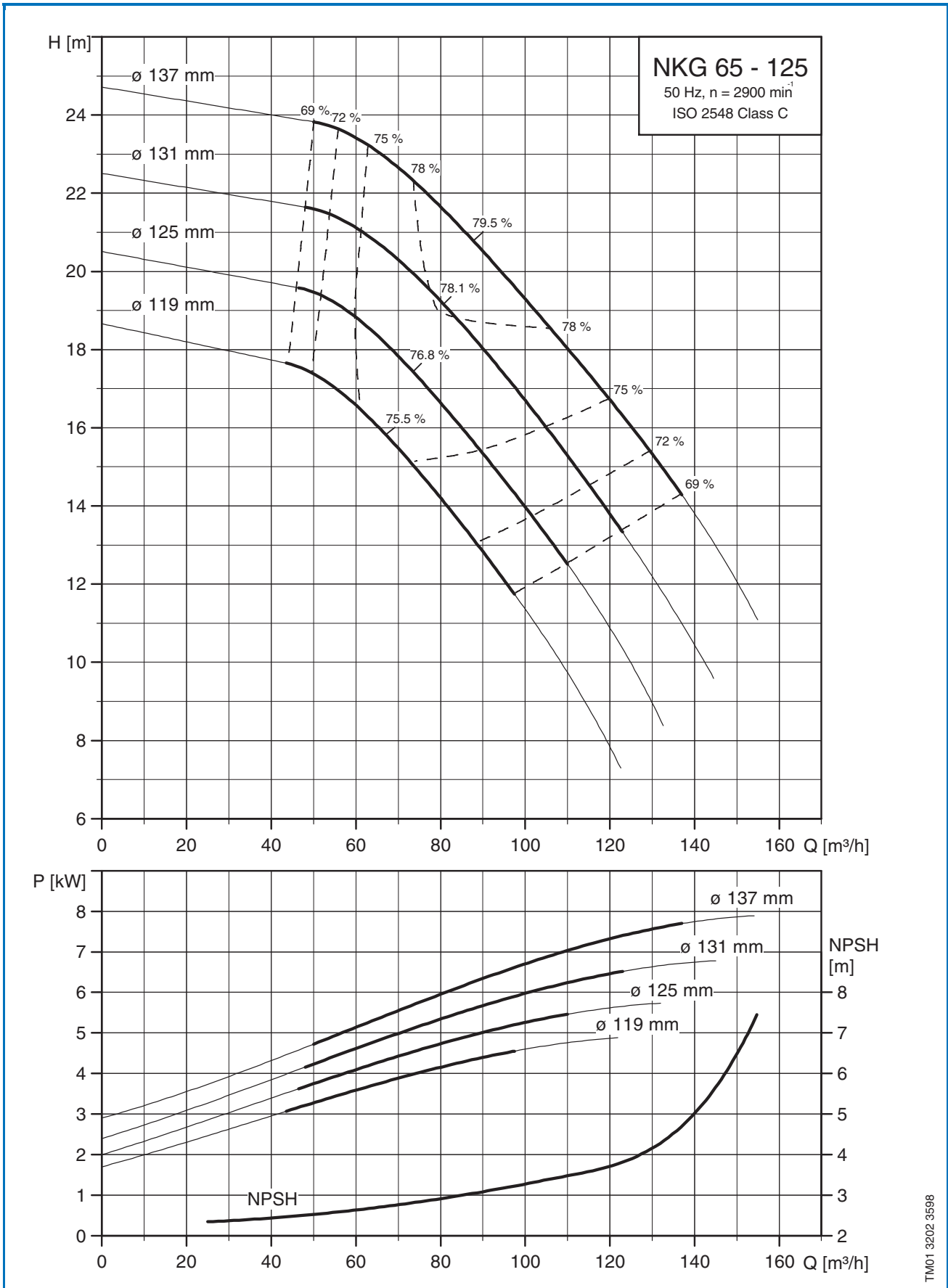
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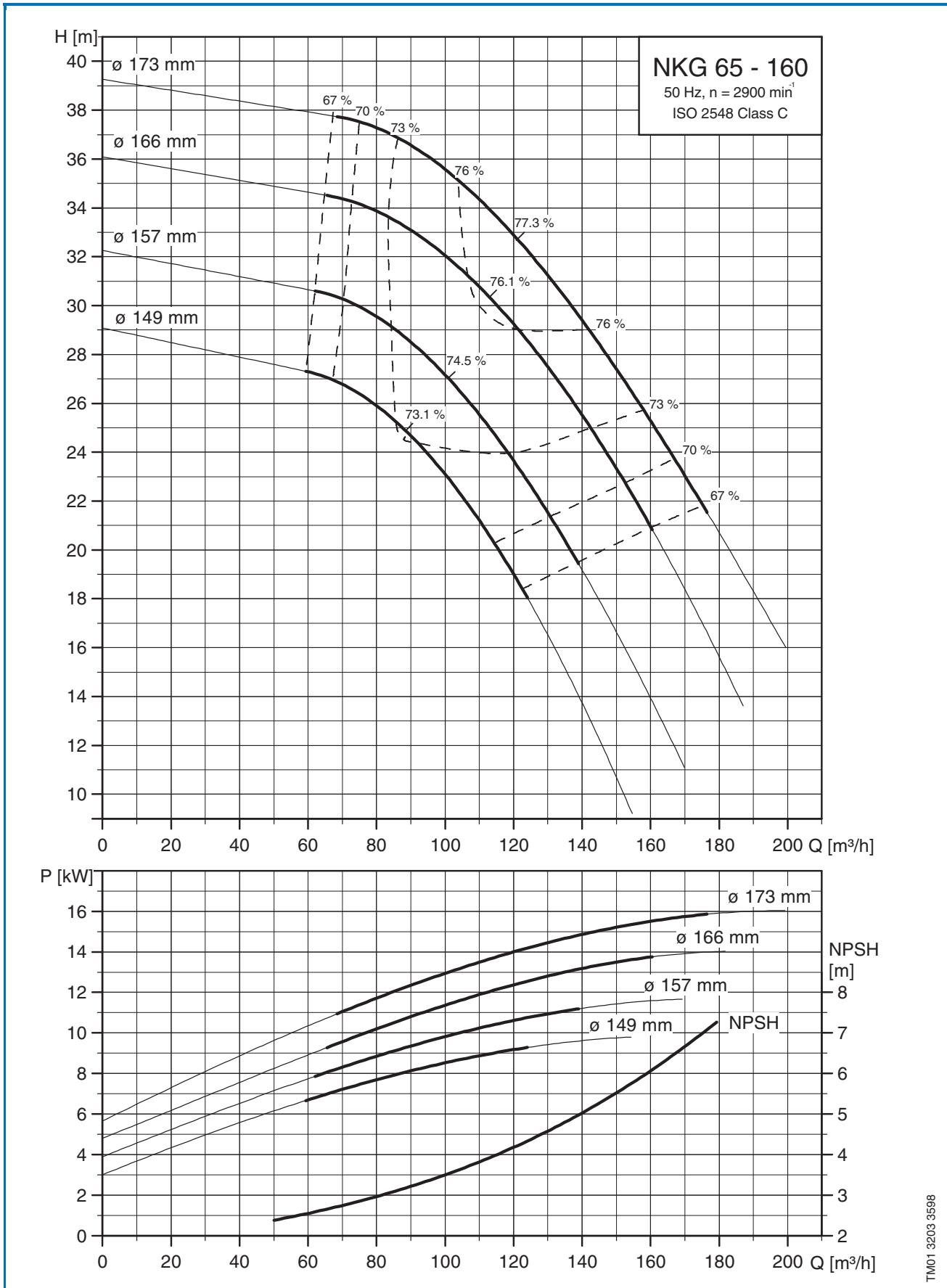
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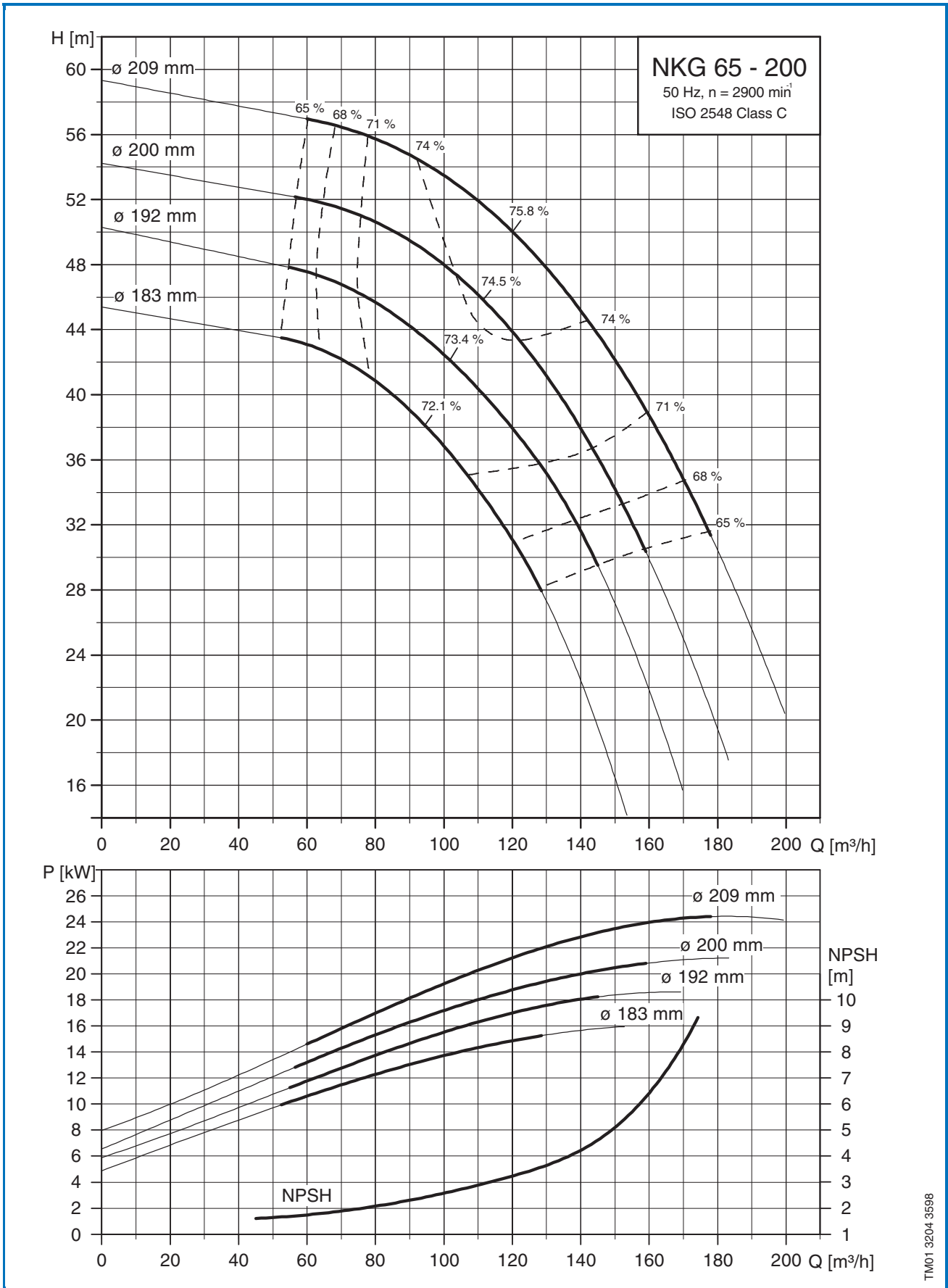
TM01 3201 3598



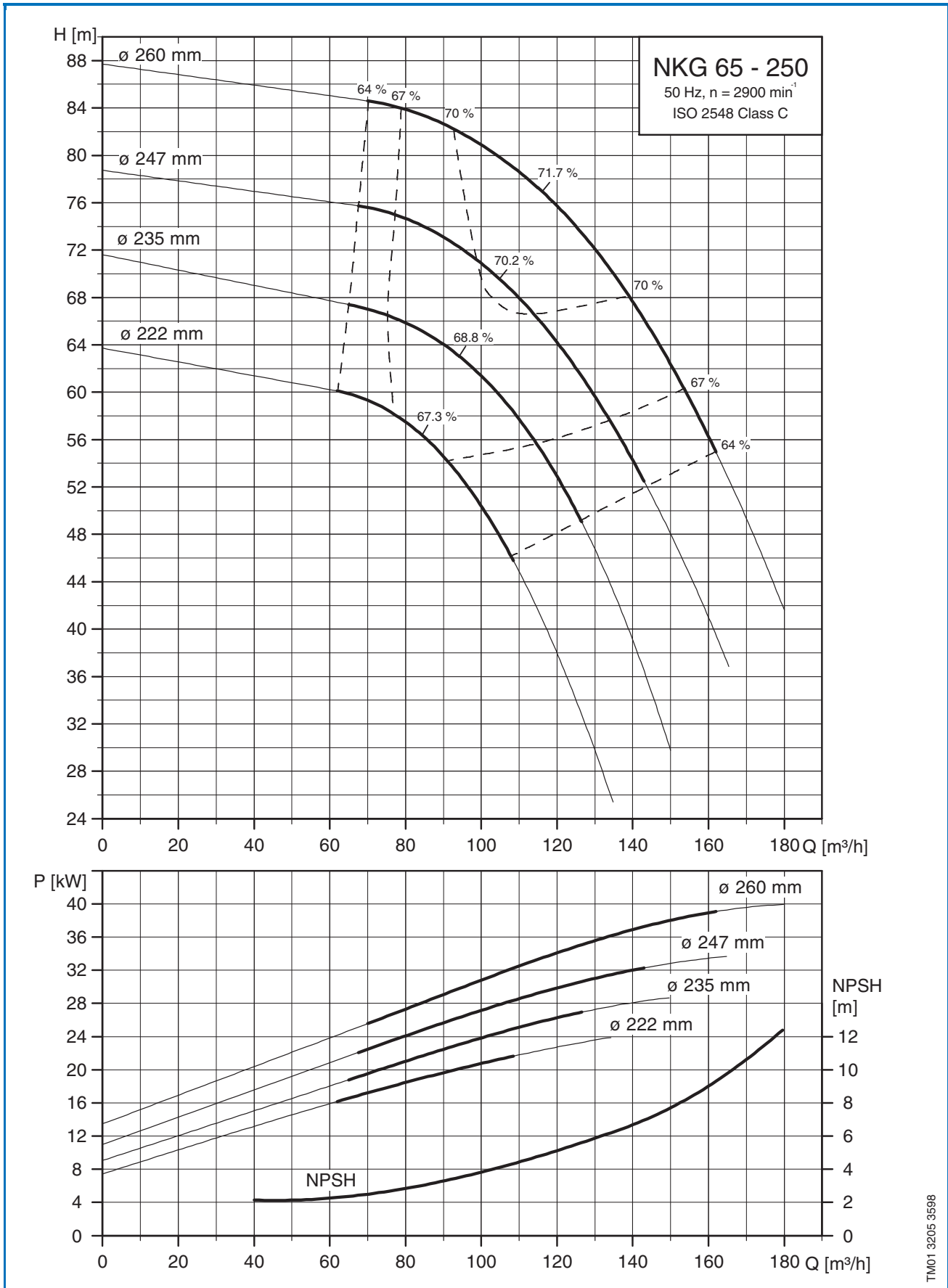
TIM01 3202 3598



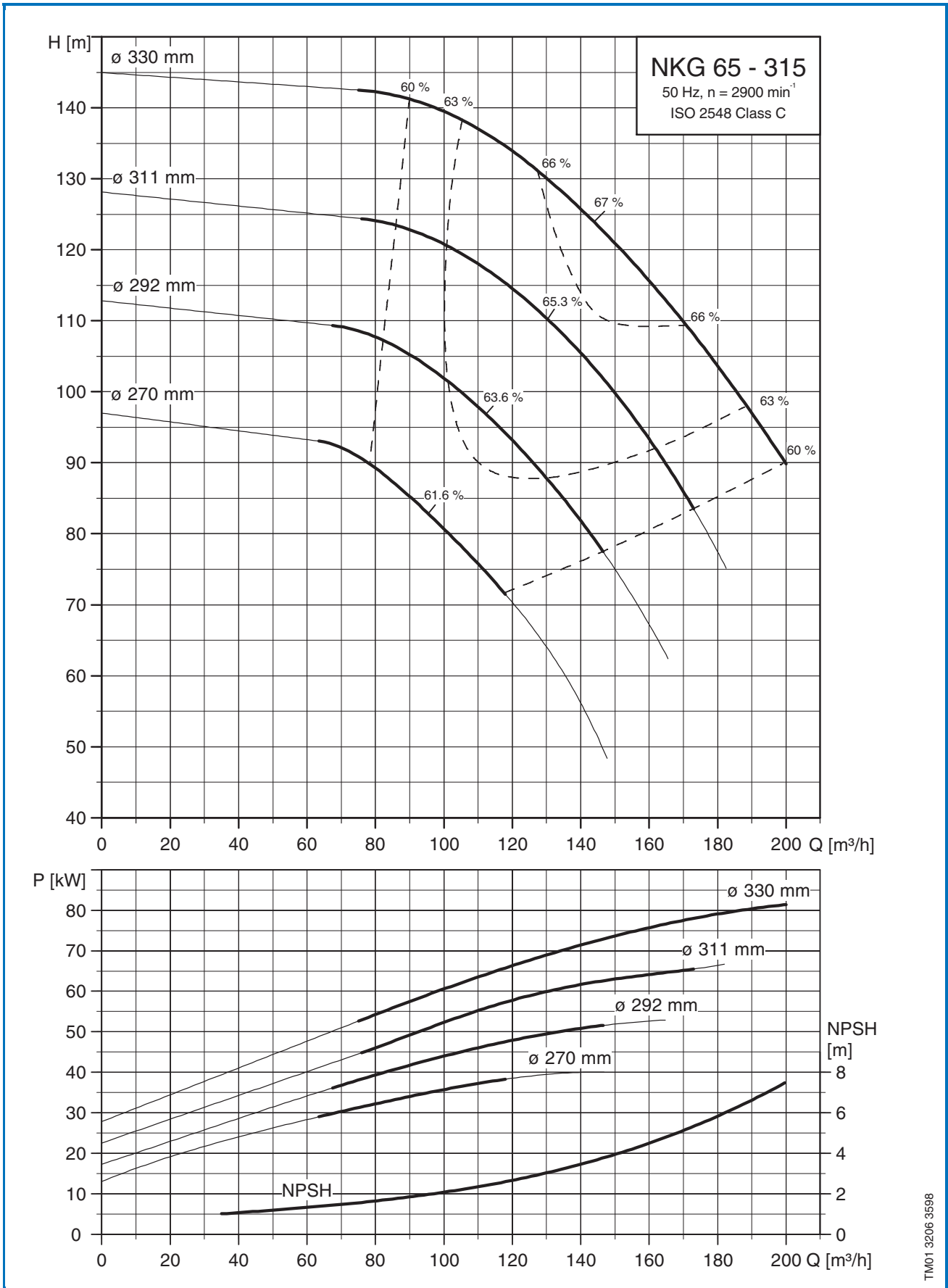
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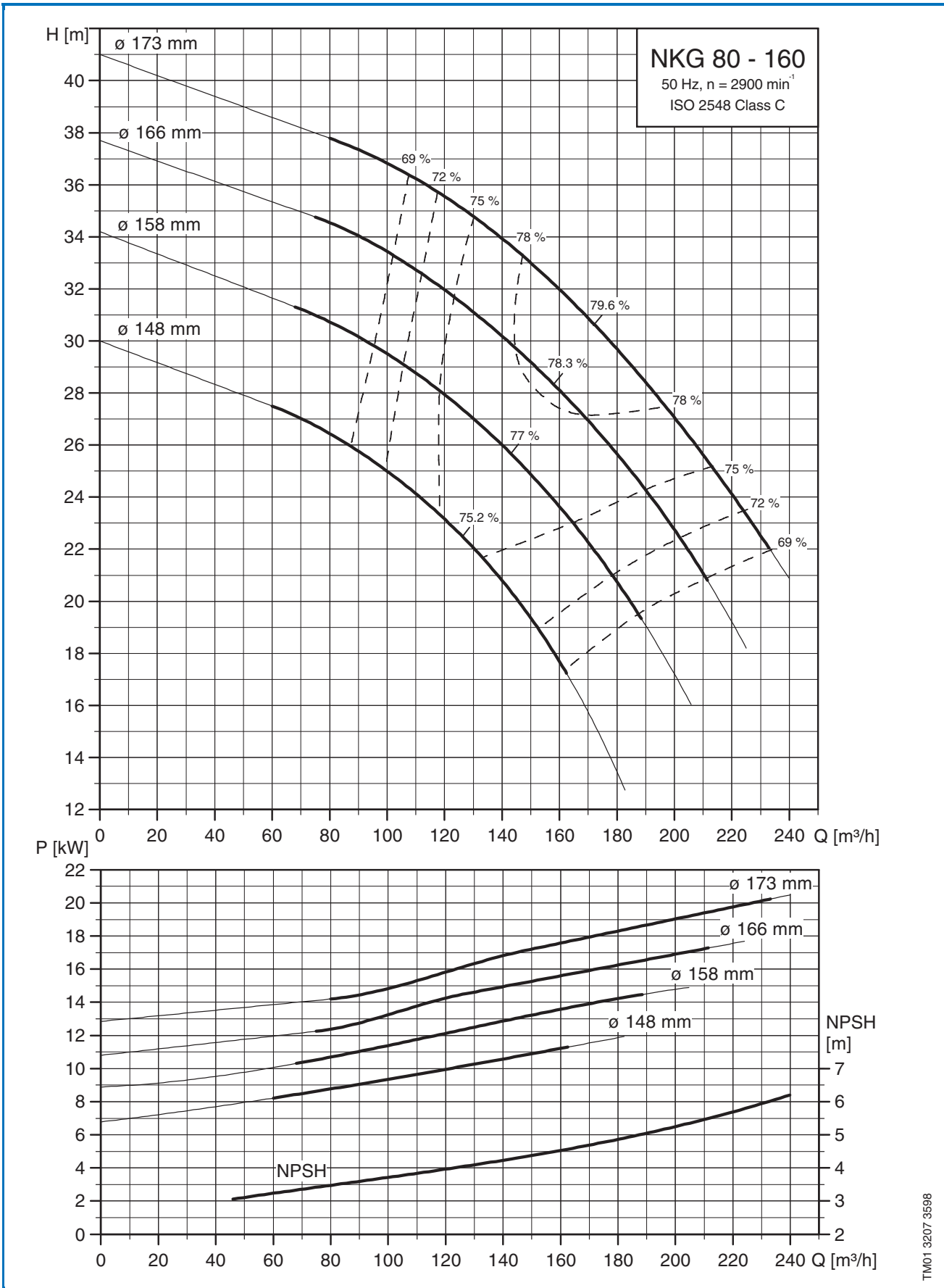
TM01 3204 3598



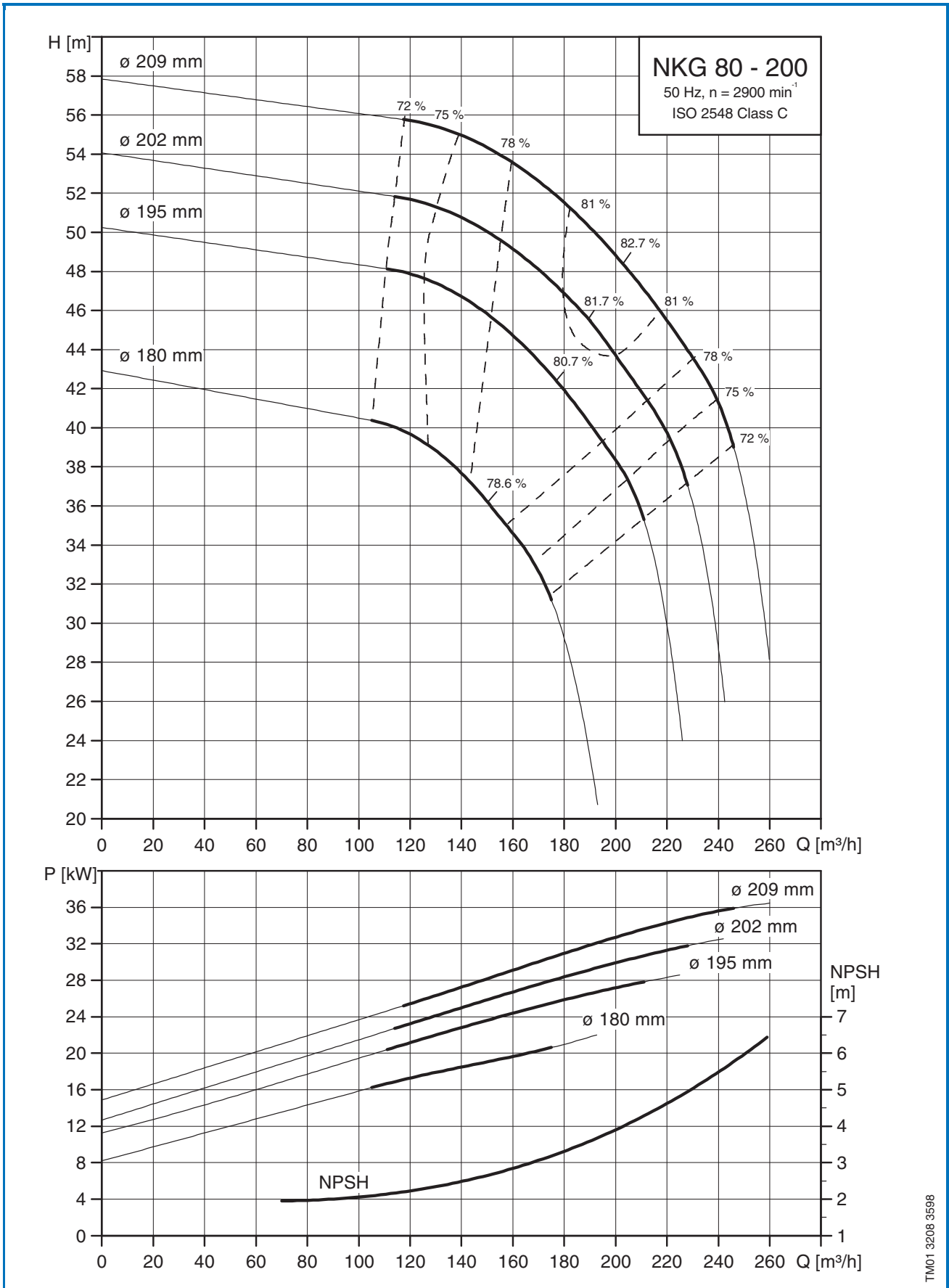
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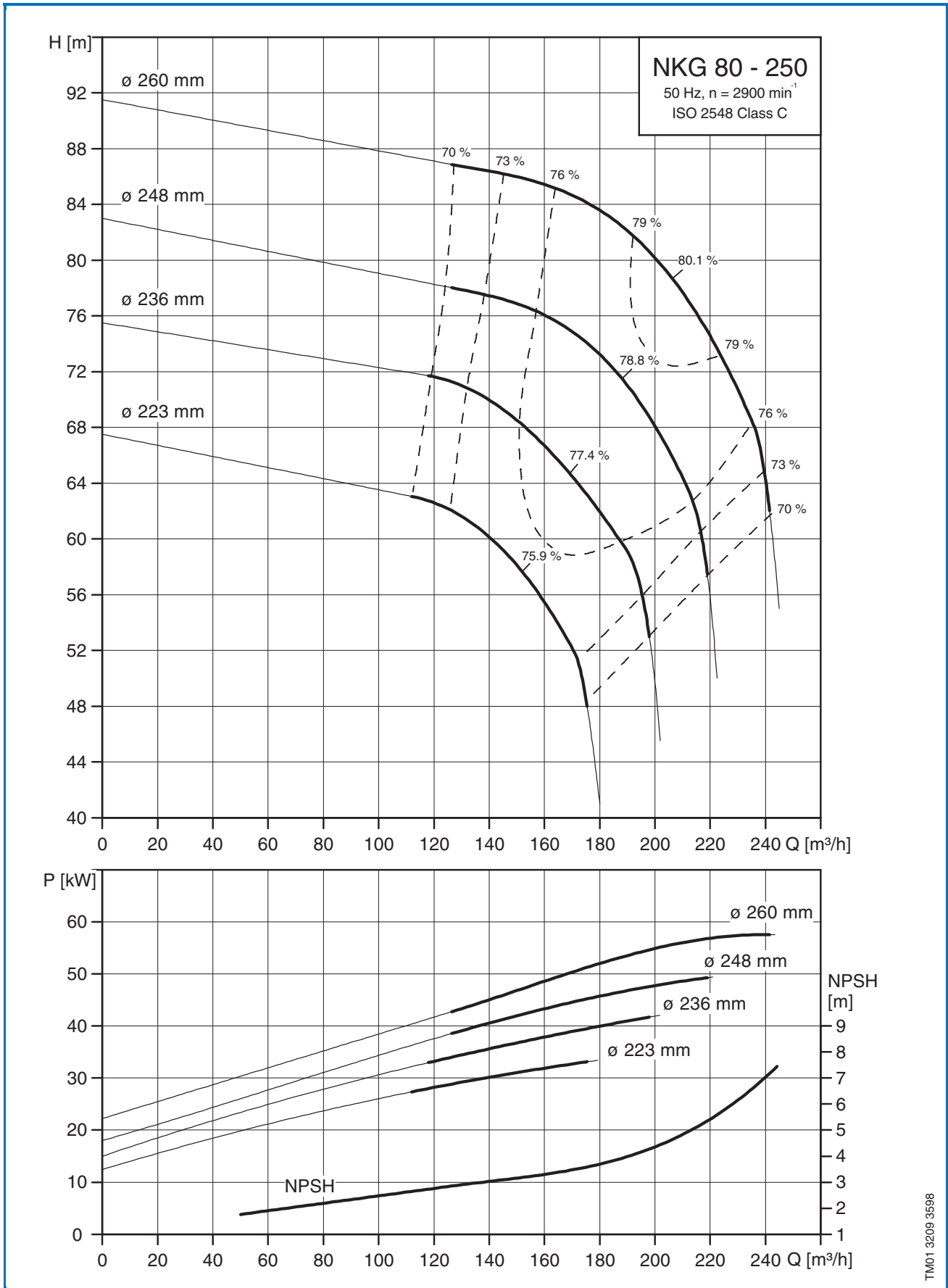
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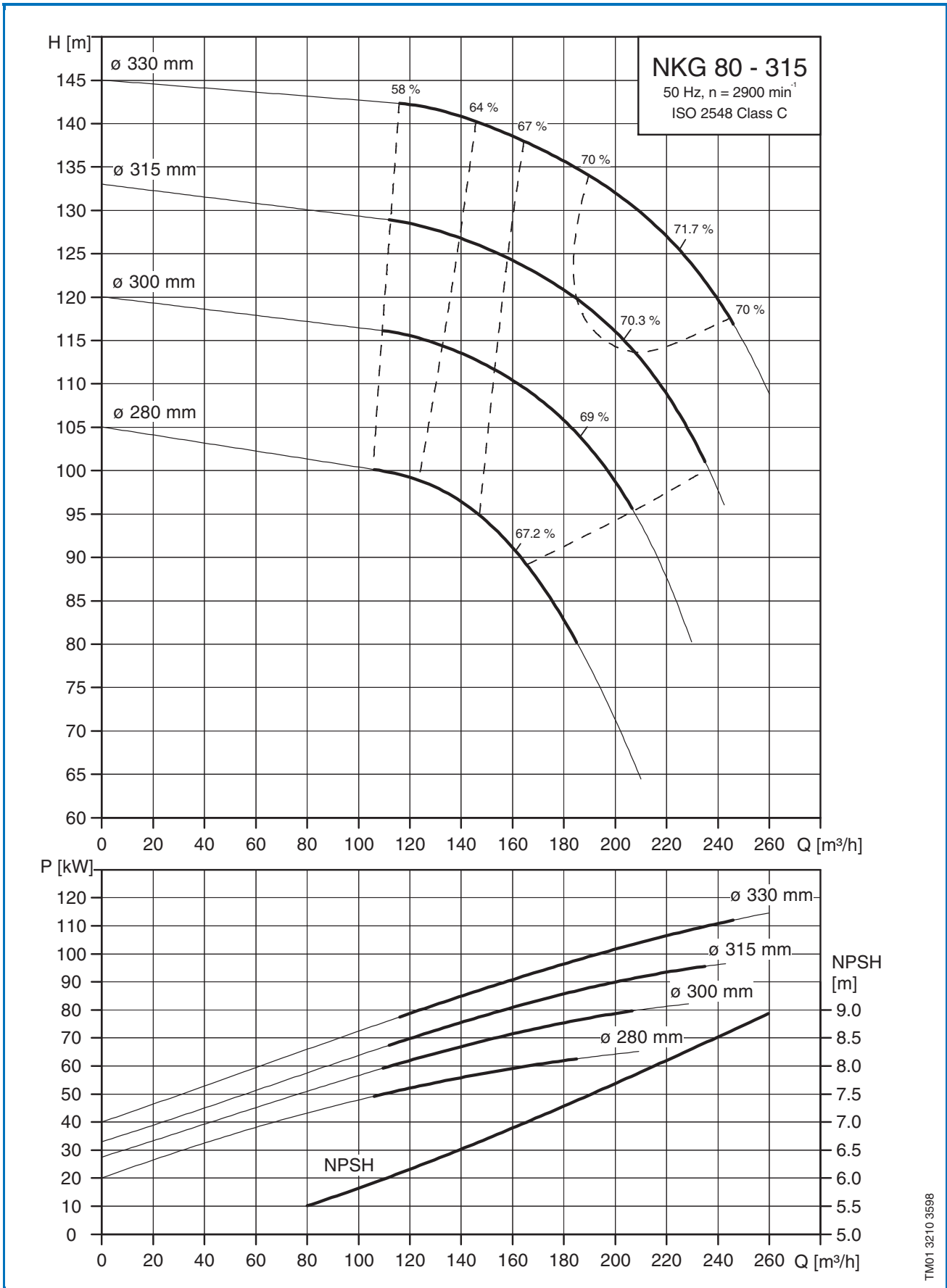
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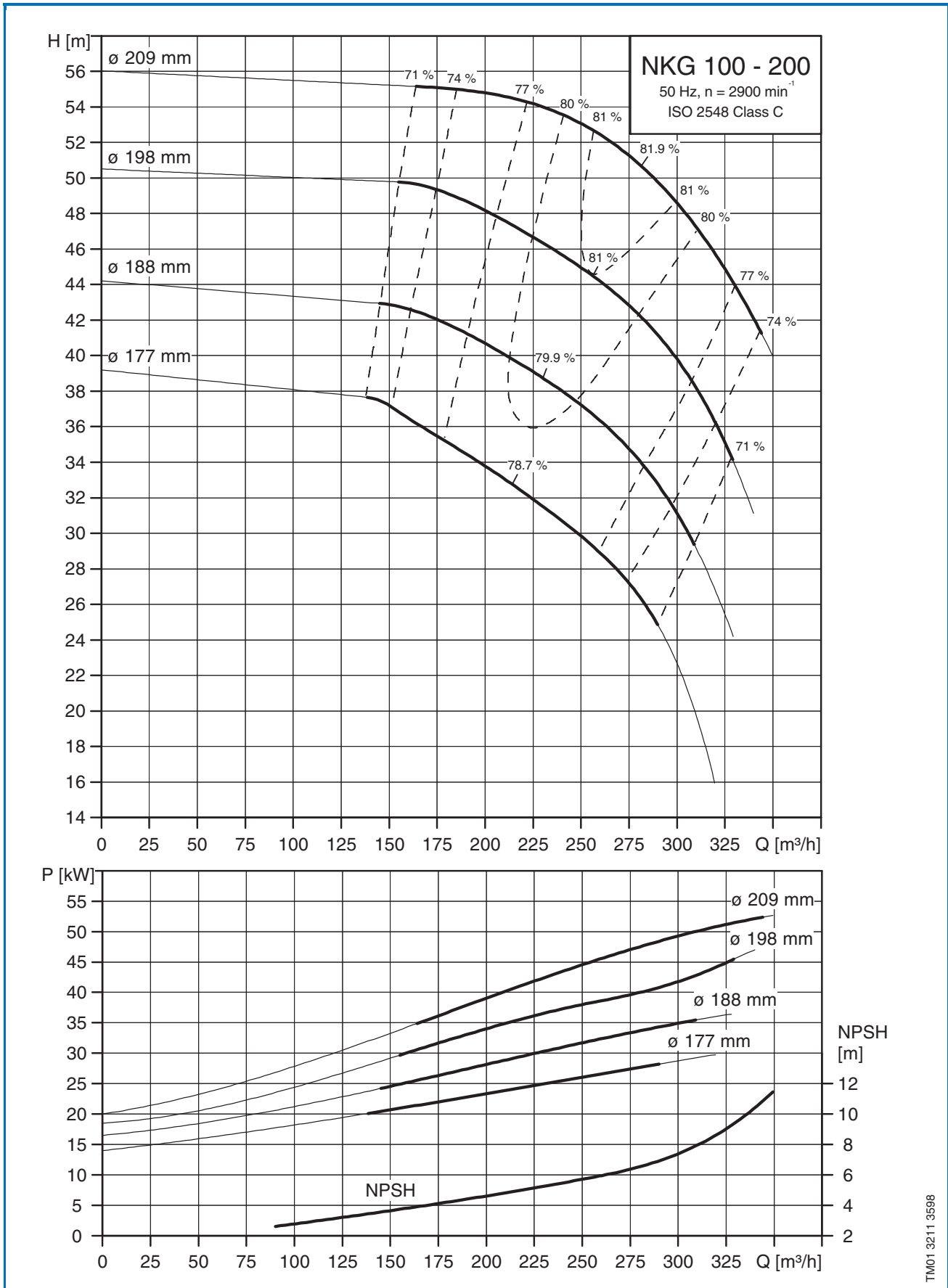
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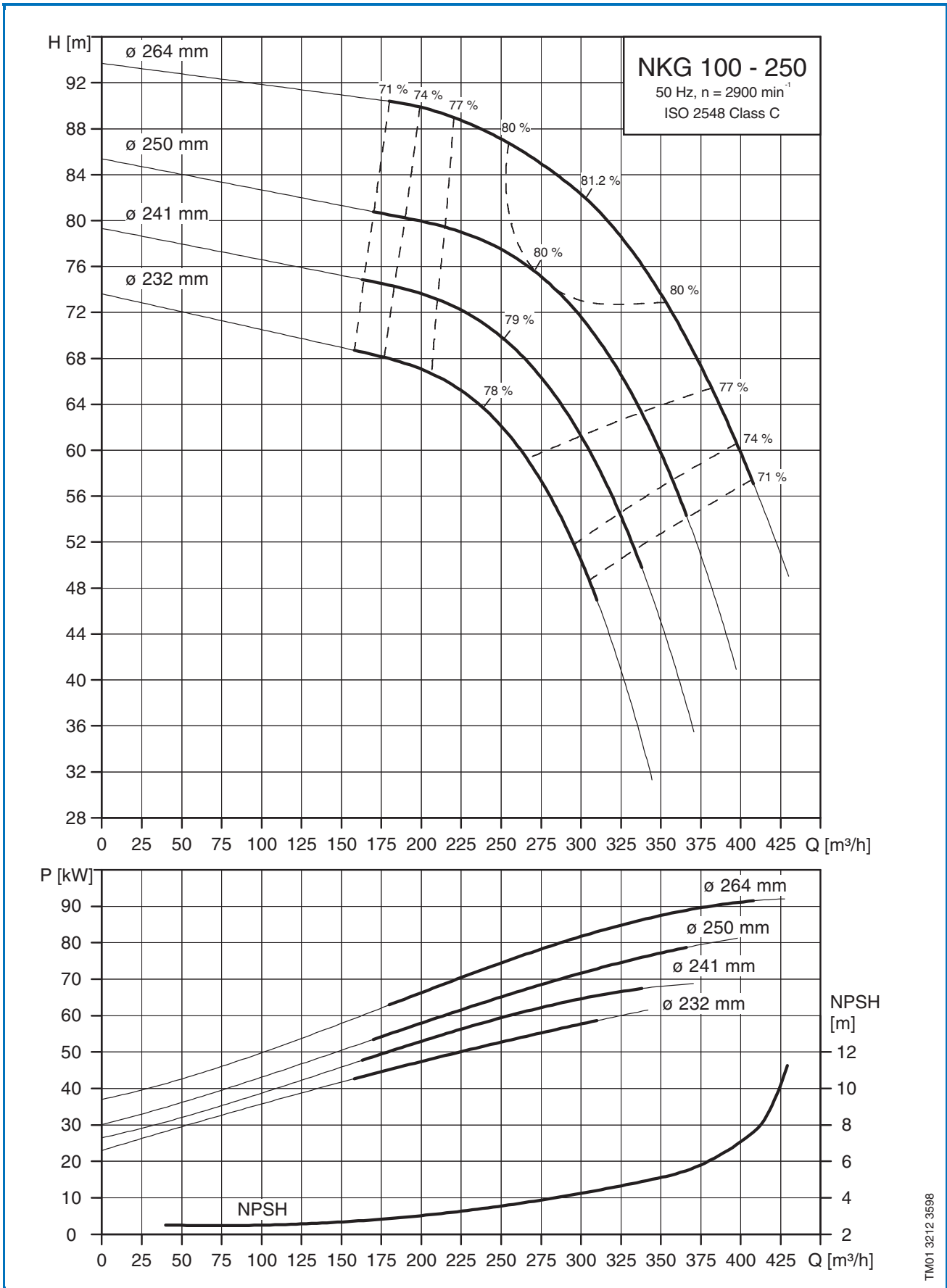
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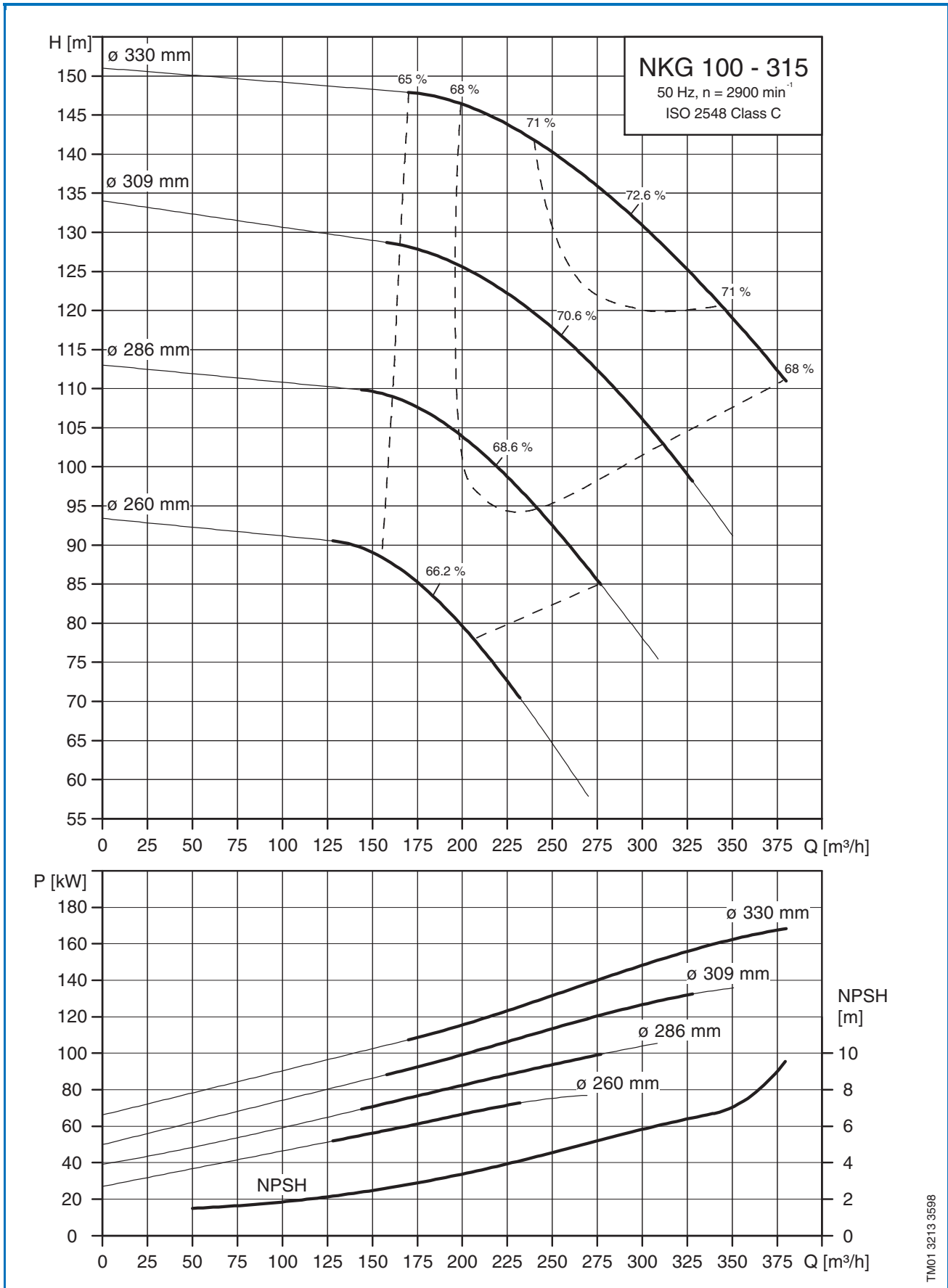
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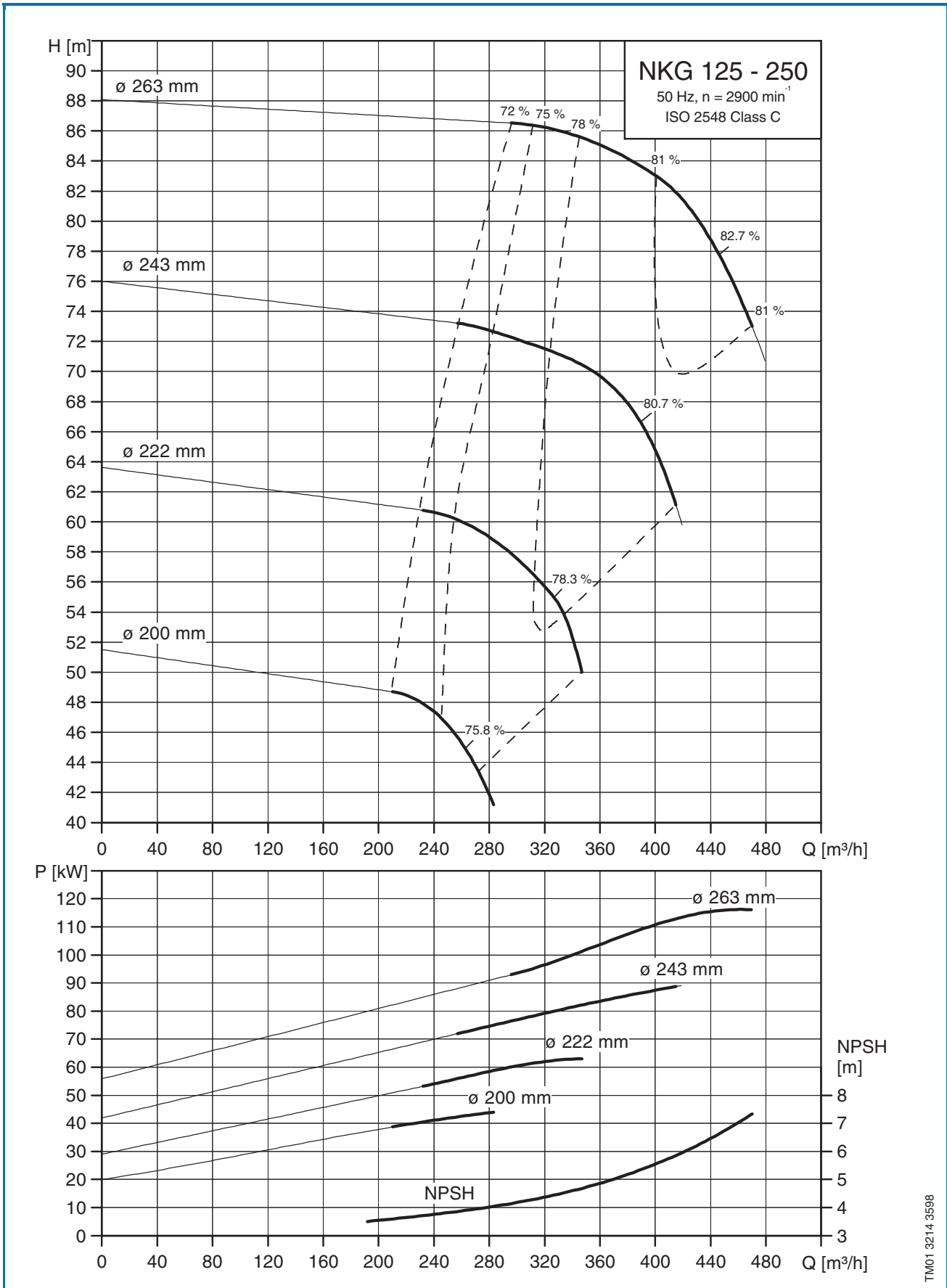
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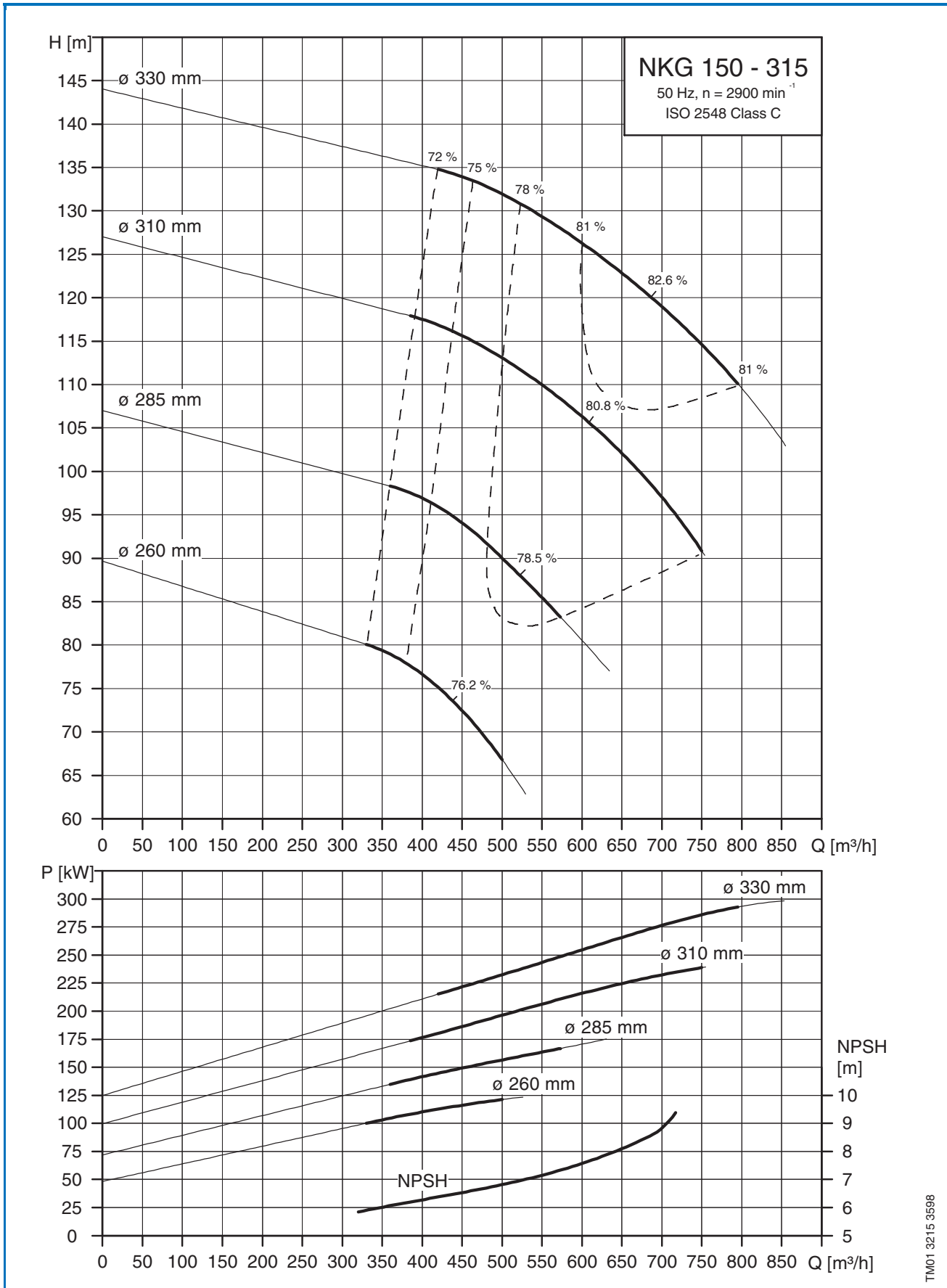
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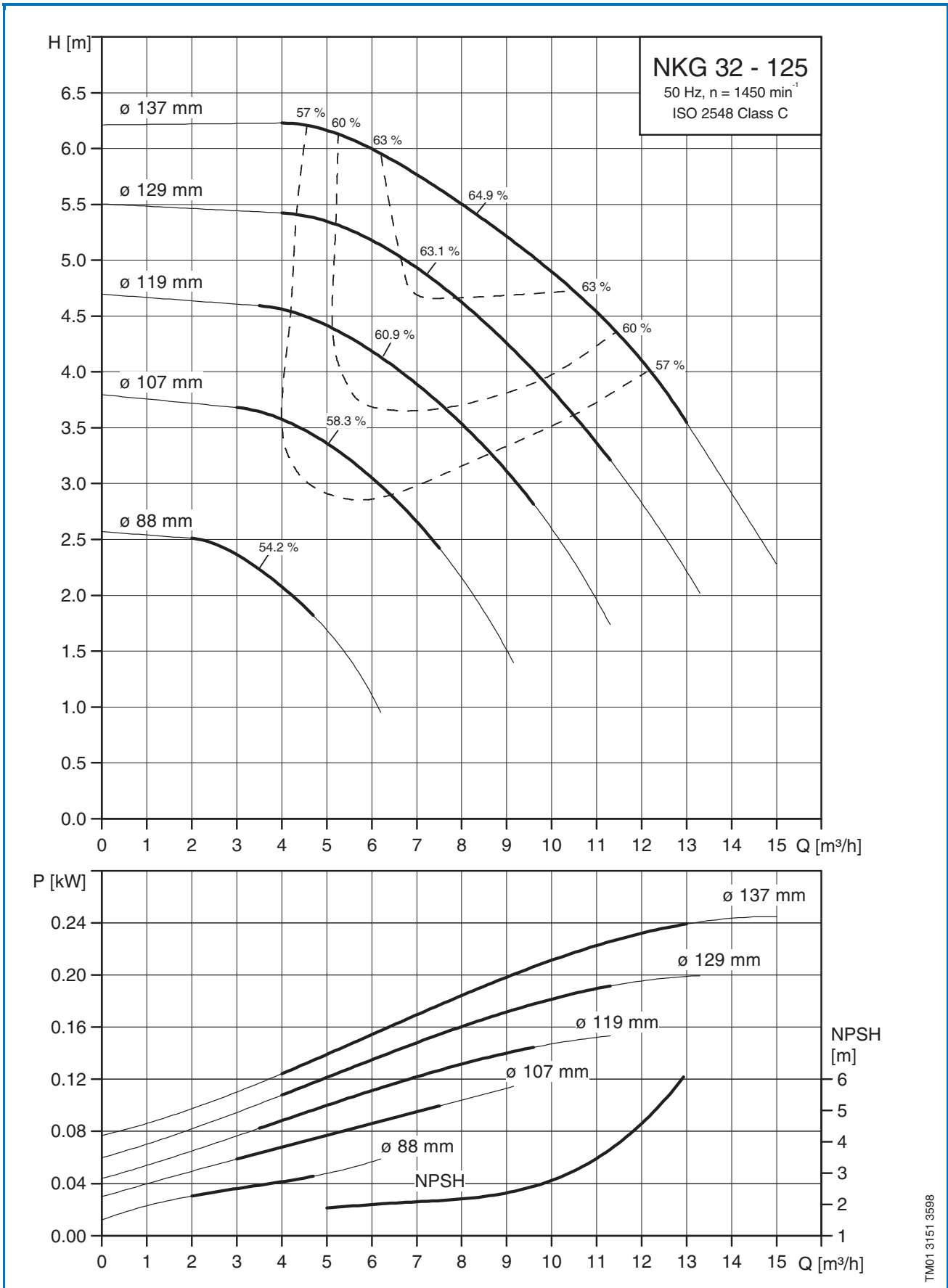
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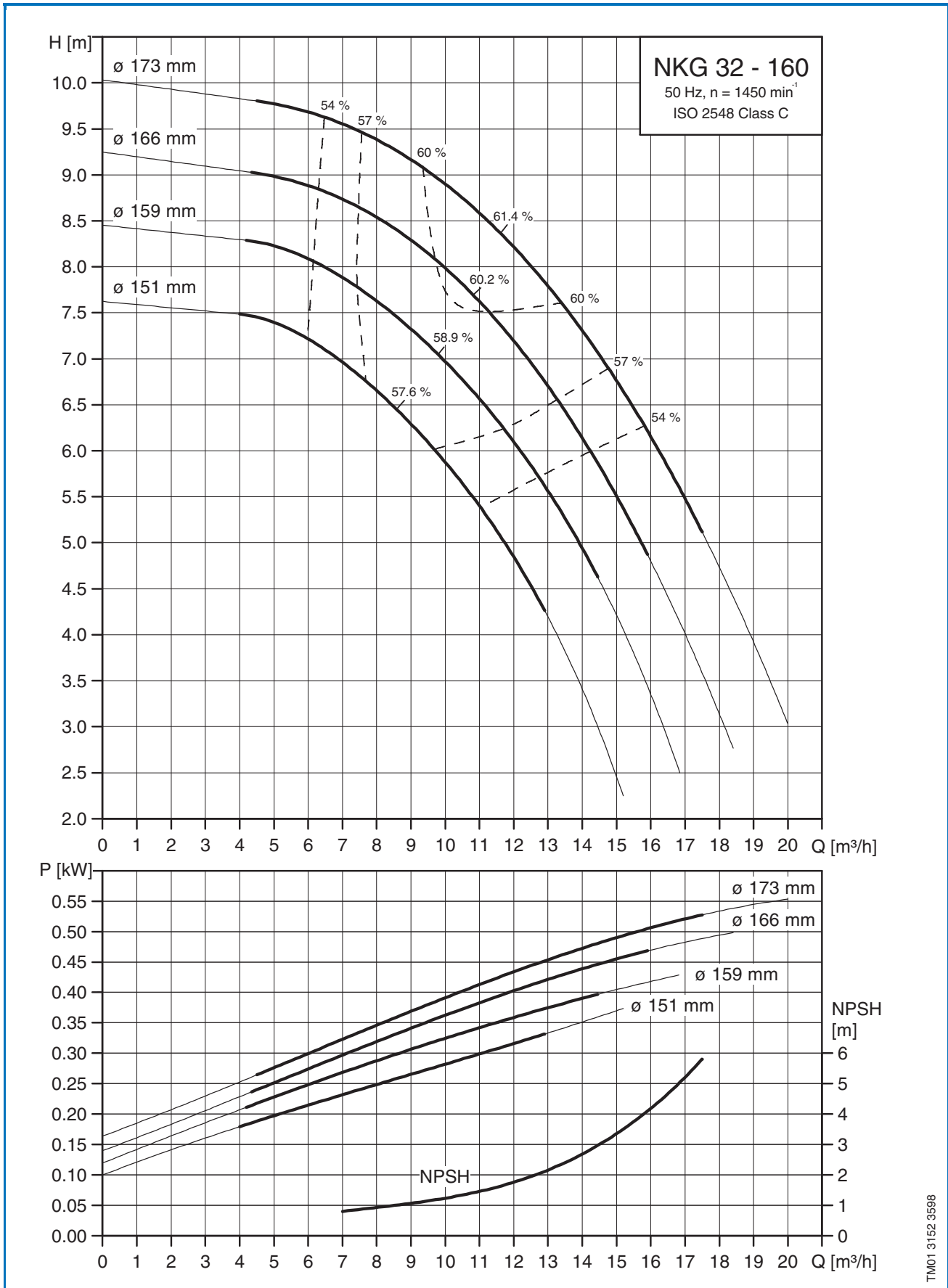
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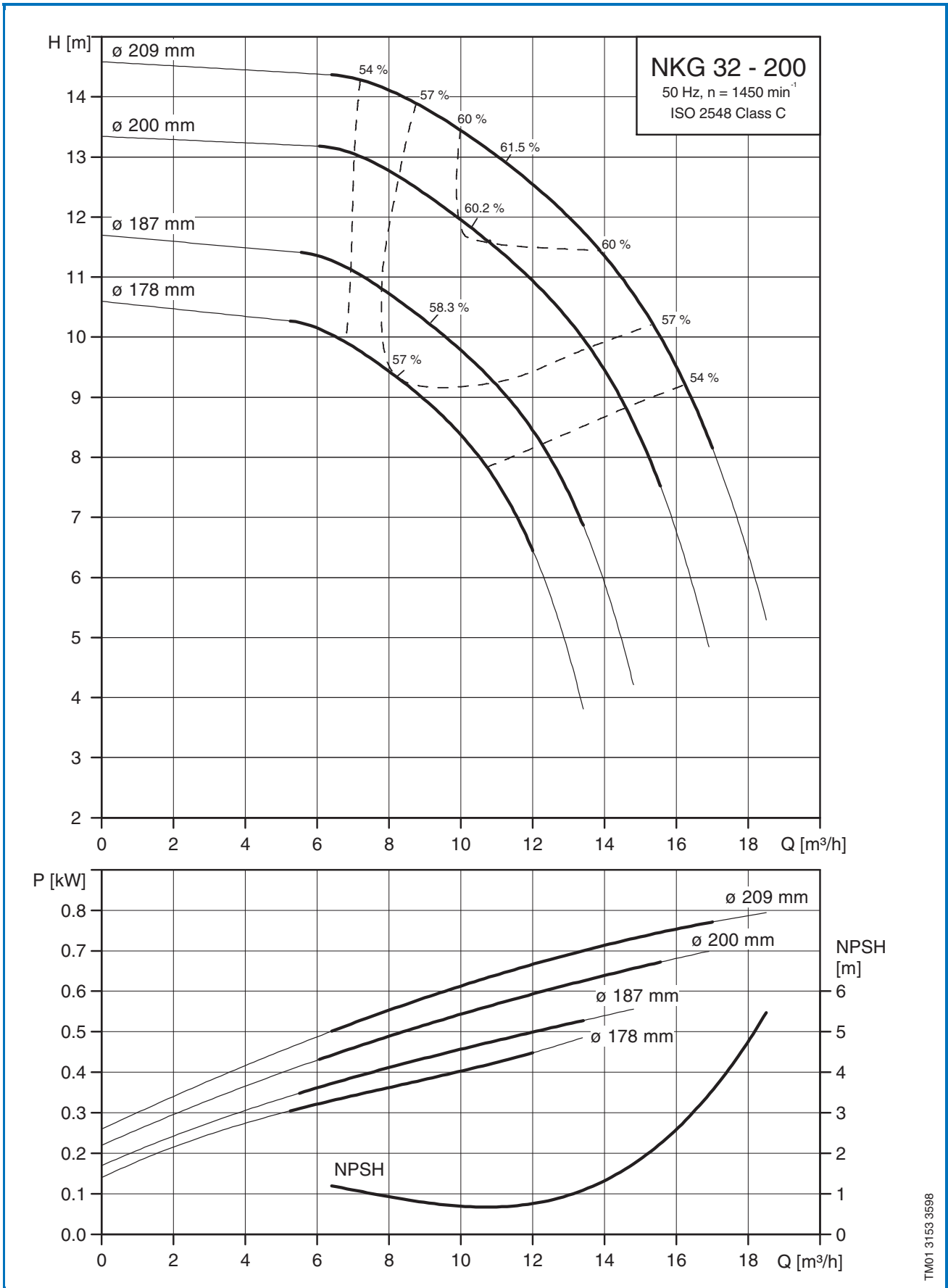
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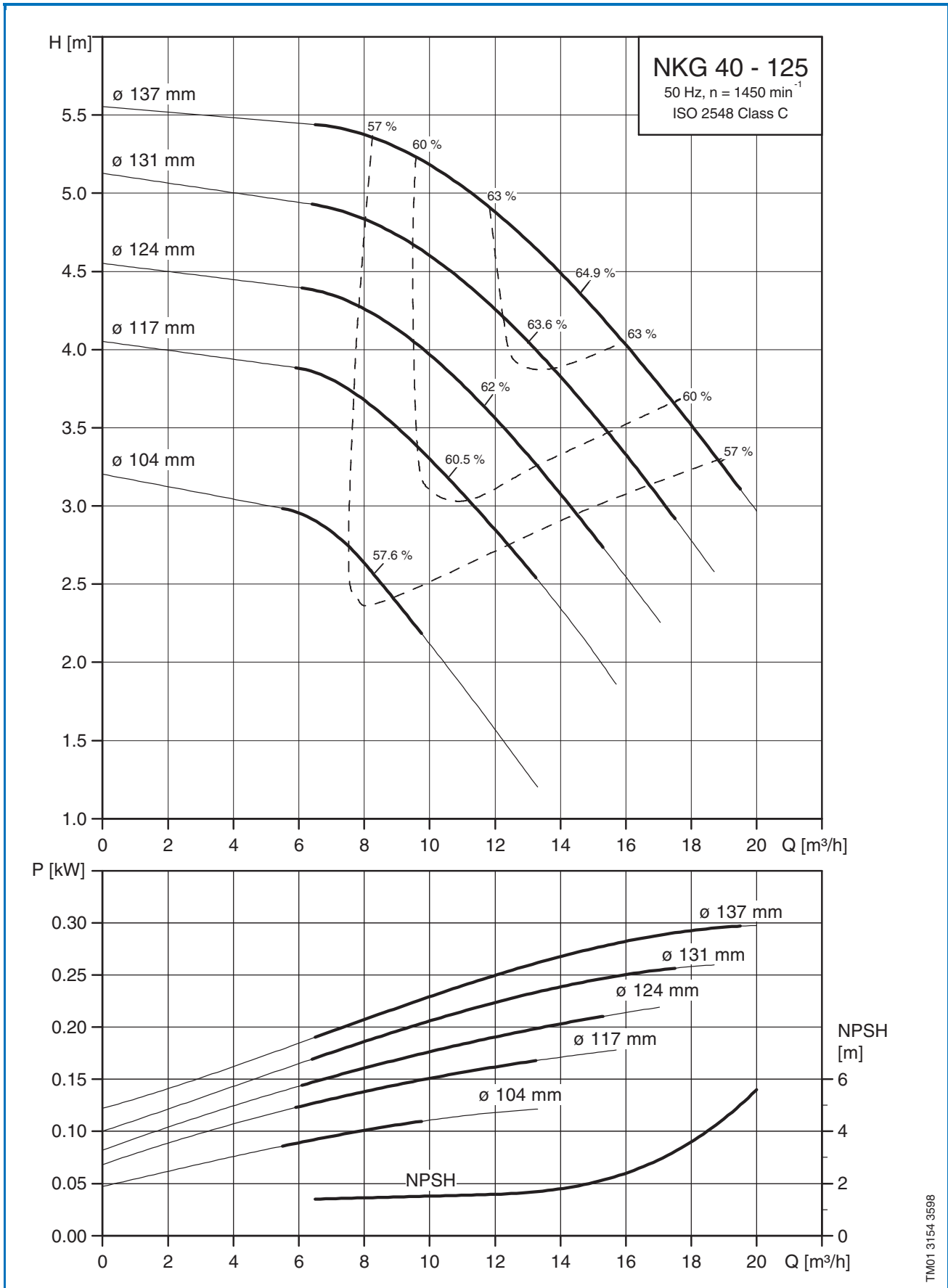
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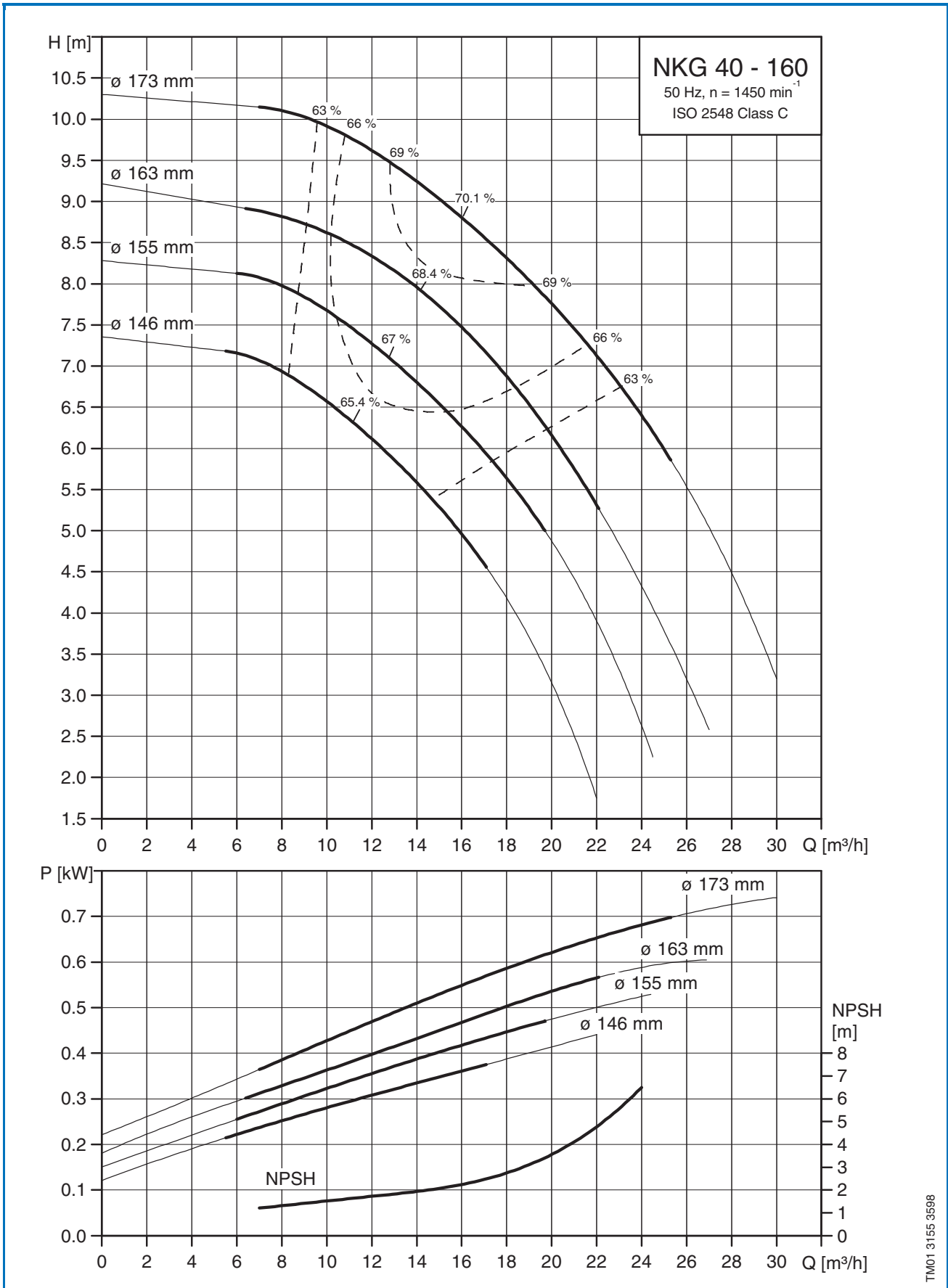
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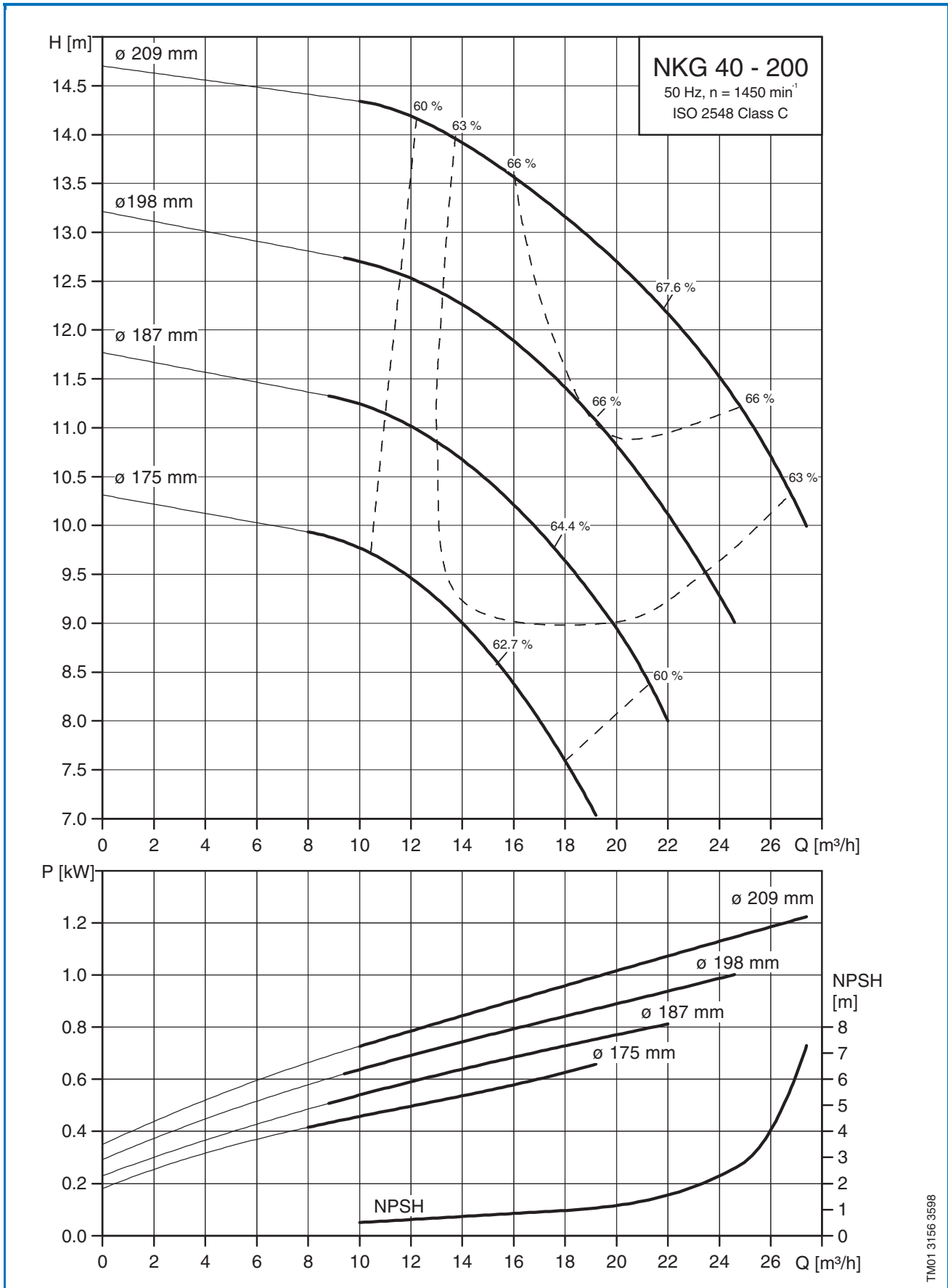
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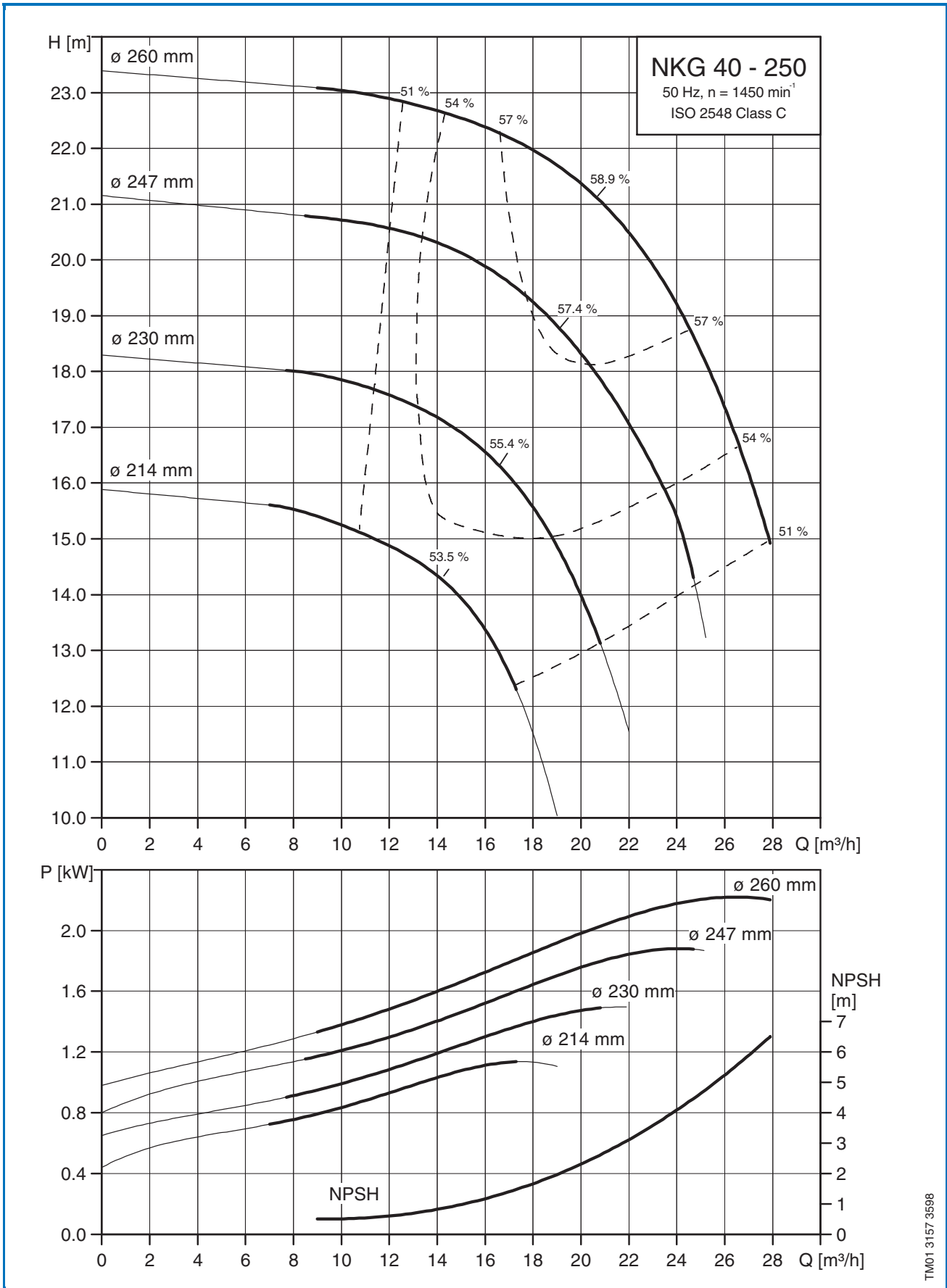
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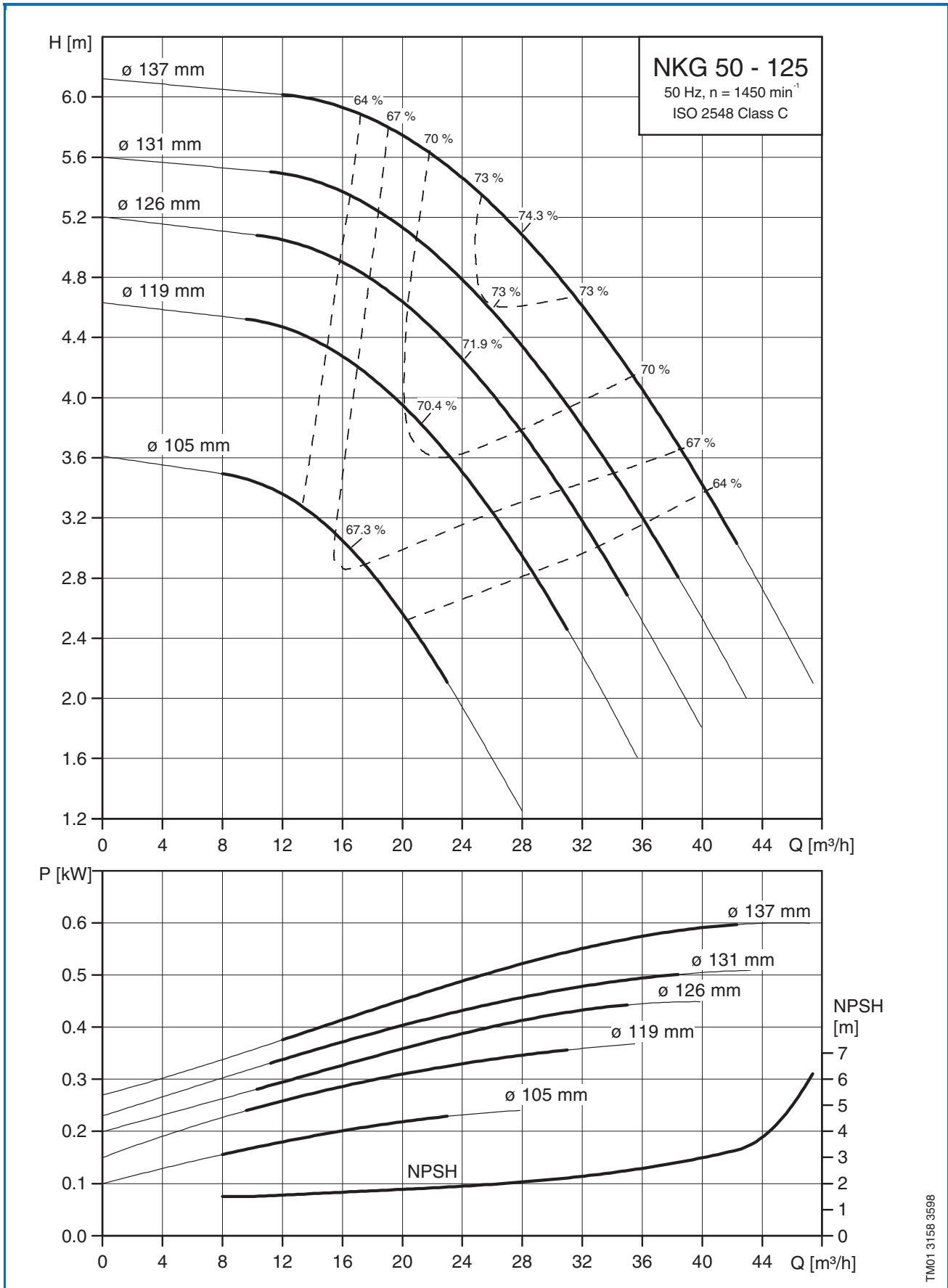
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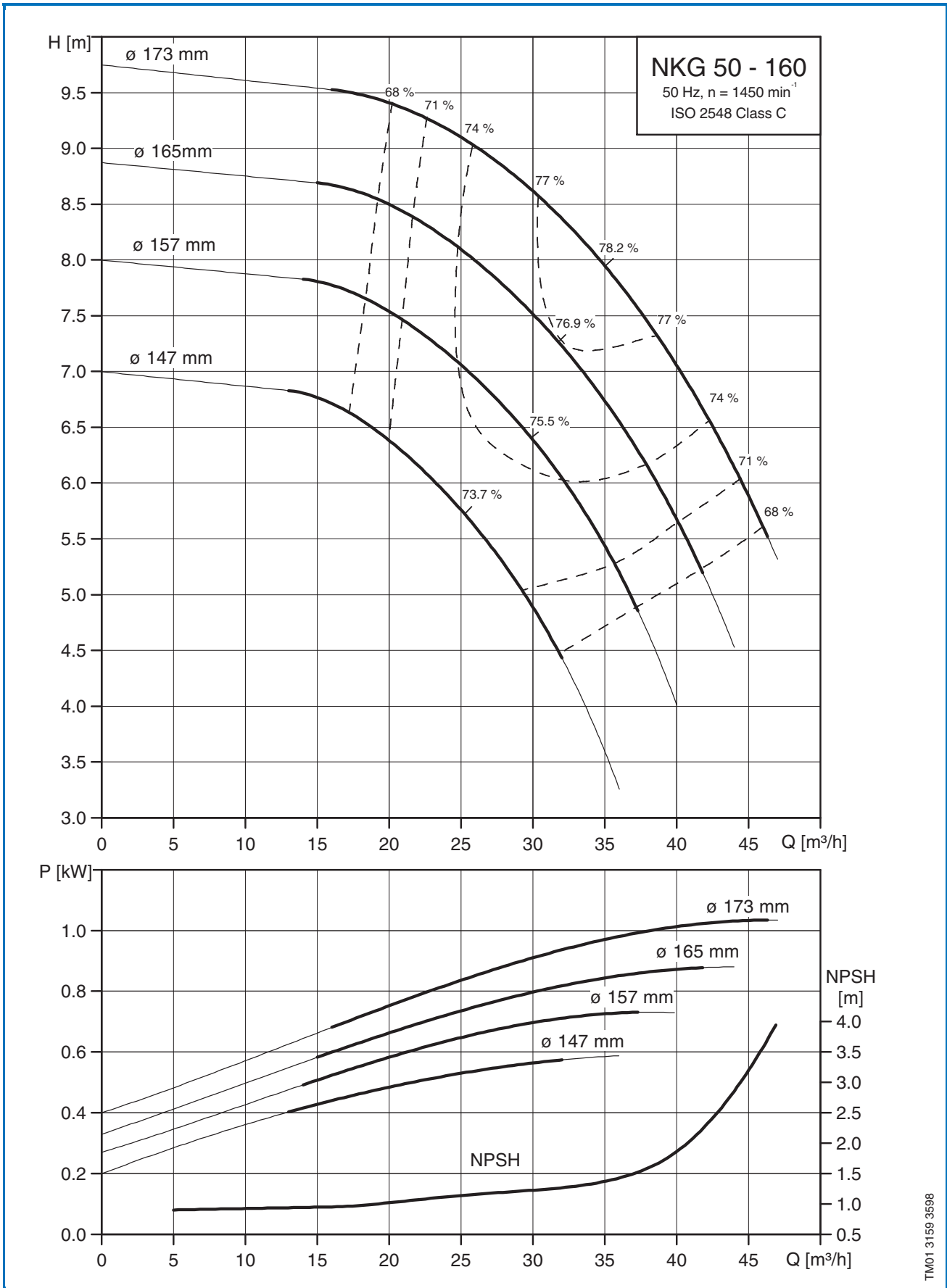
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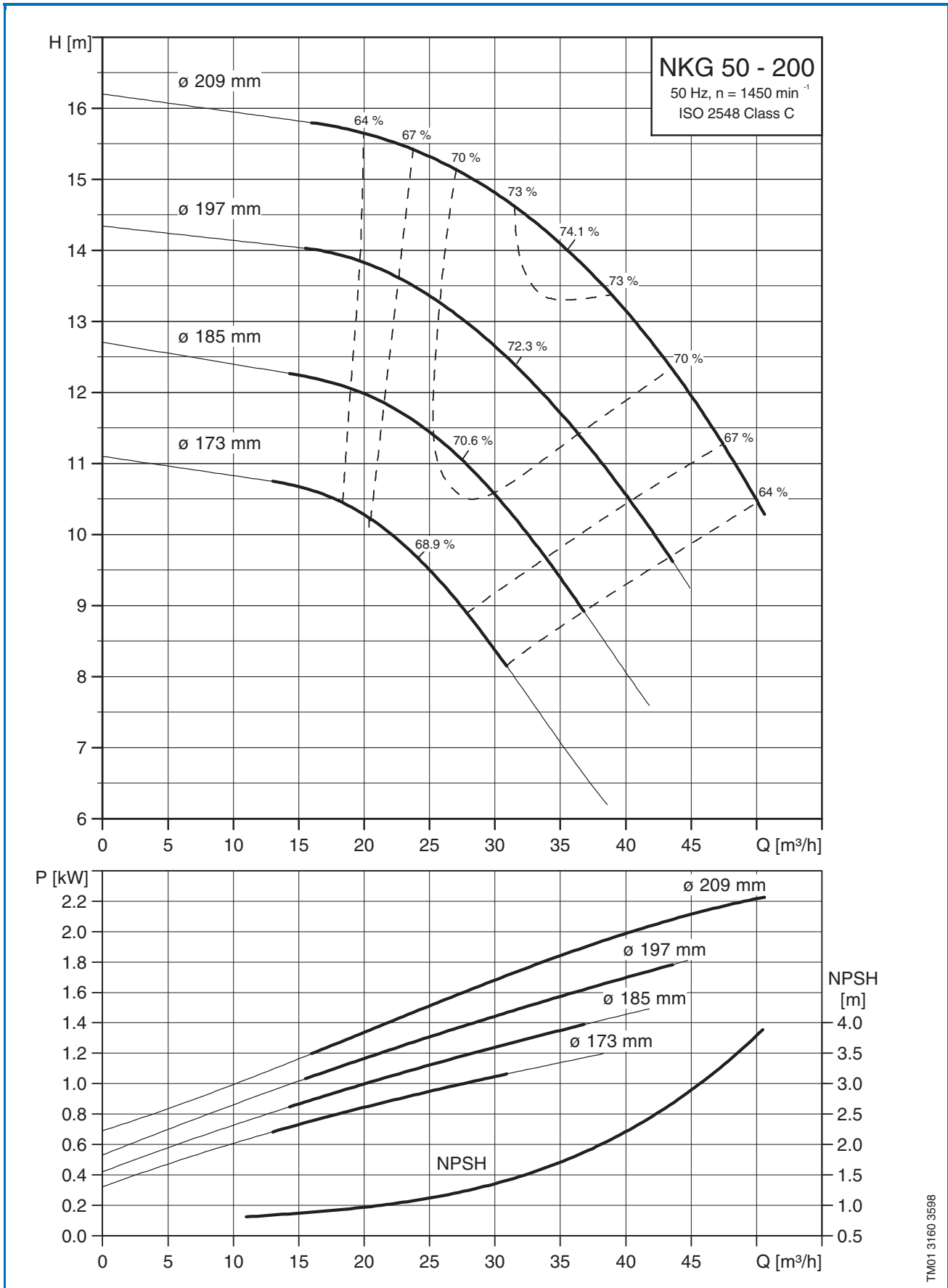
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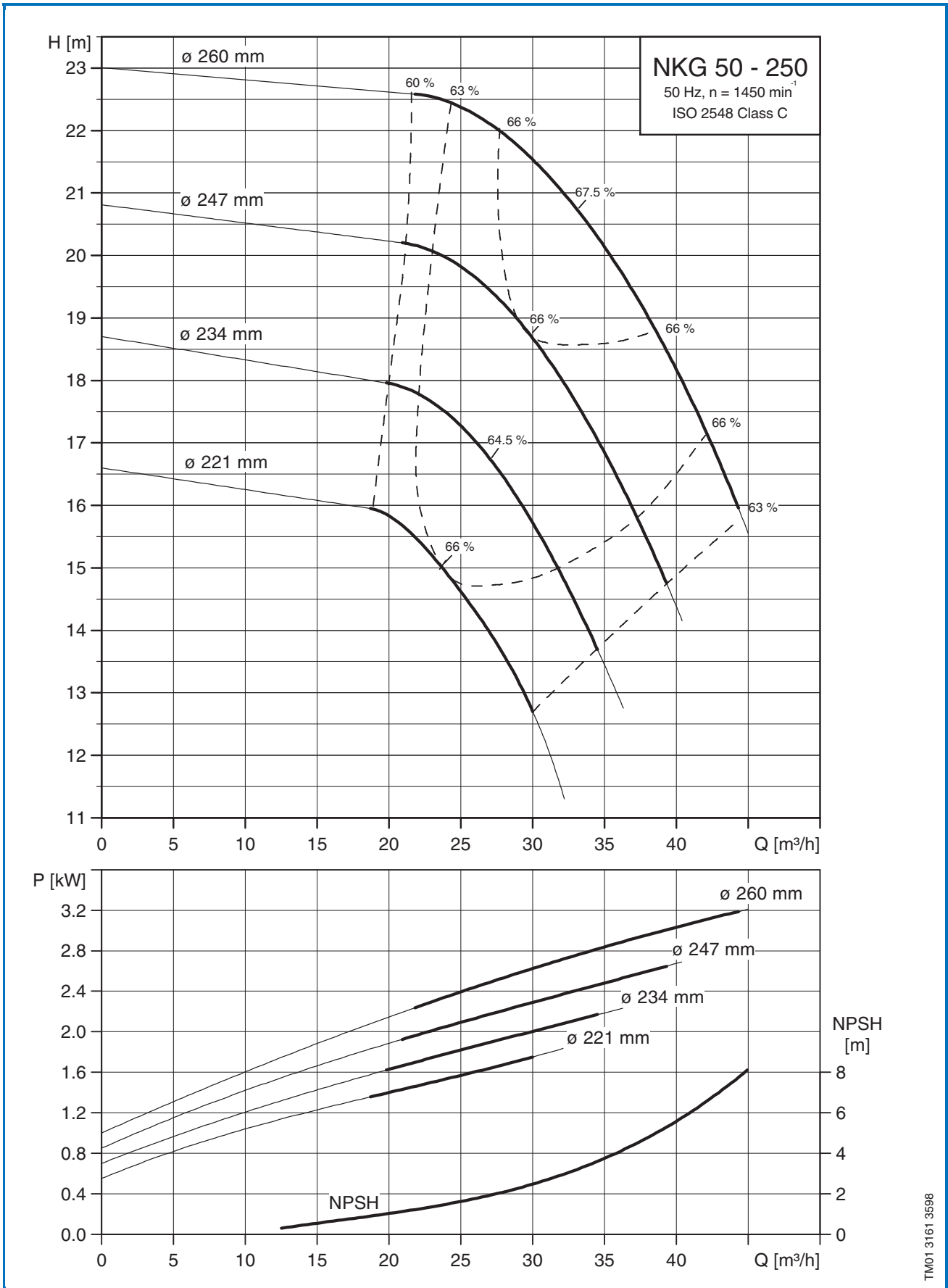
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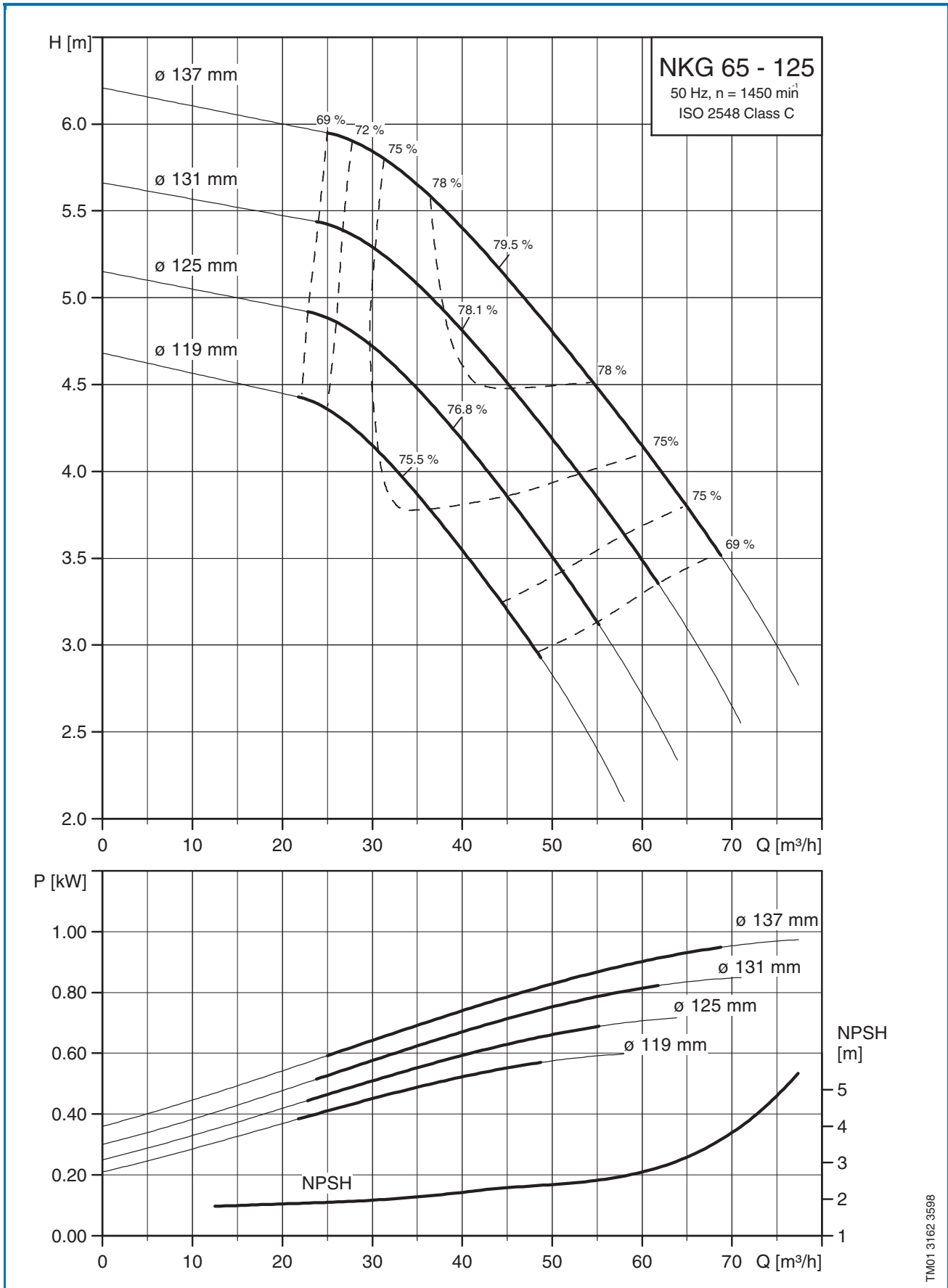
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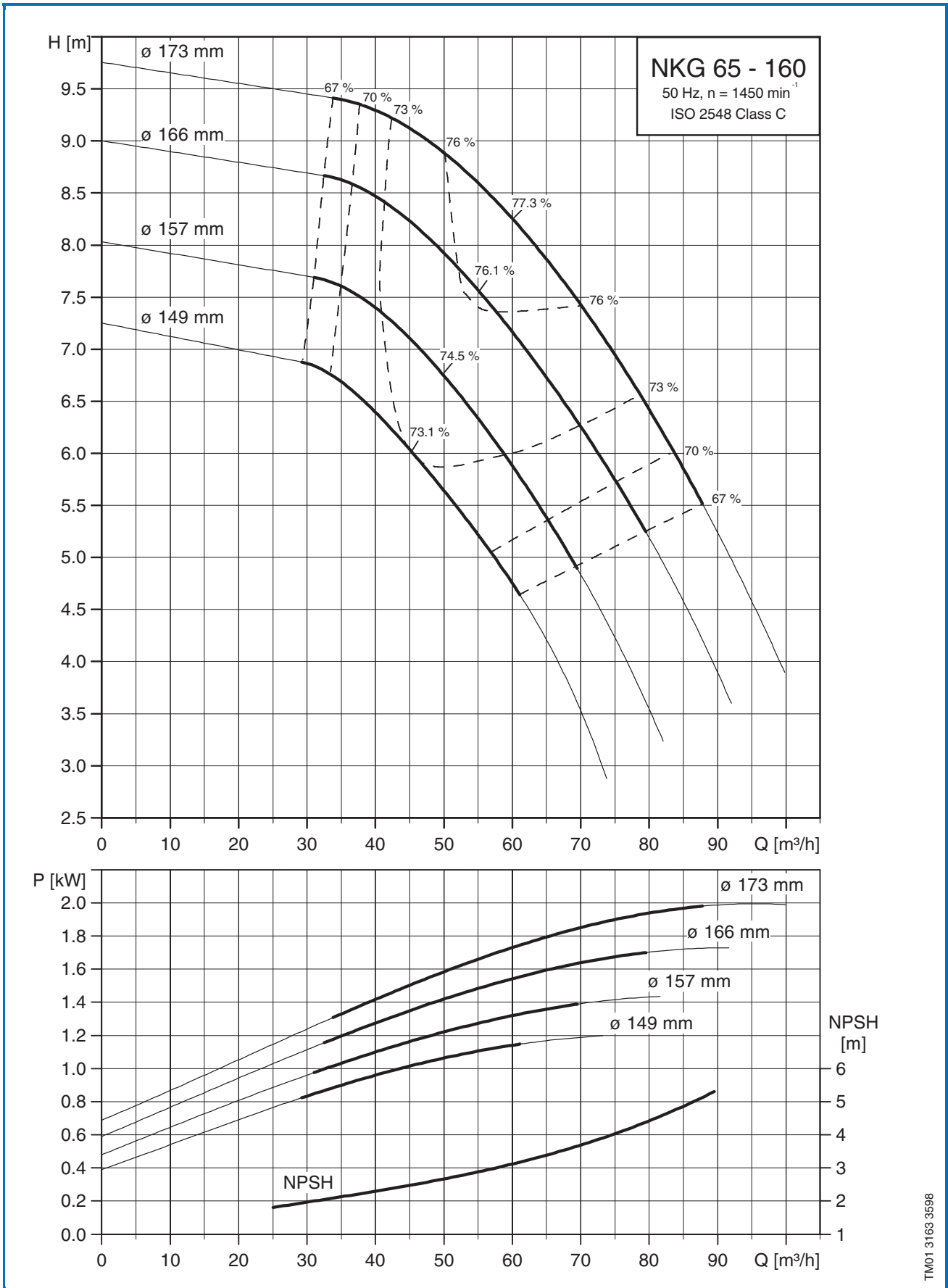


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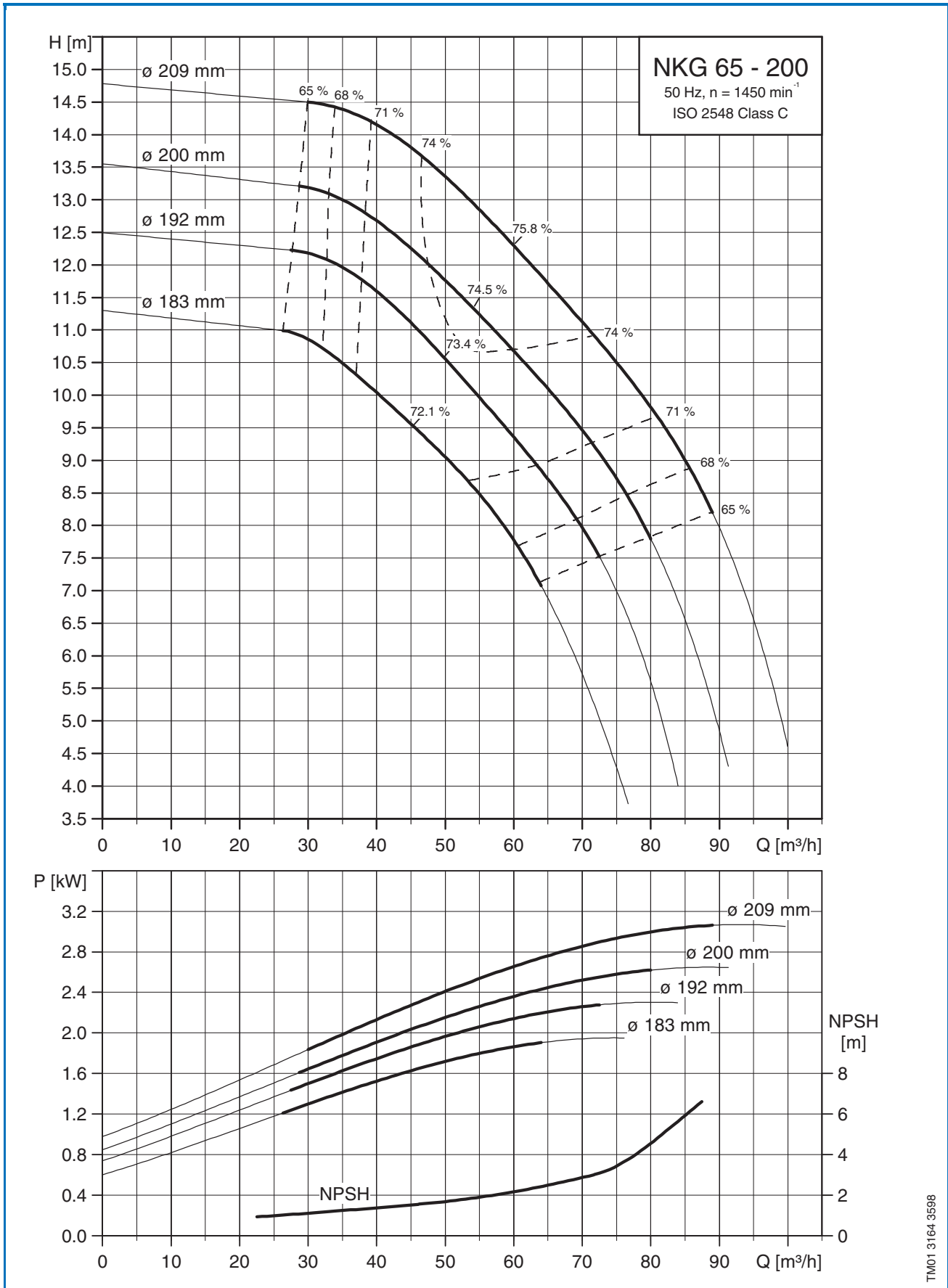


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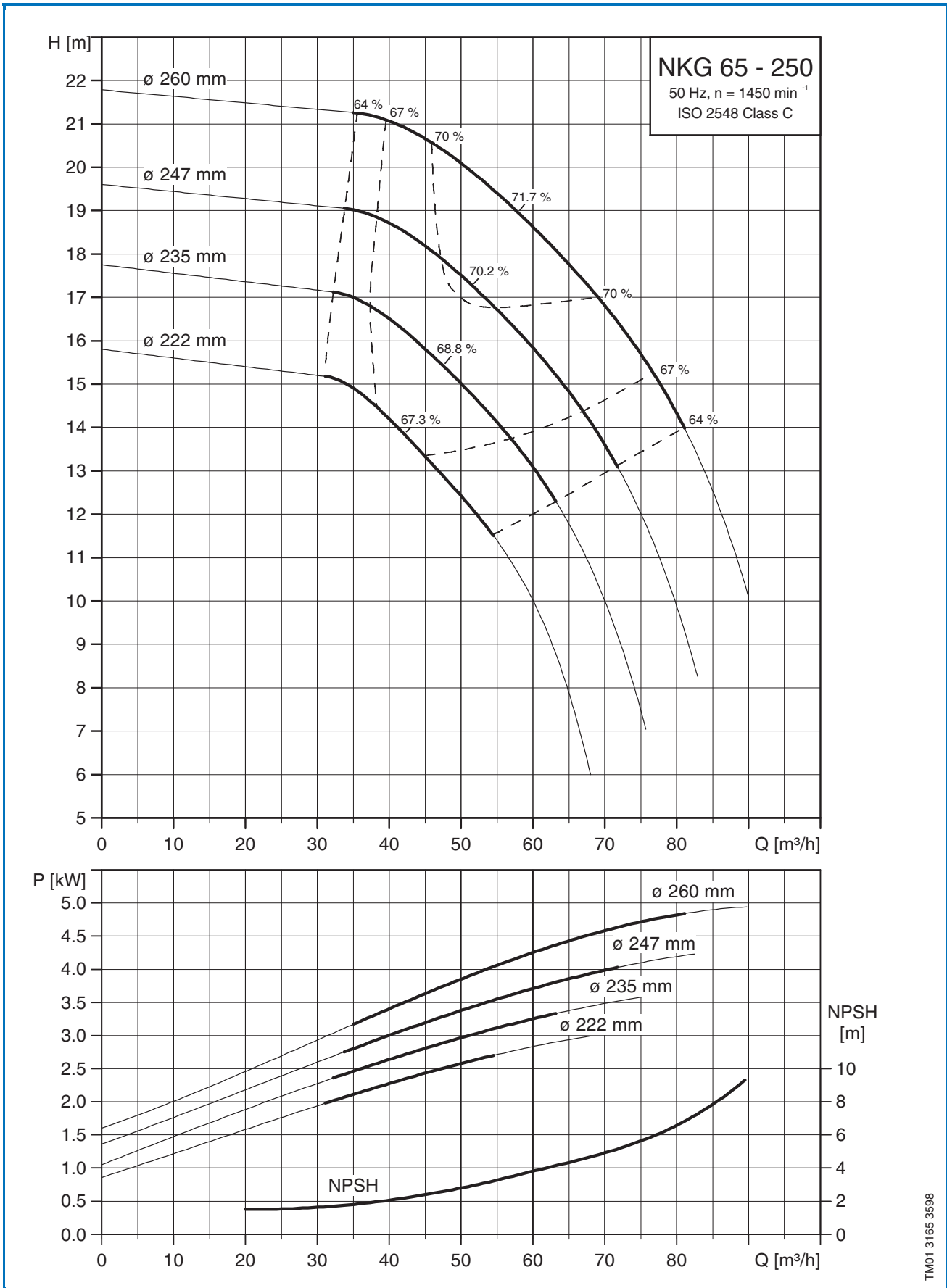




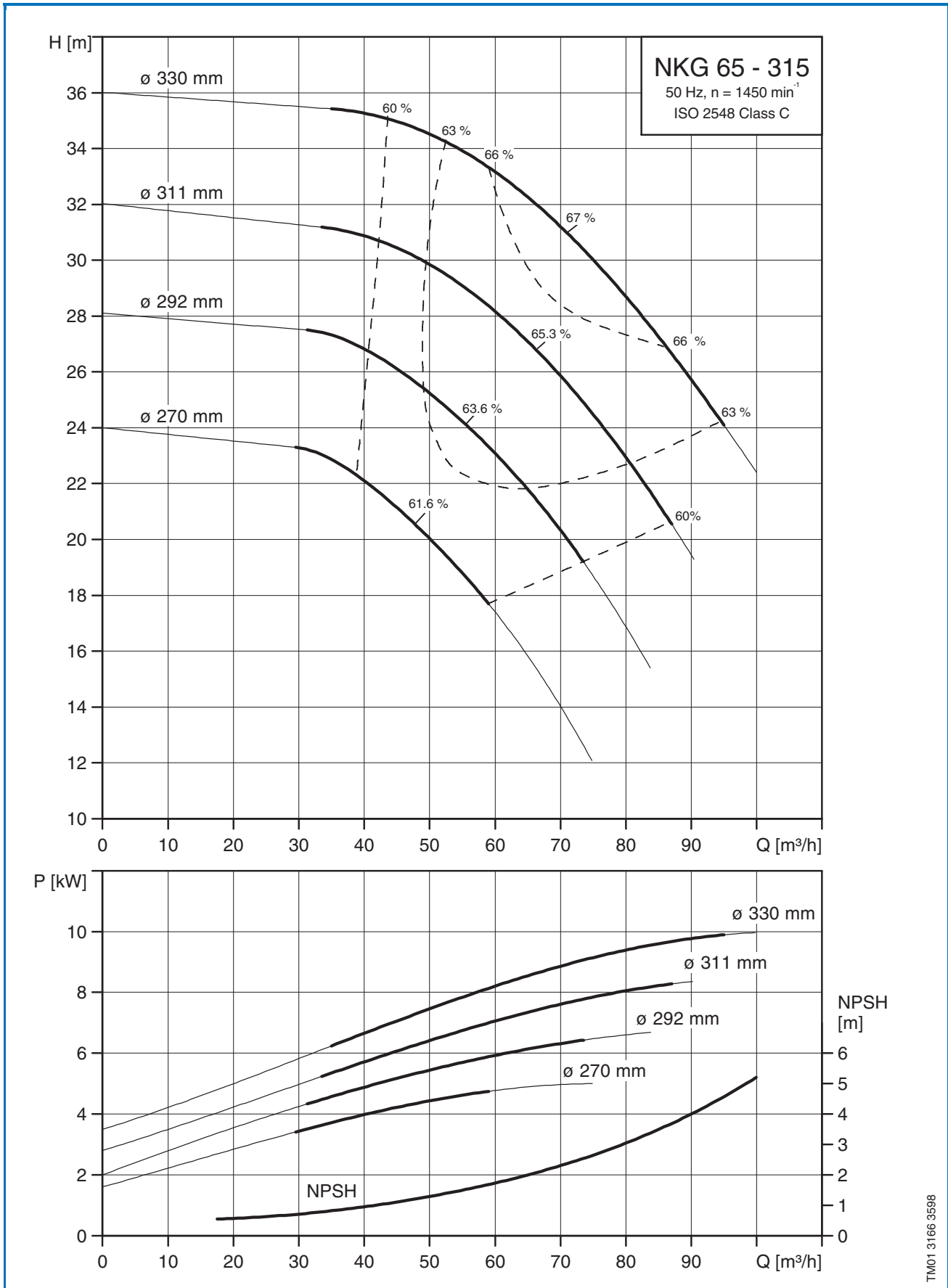
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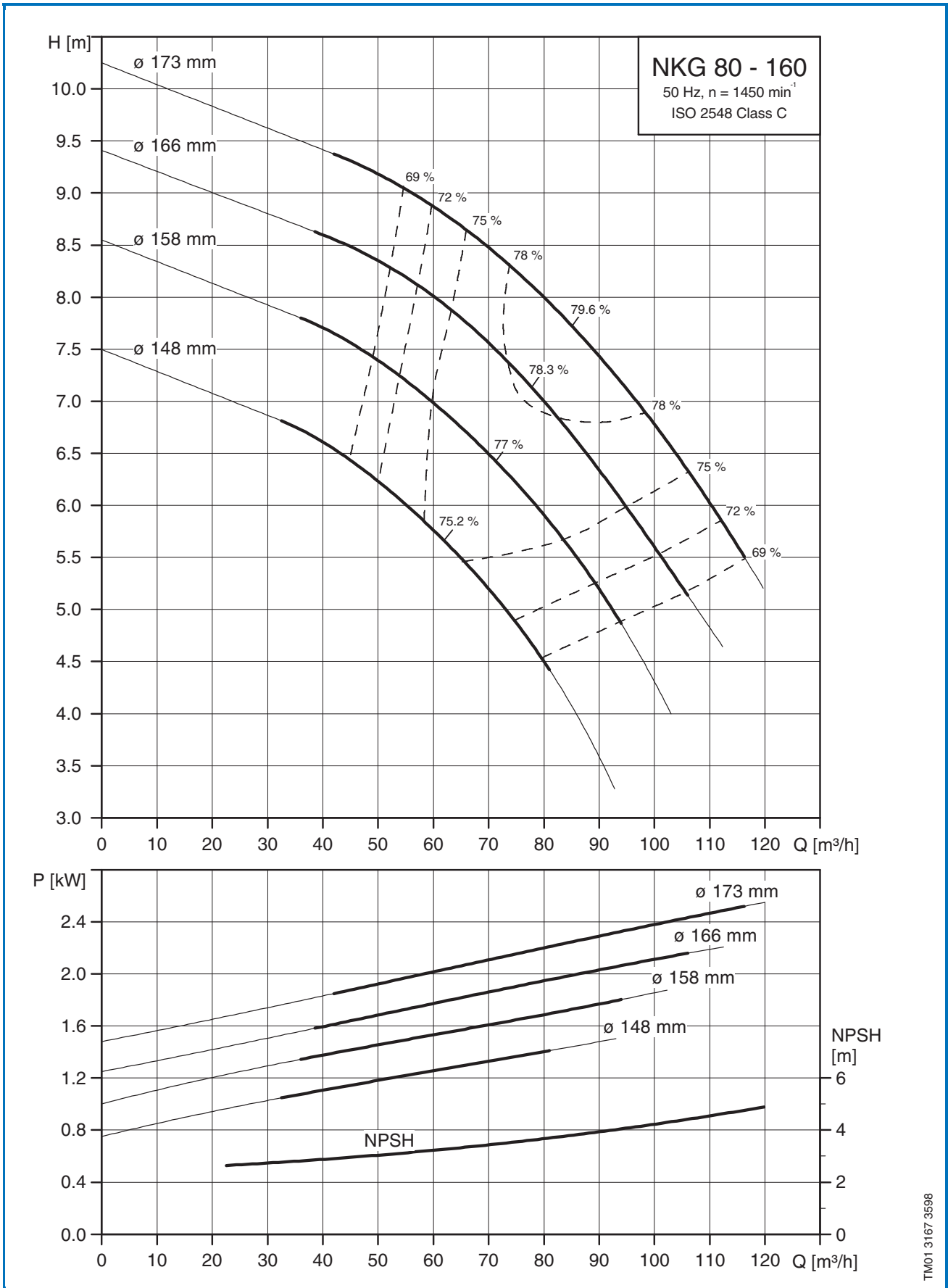
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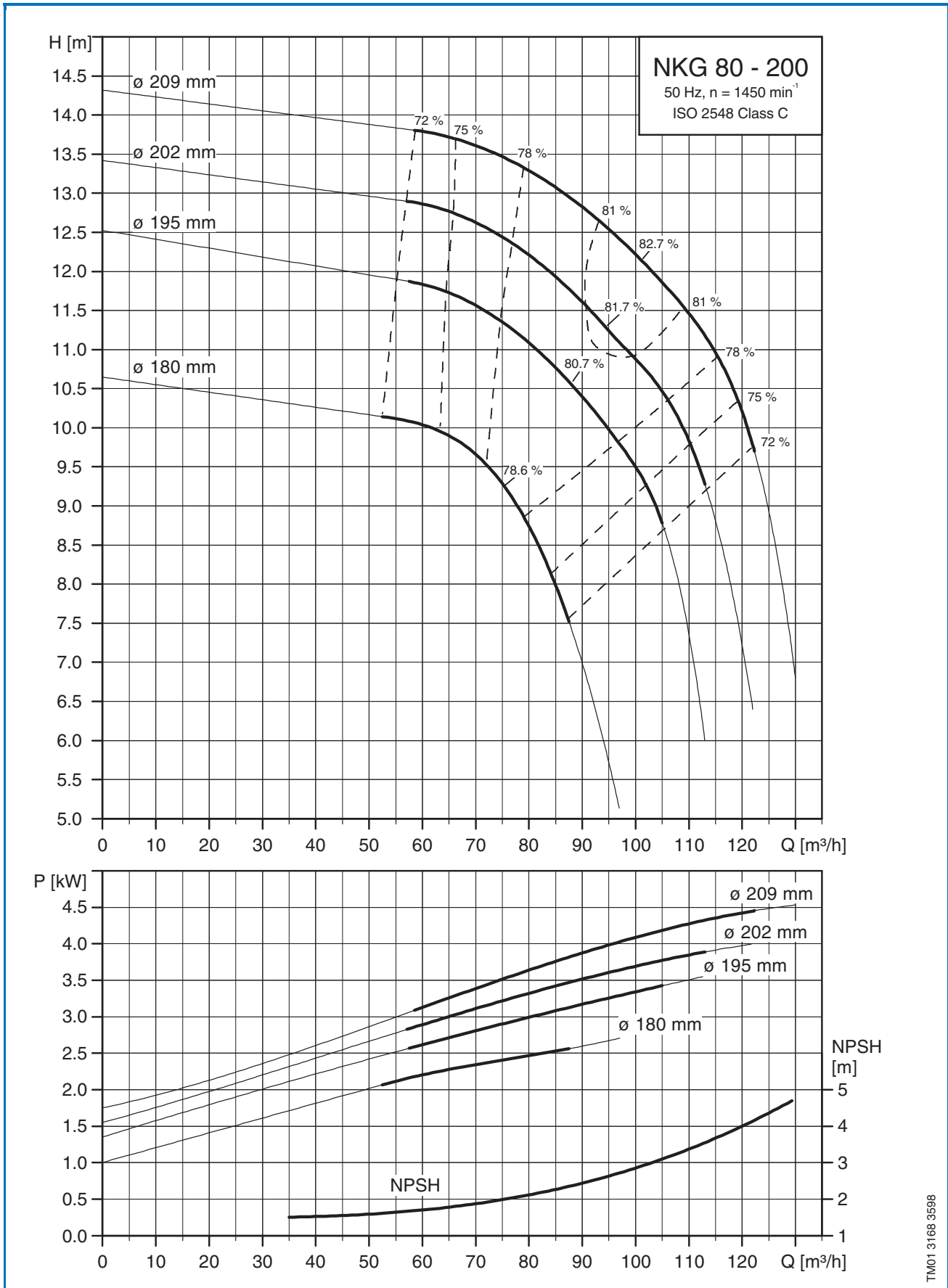
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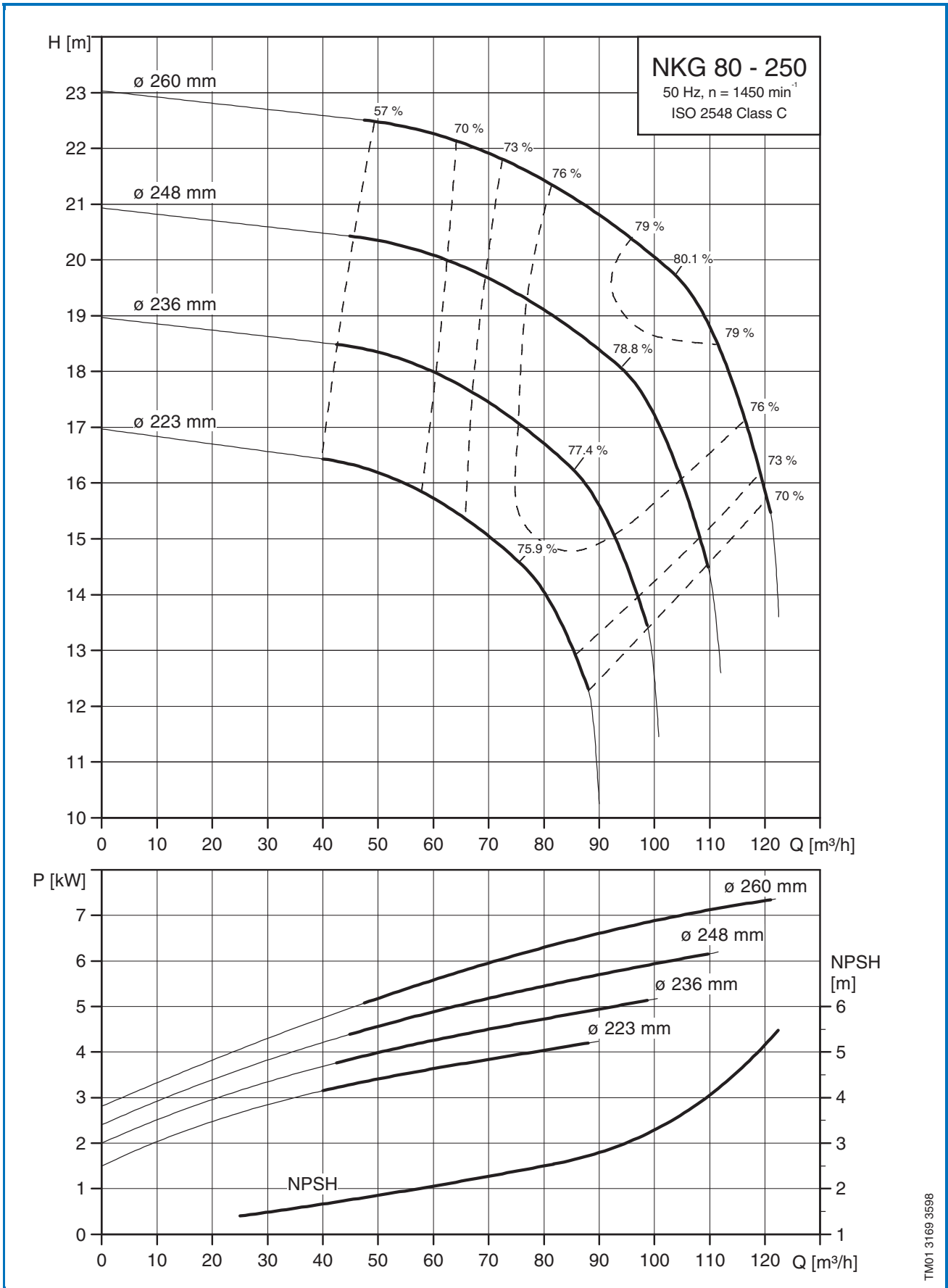
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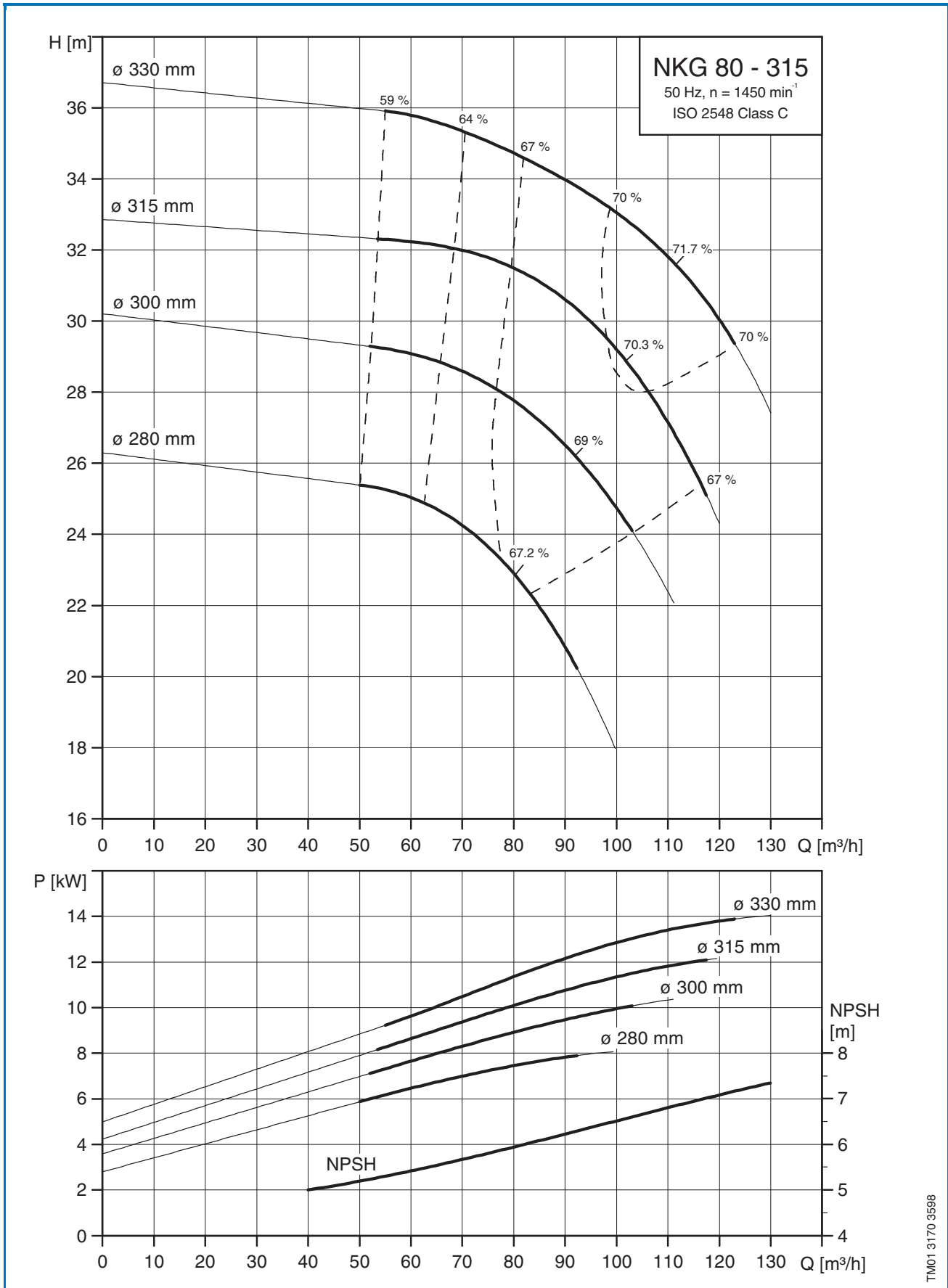
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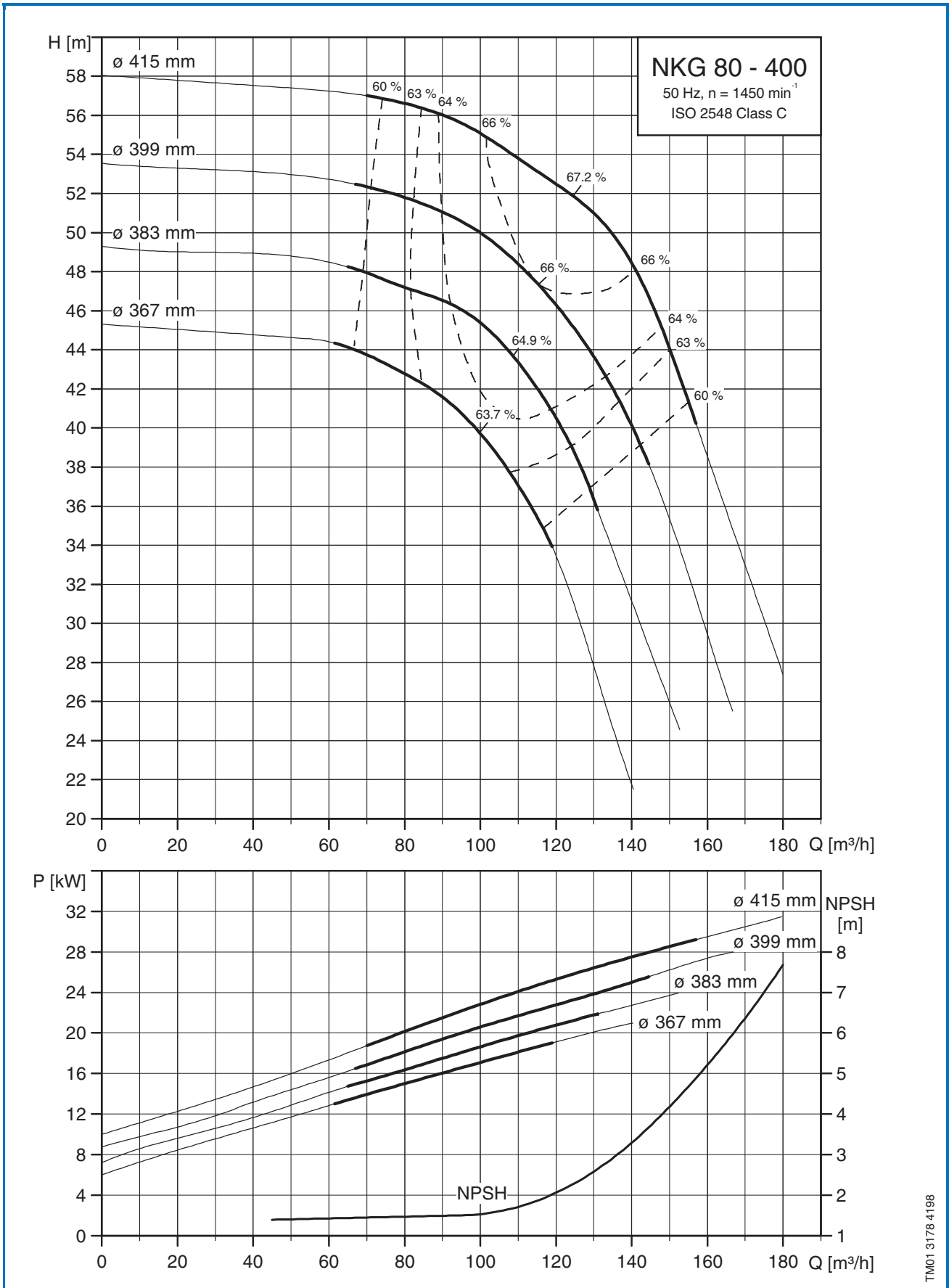
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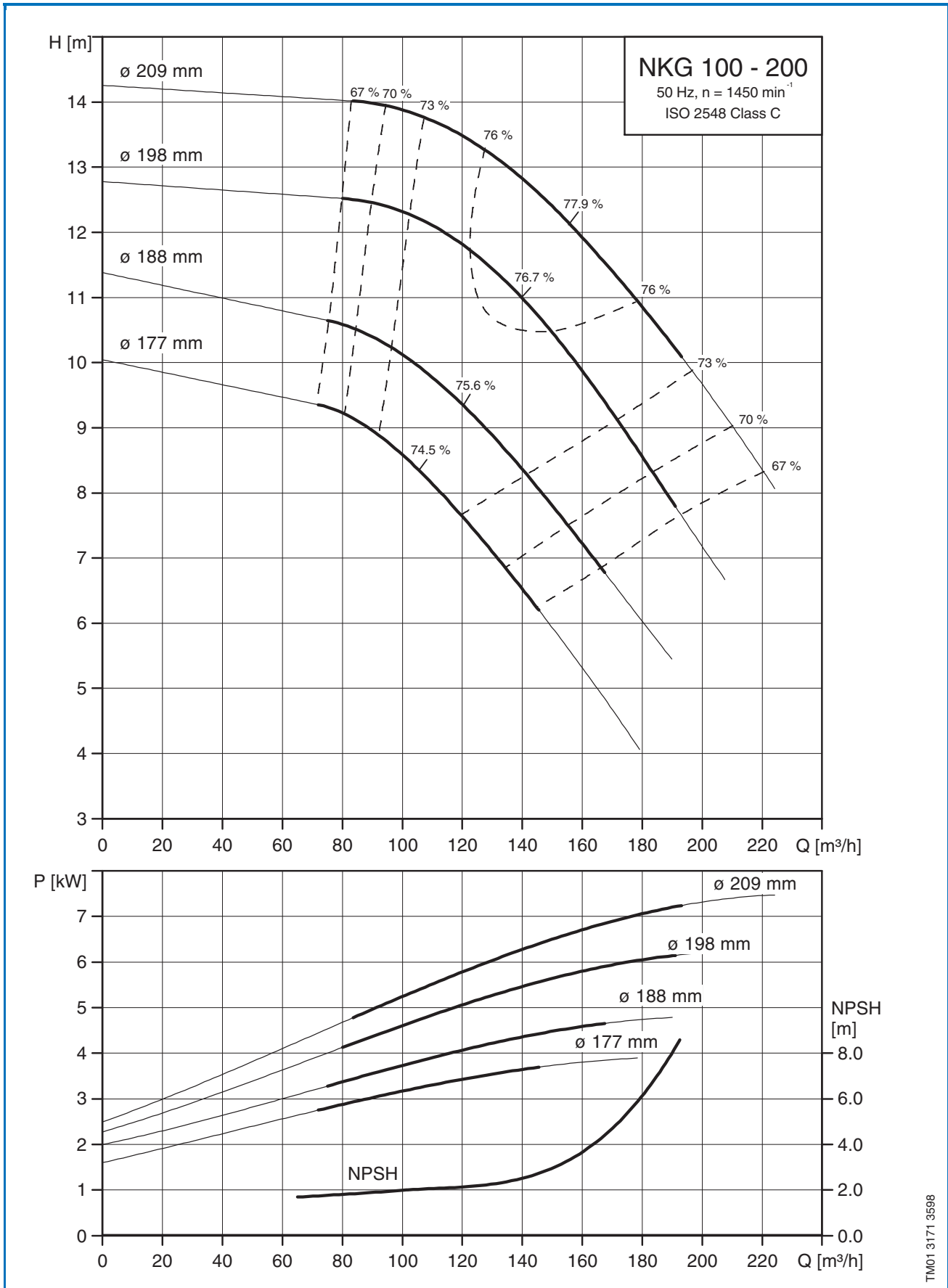
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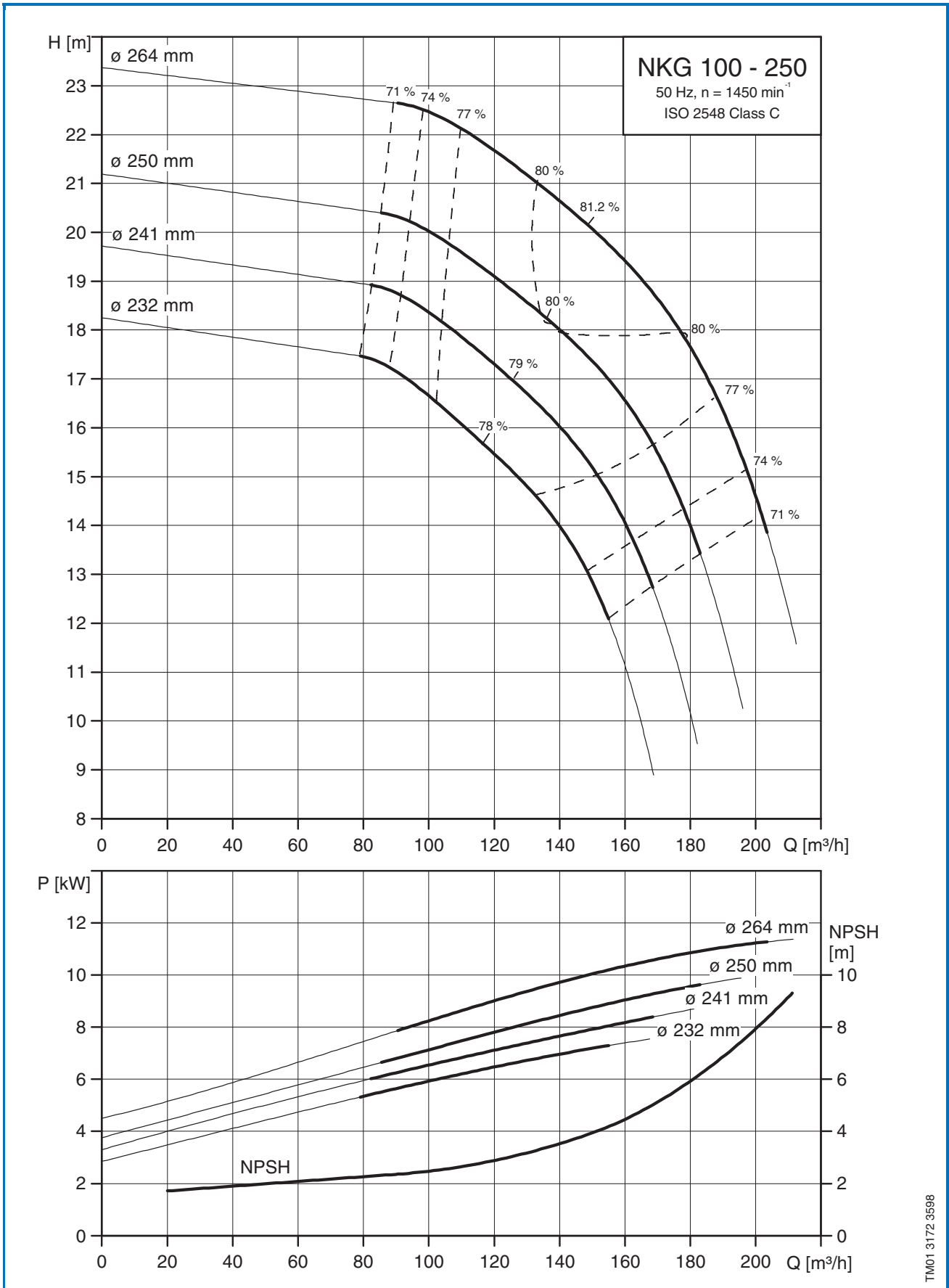
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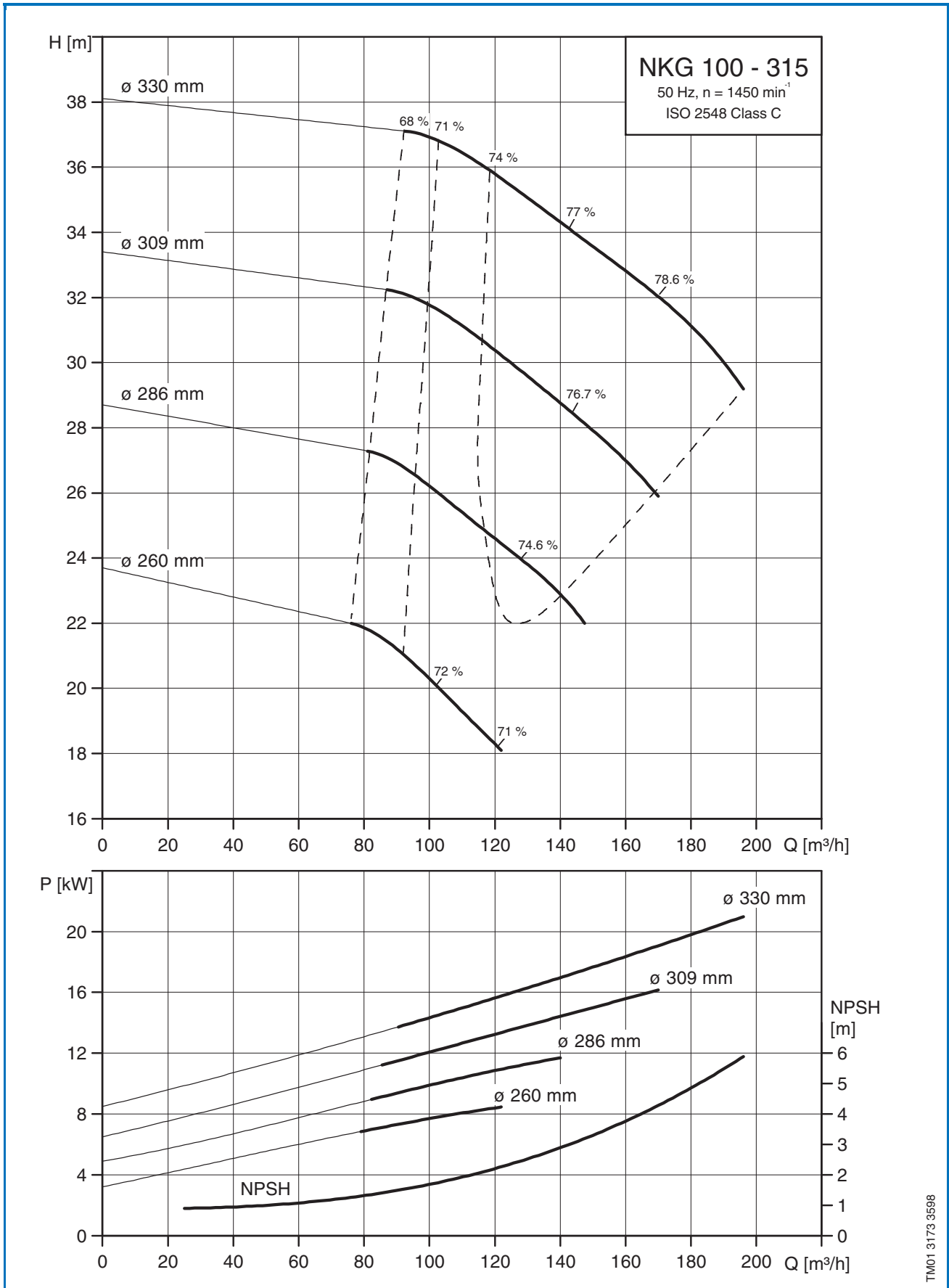
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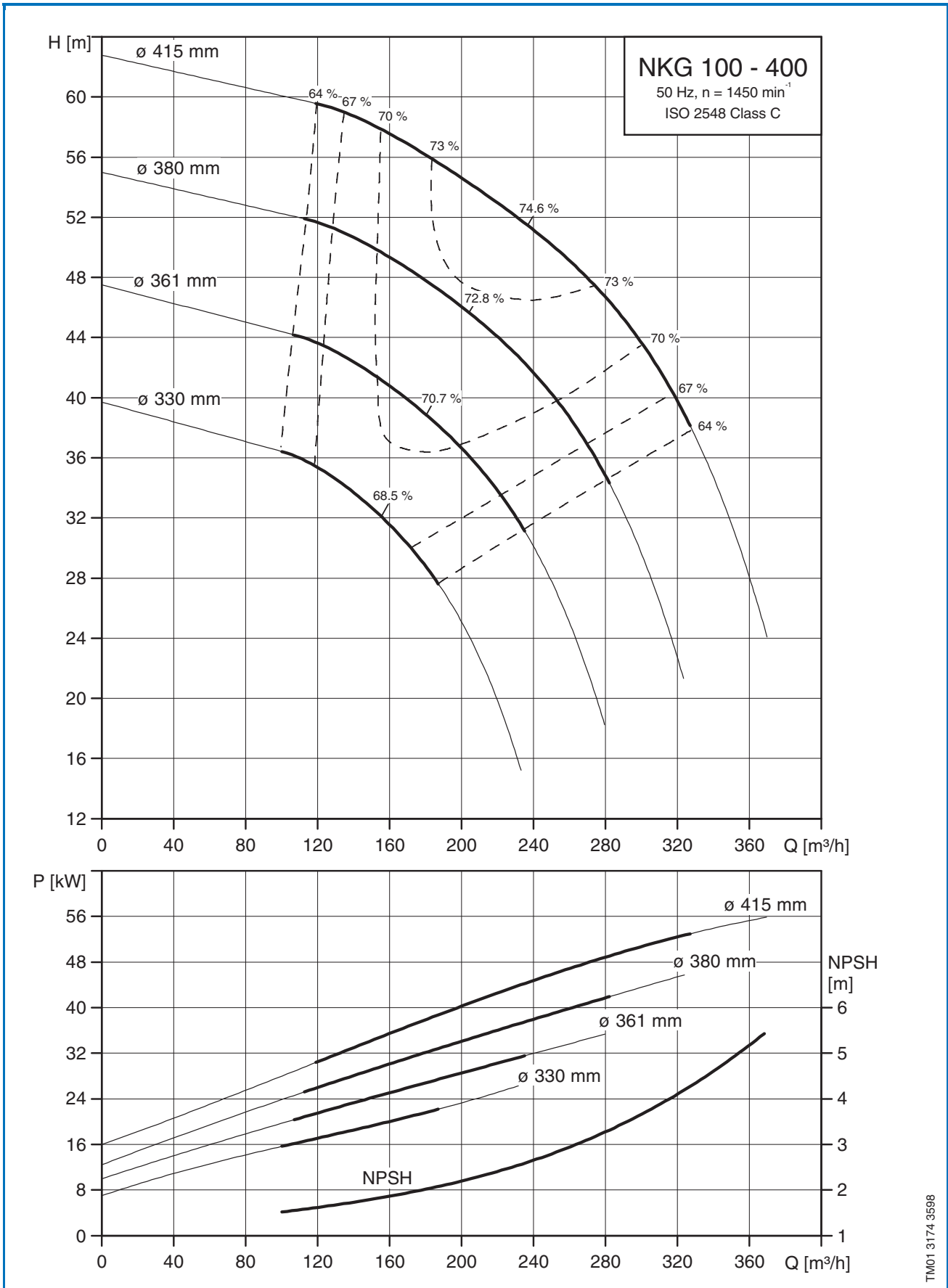
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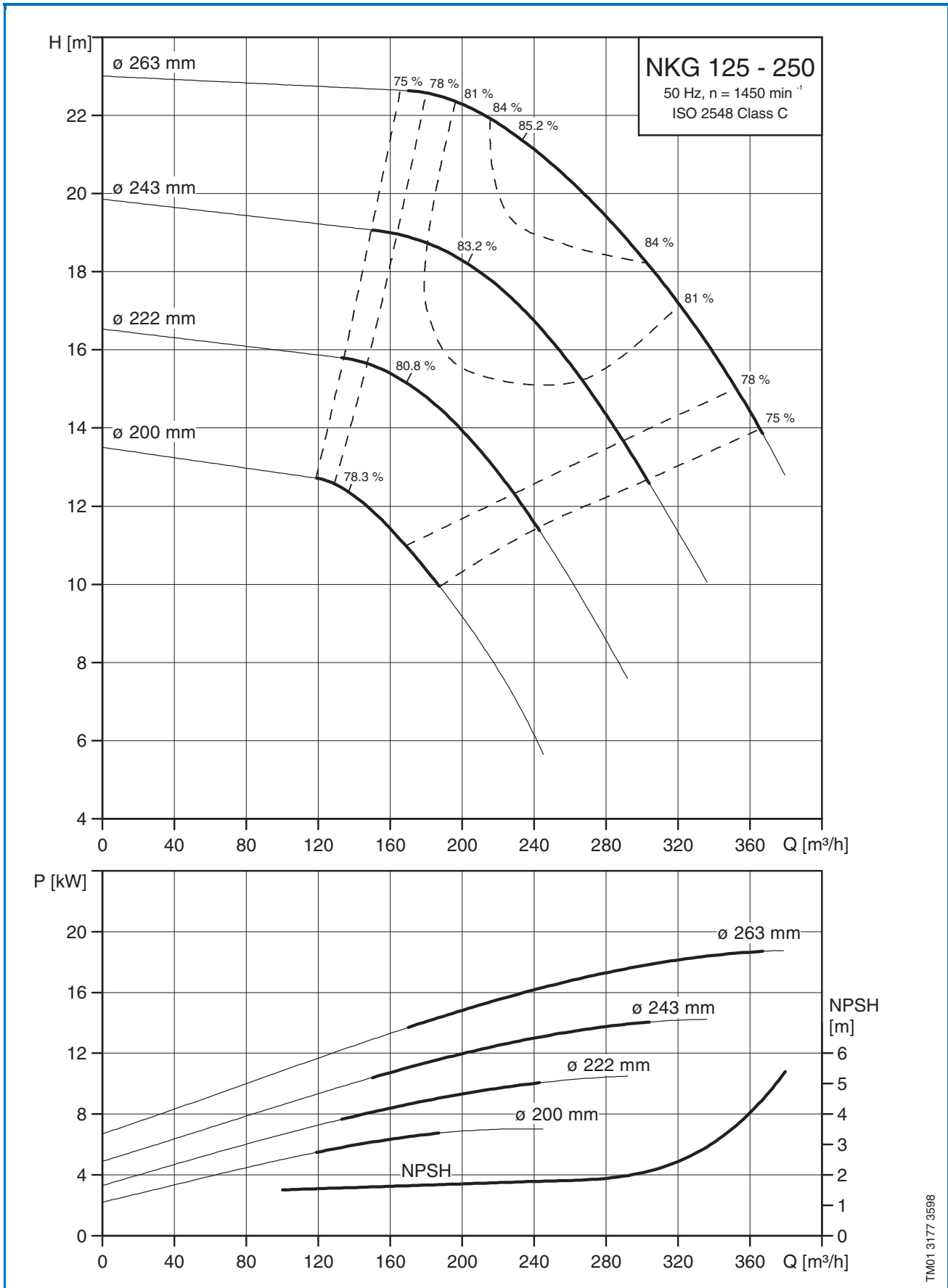
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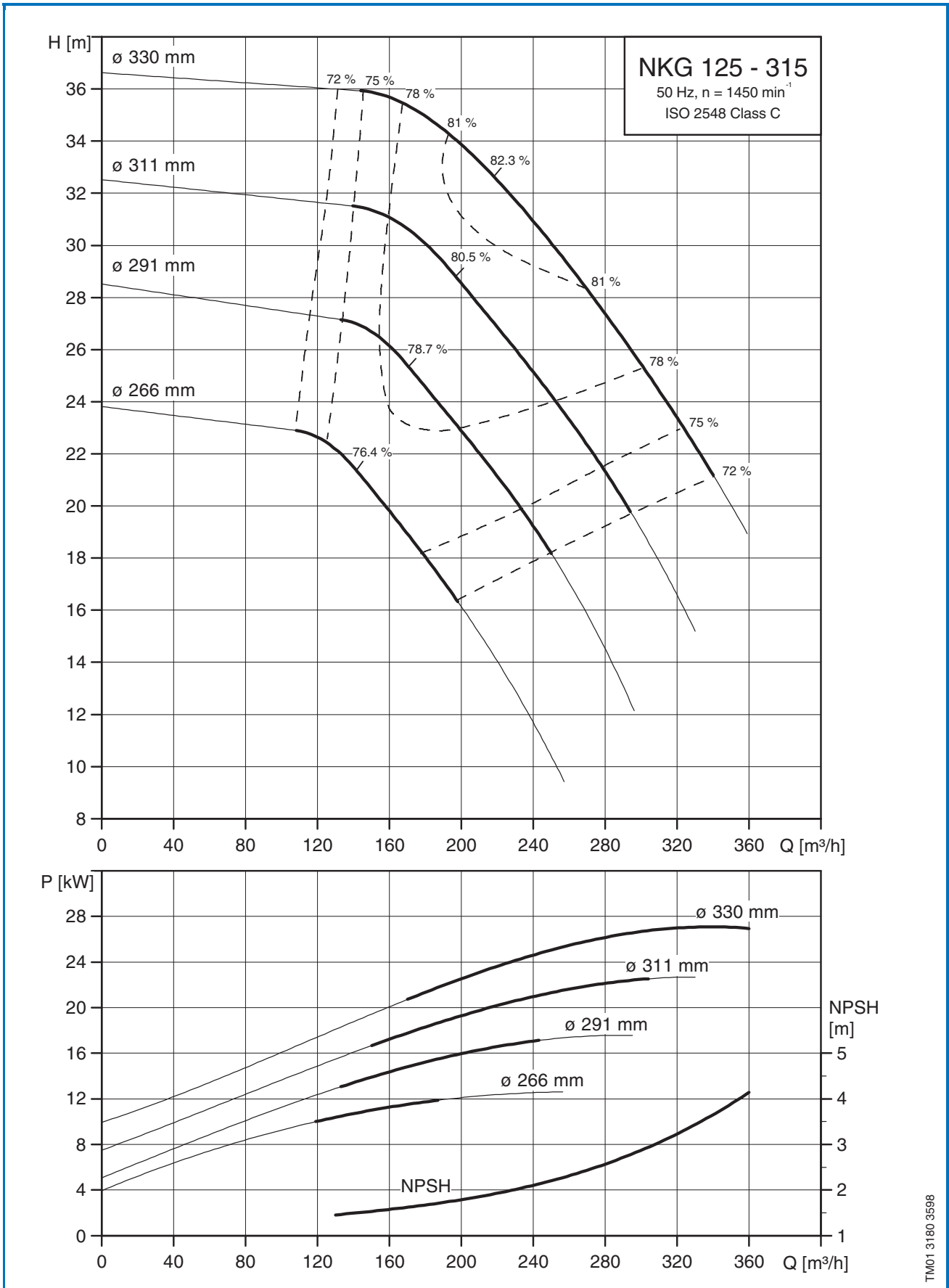
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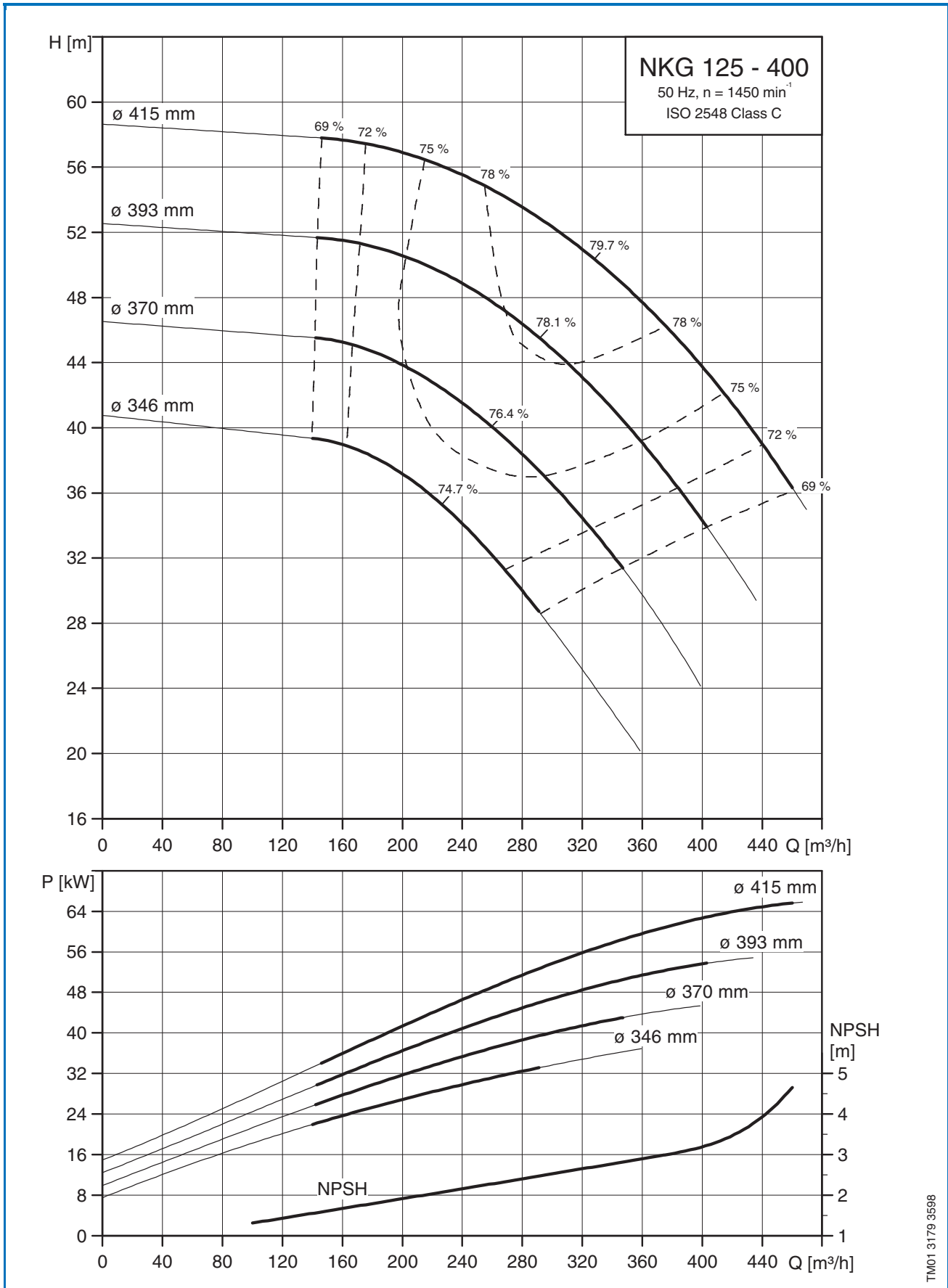
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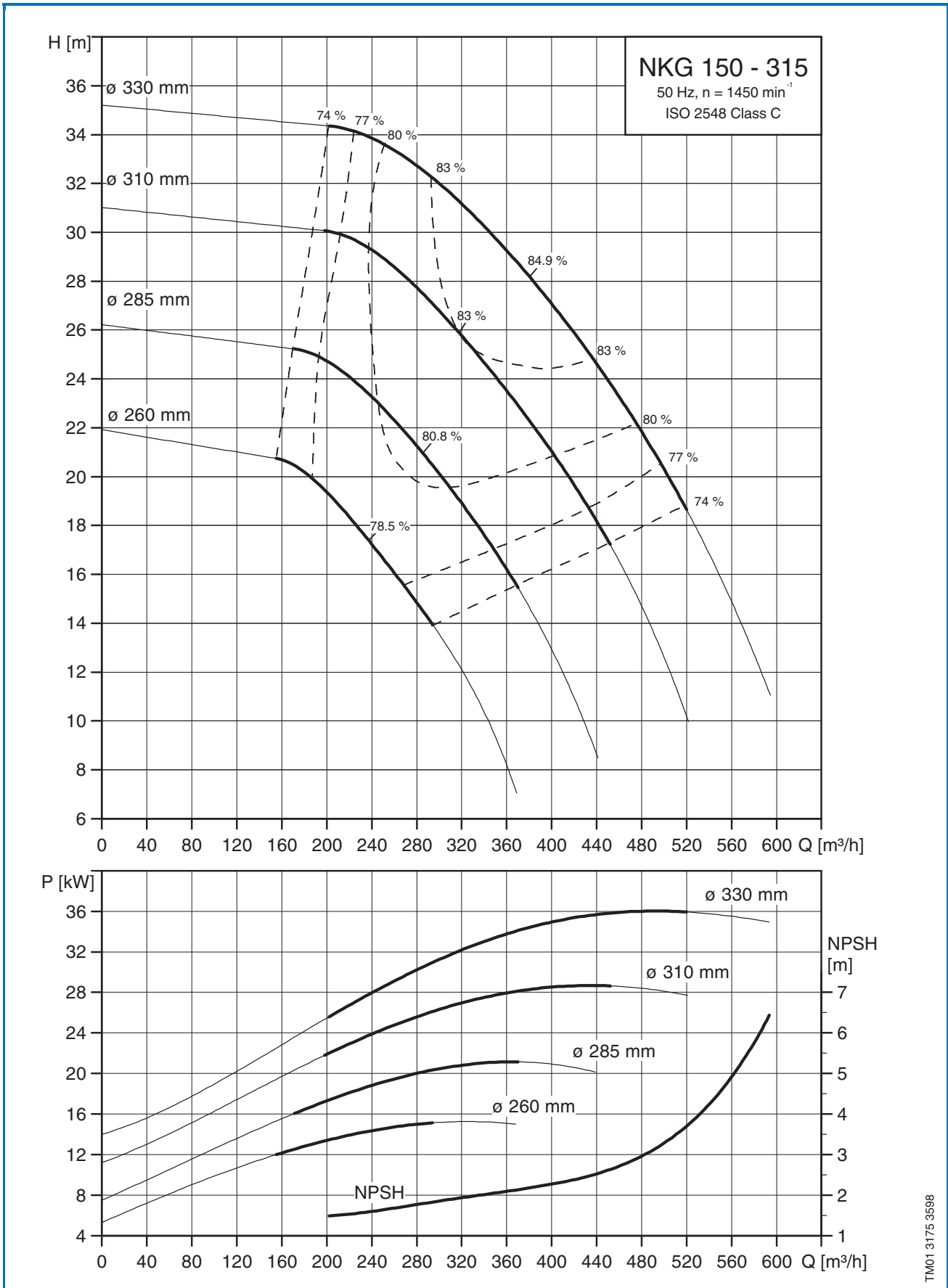
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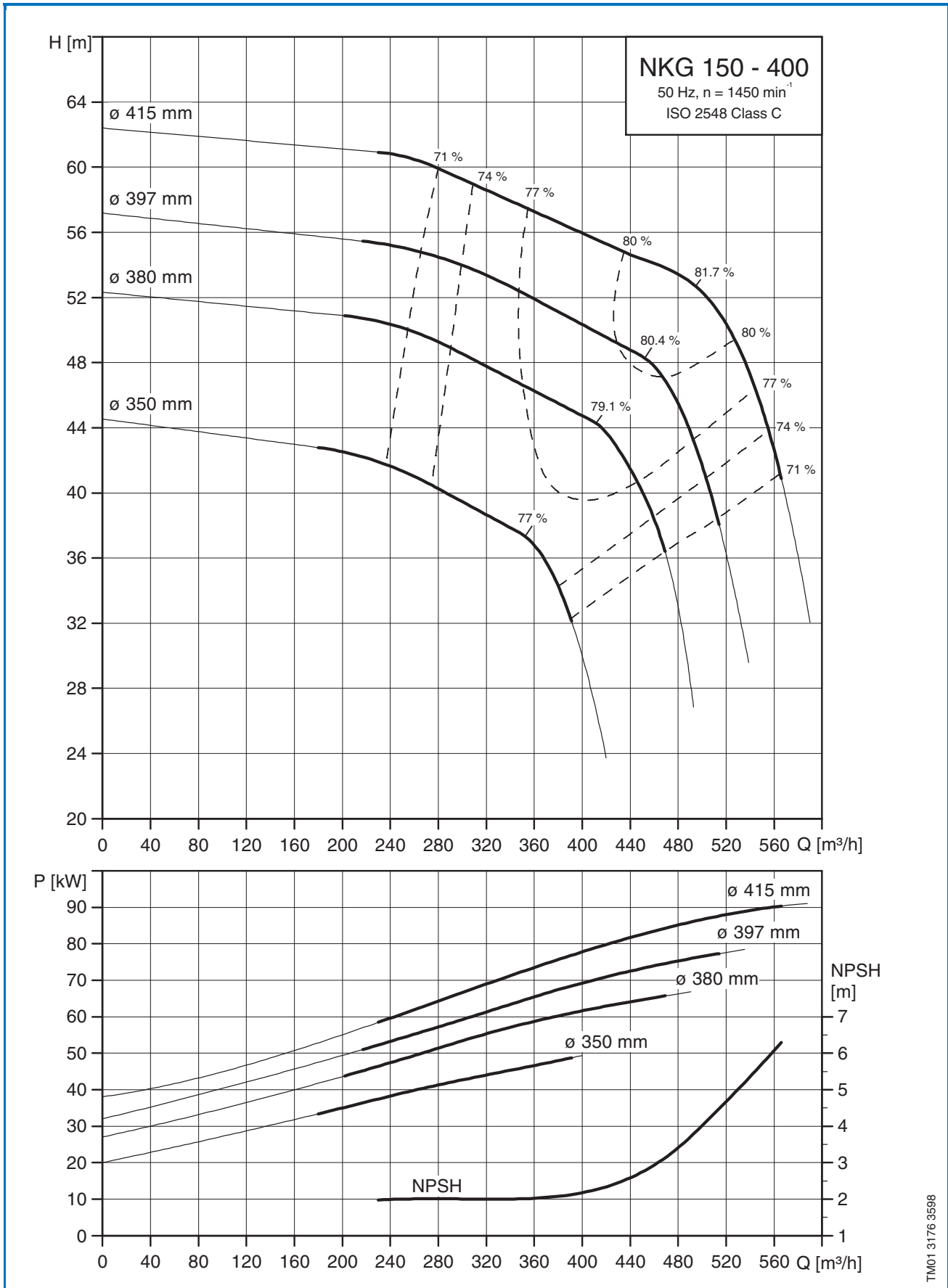
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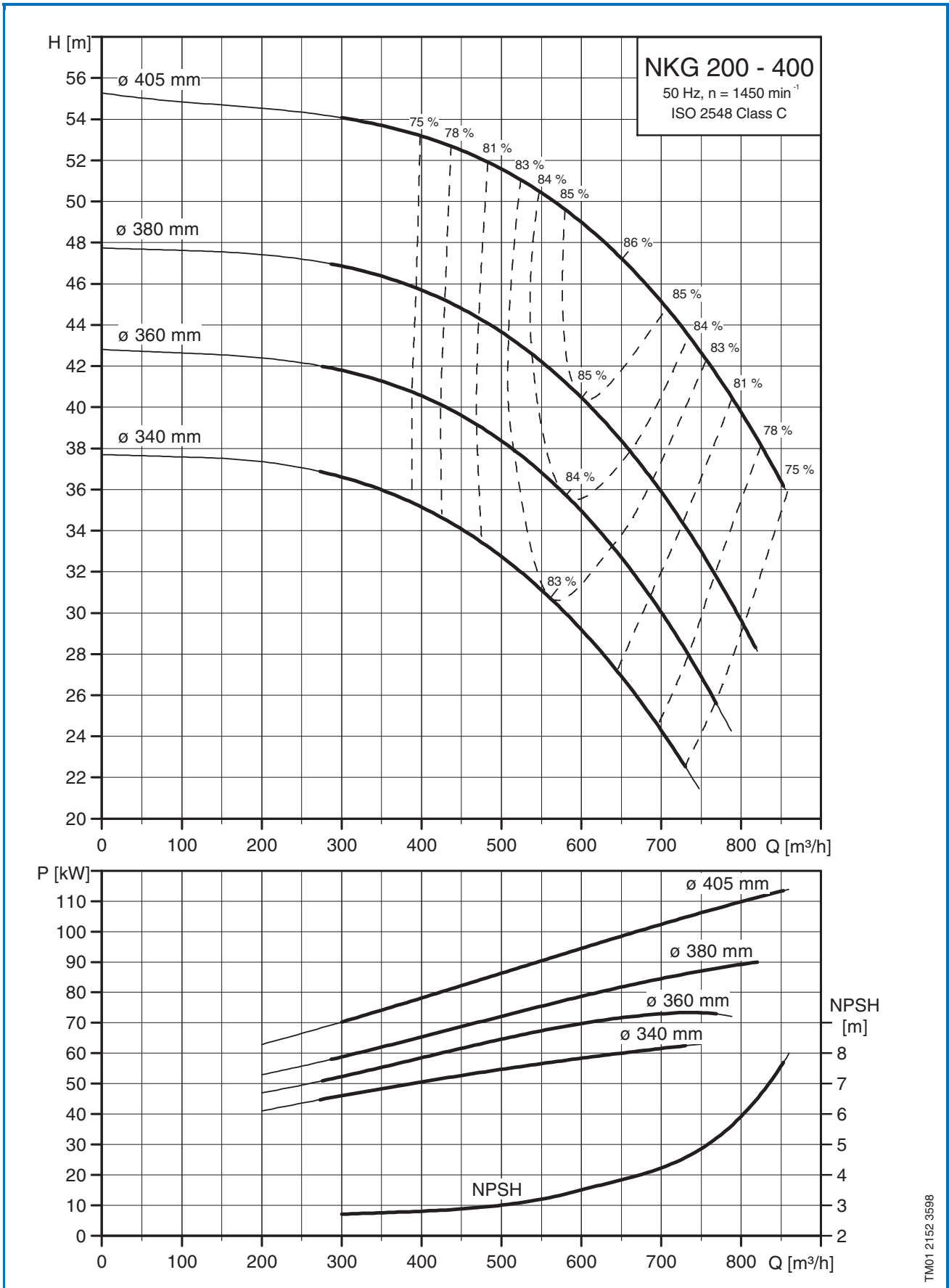
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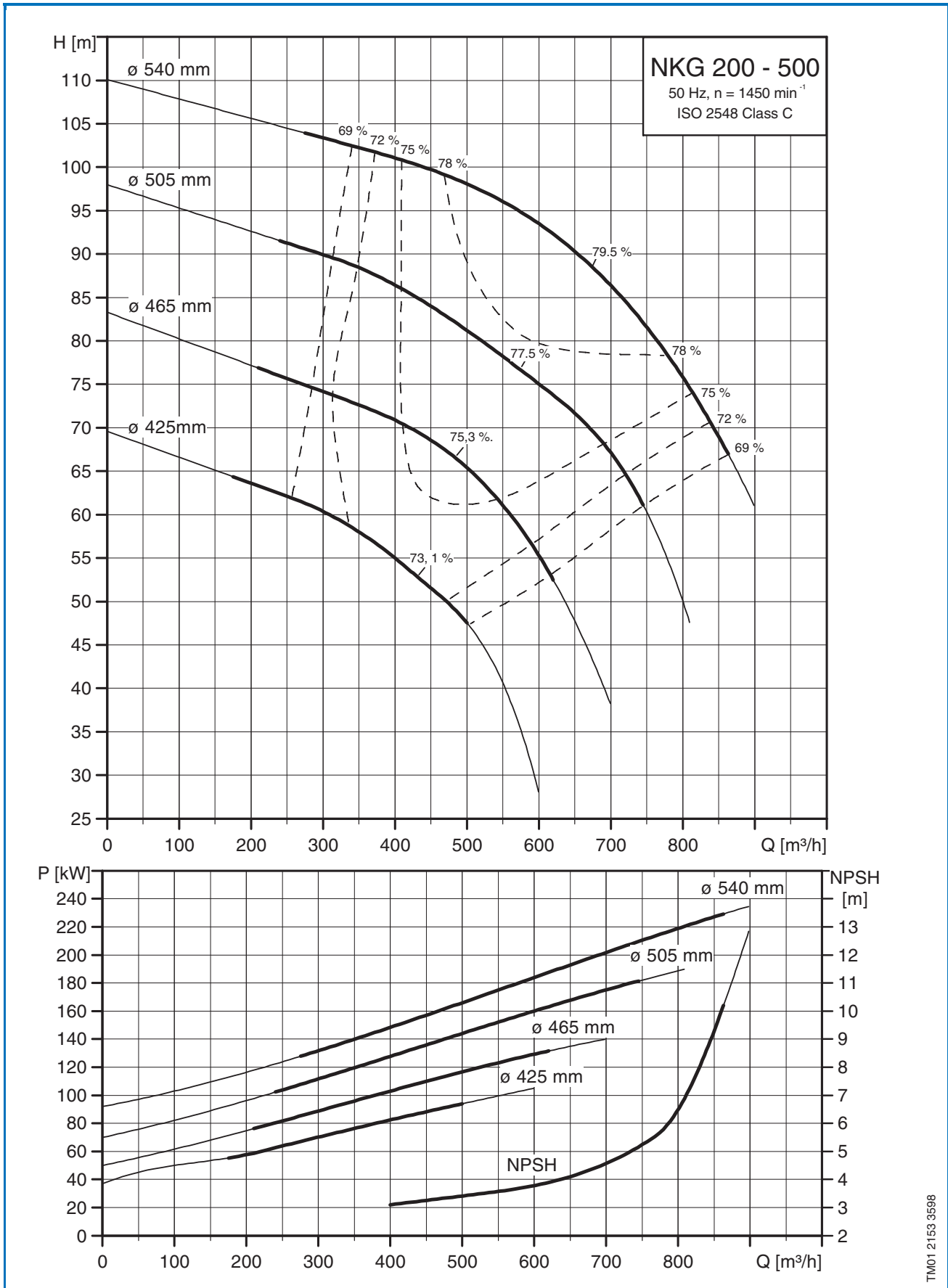
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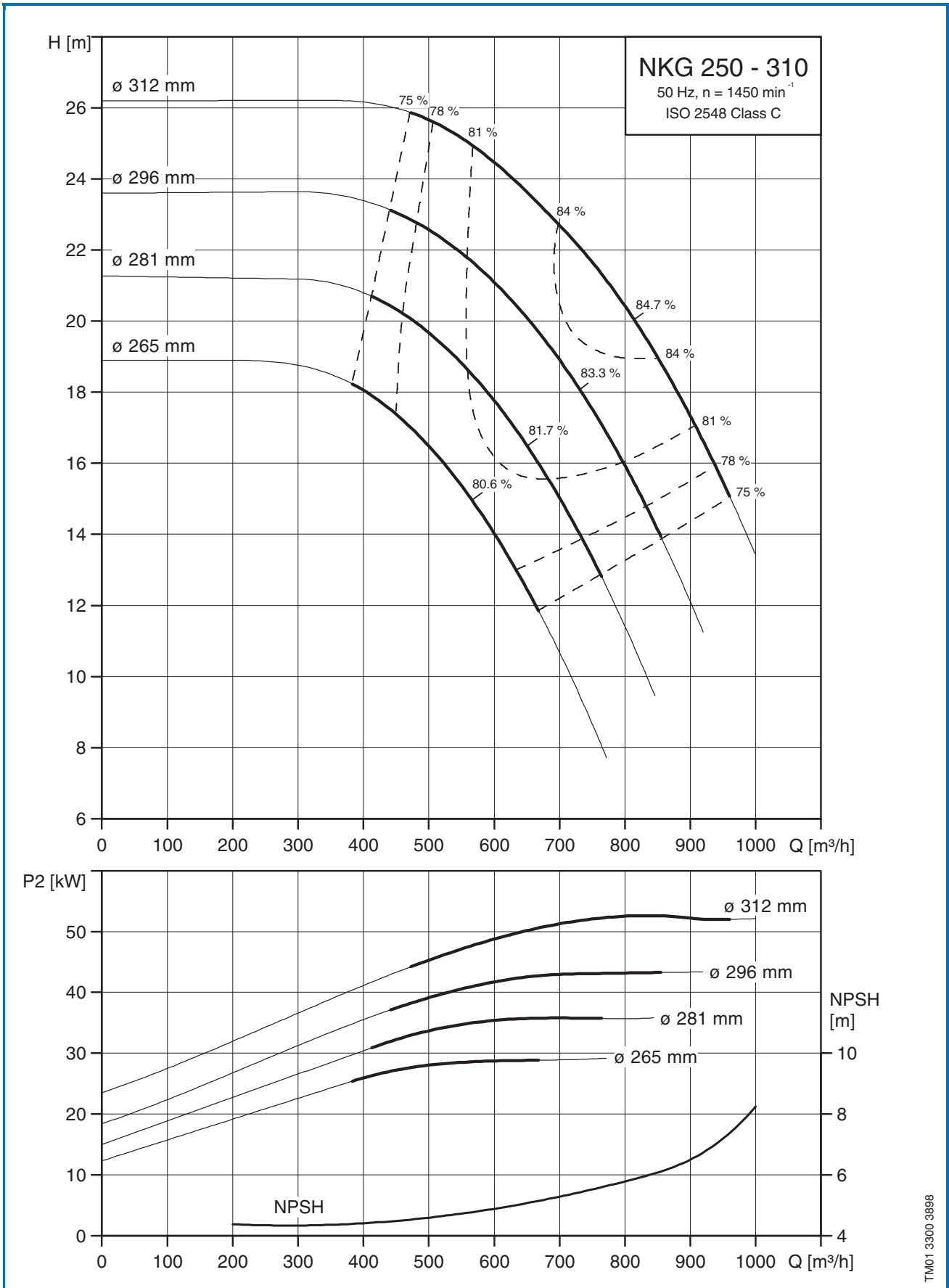
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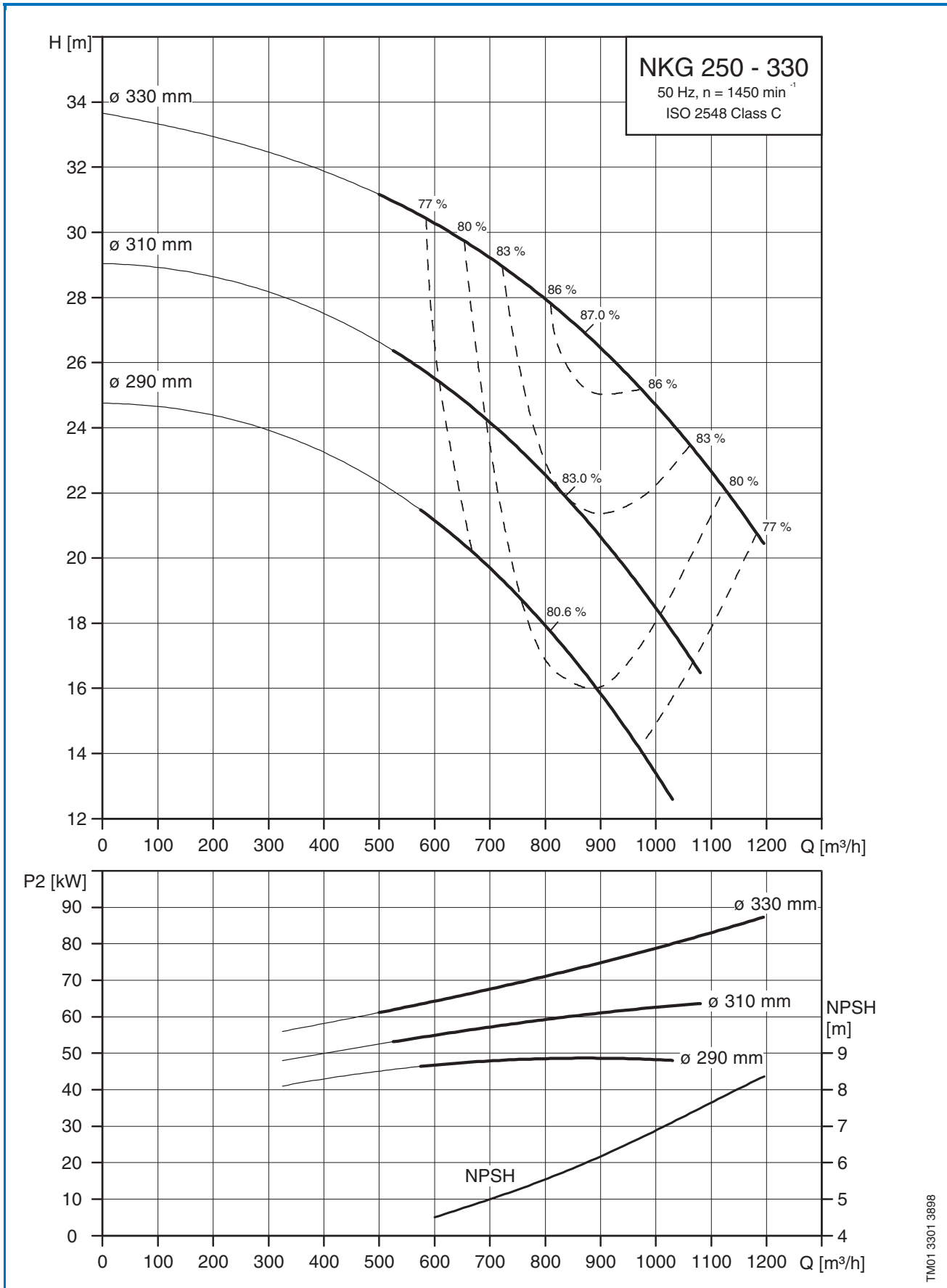
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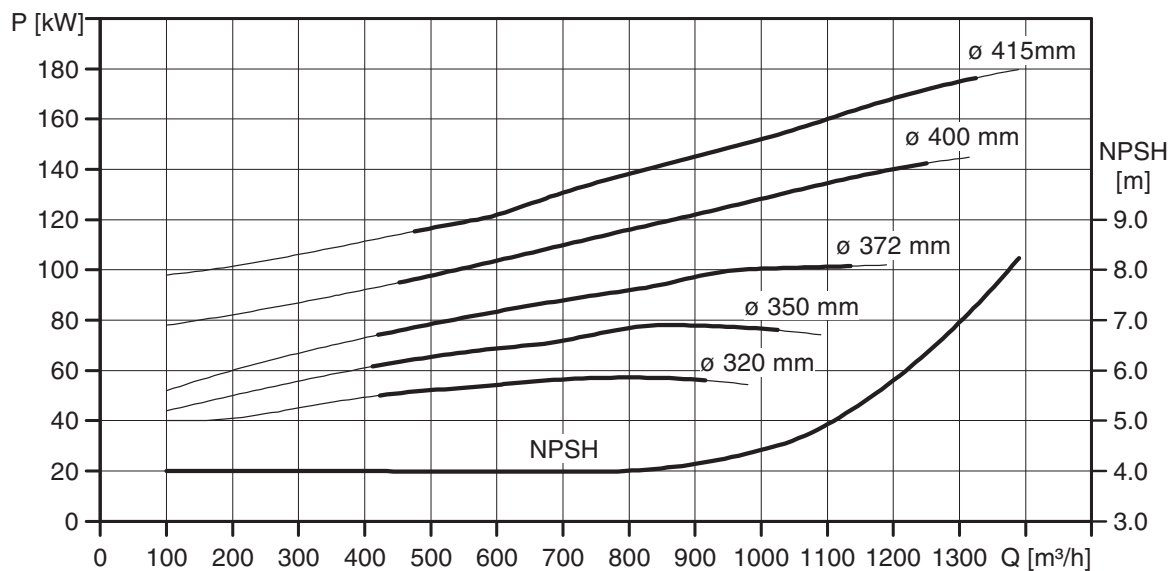
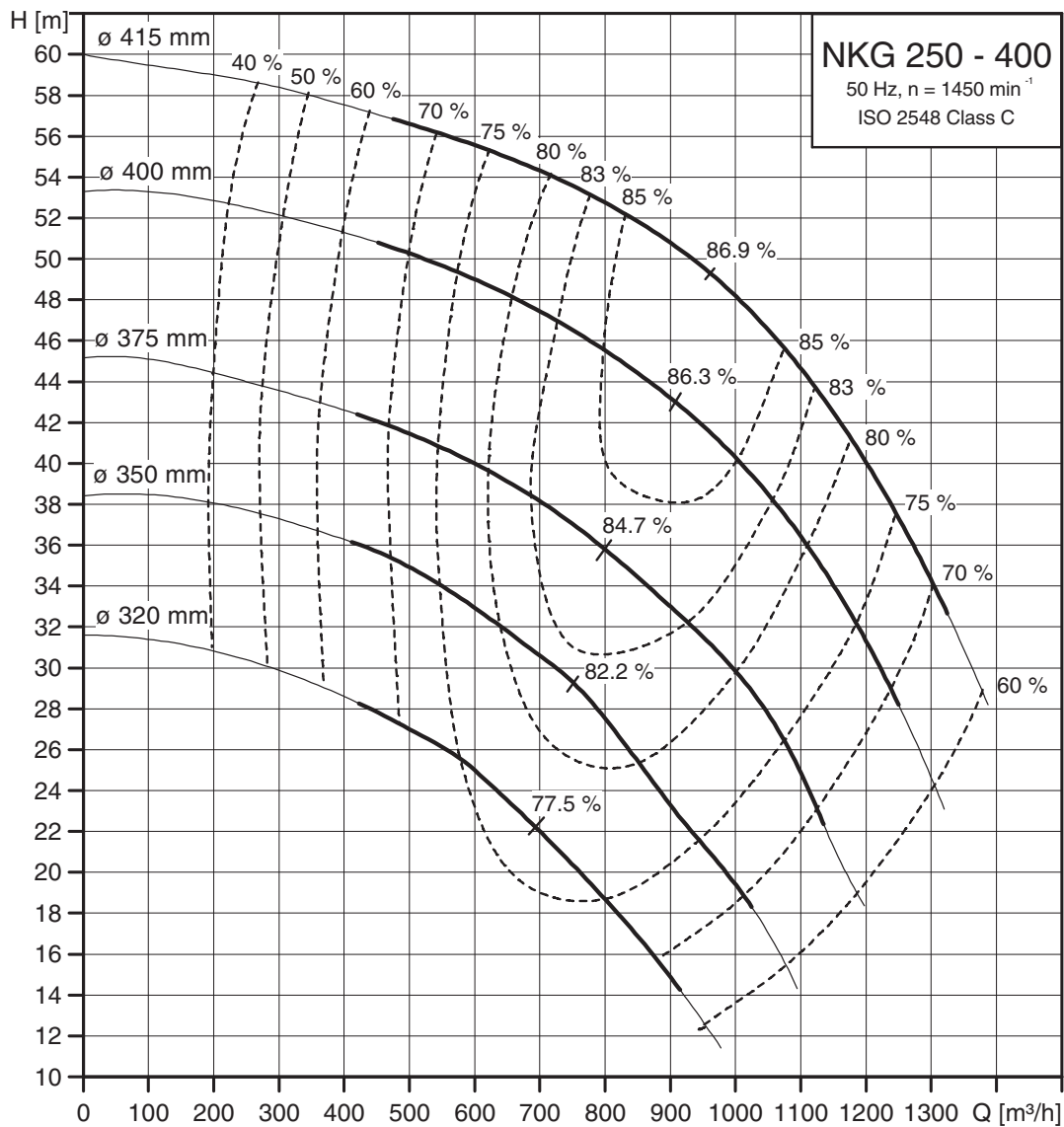
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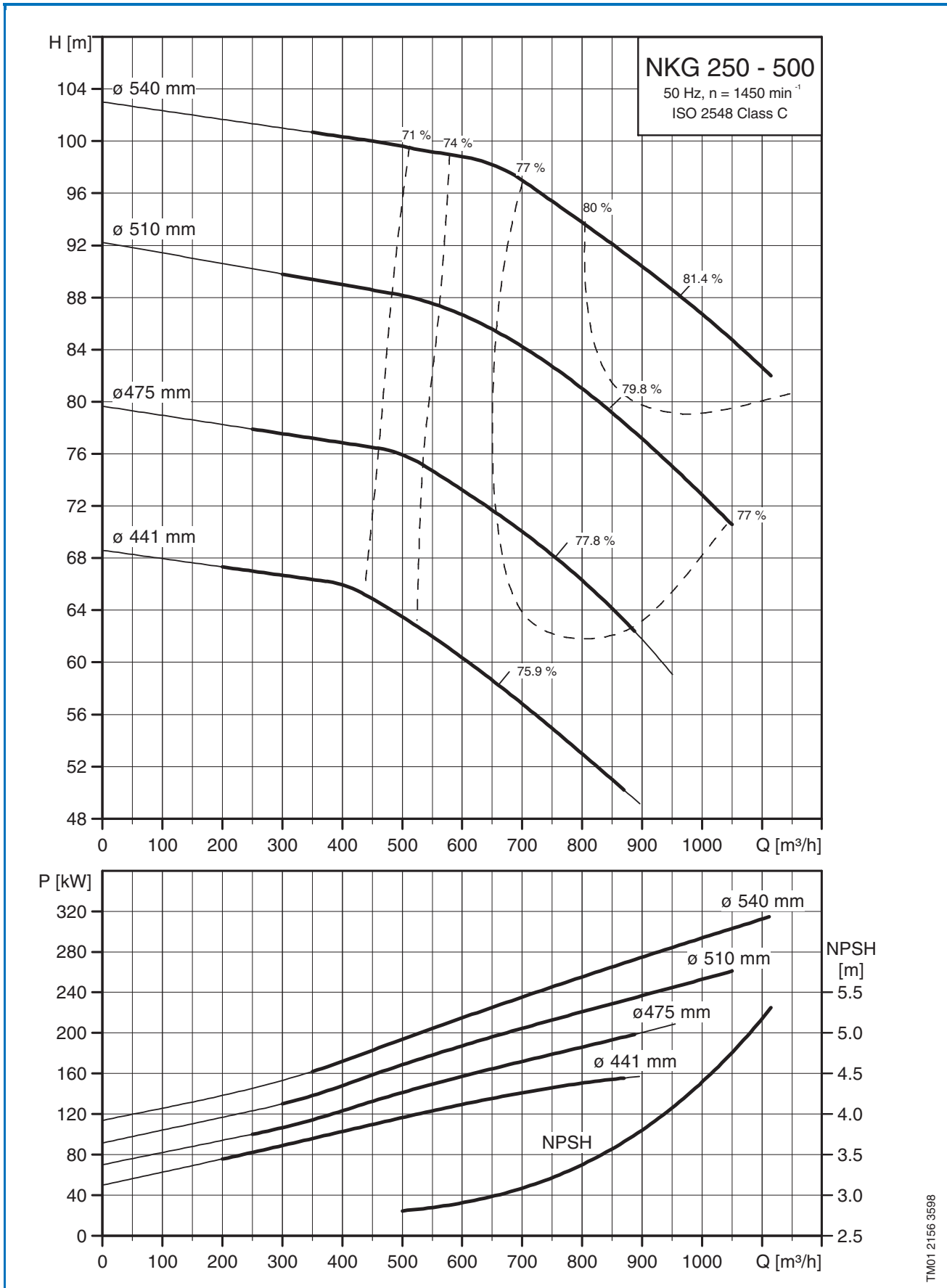
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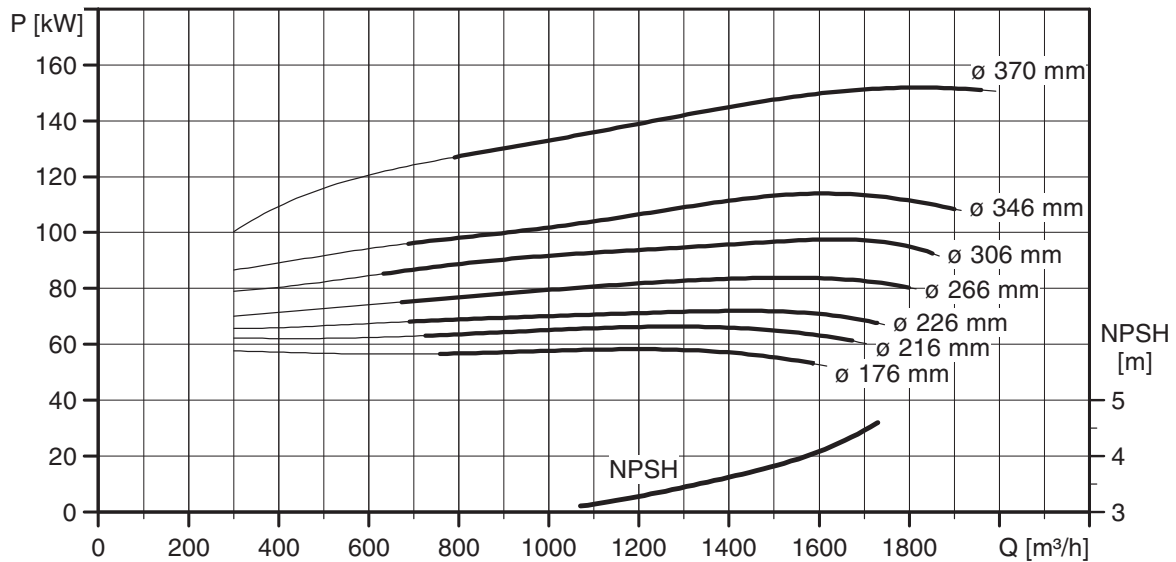
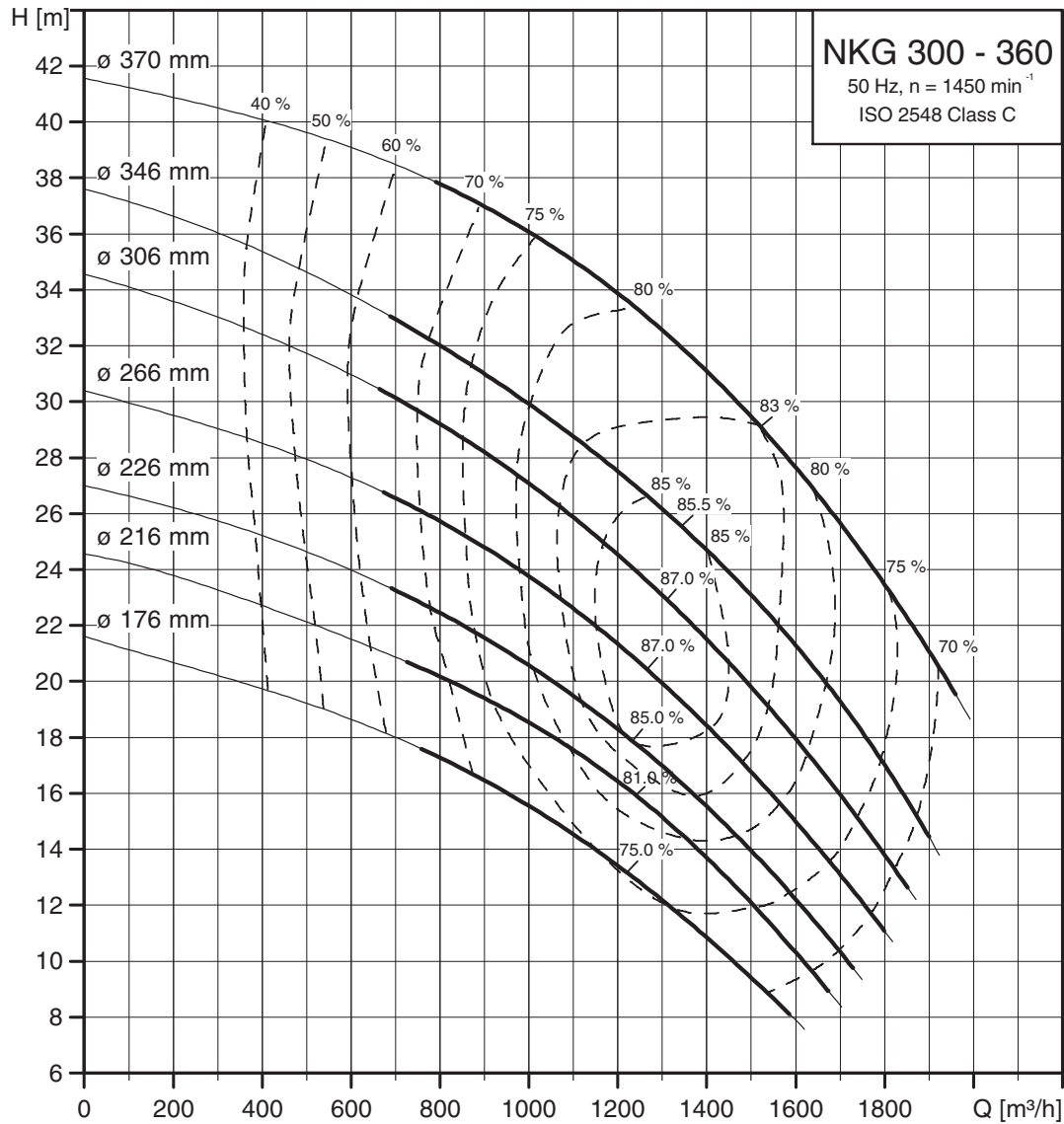
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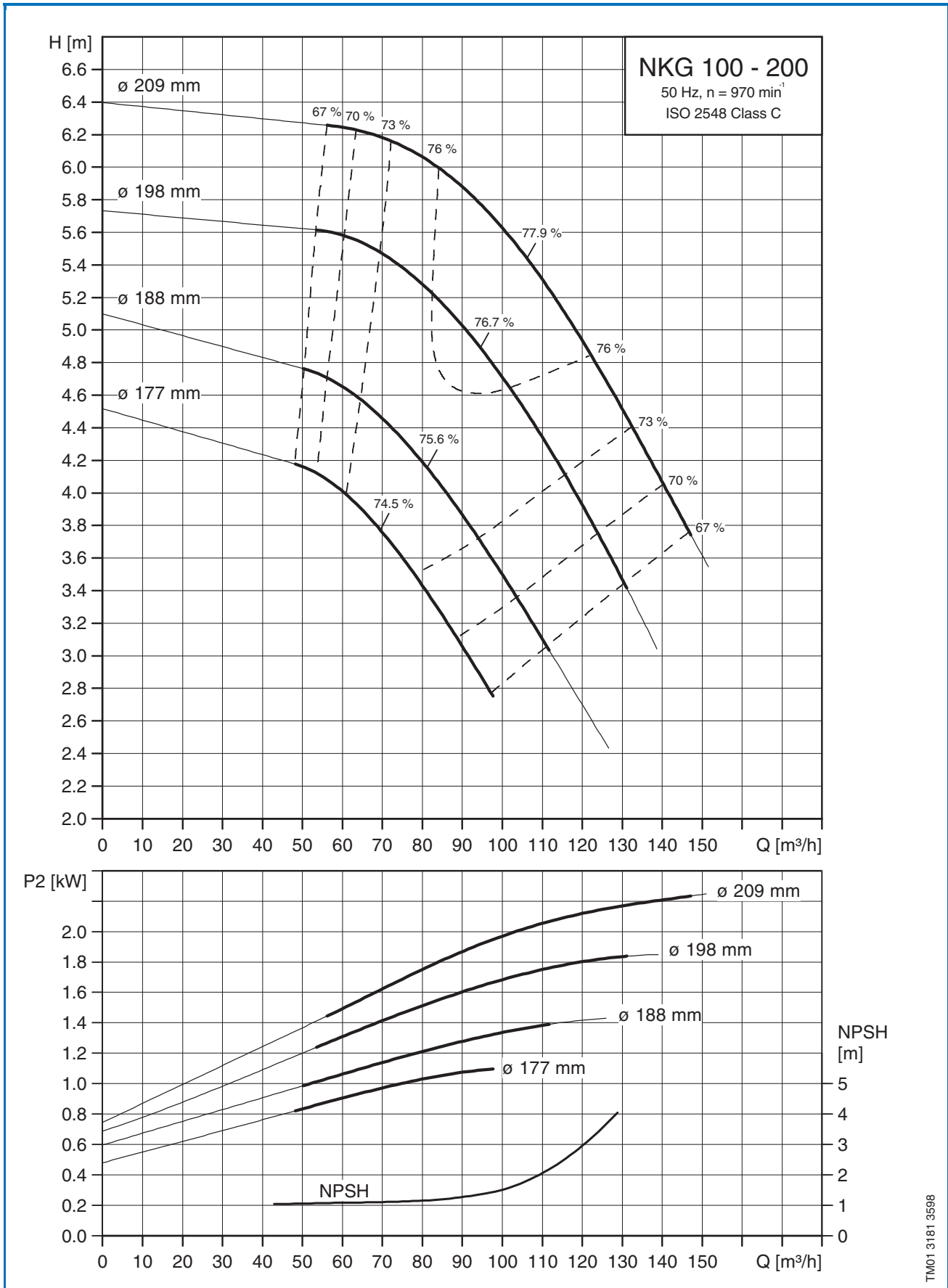
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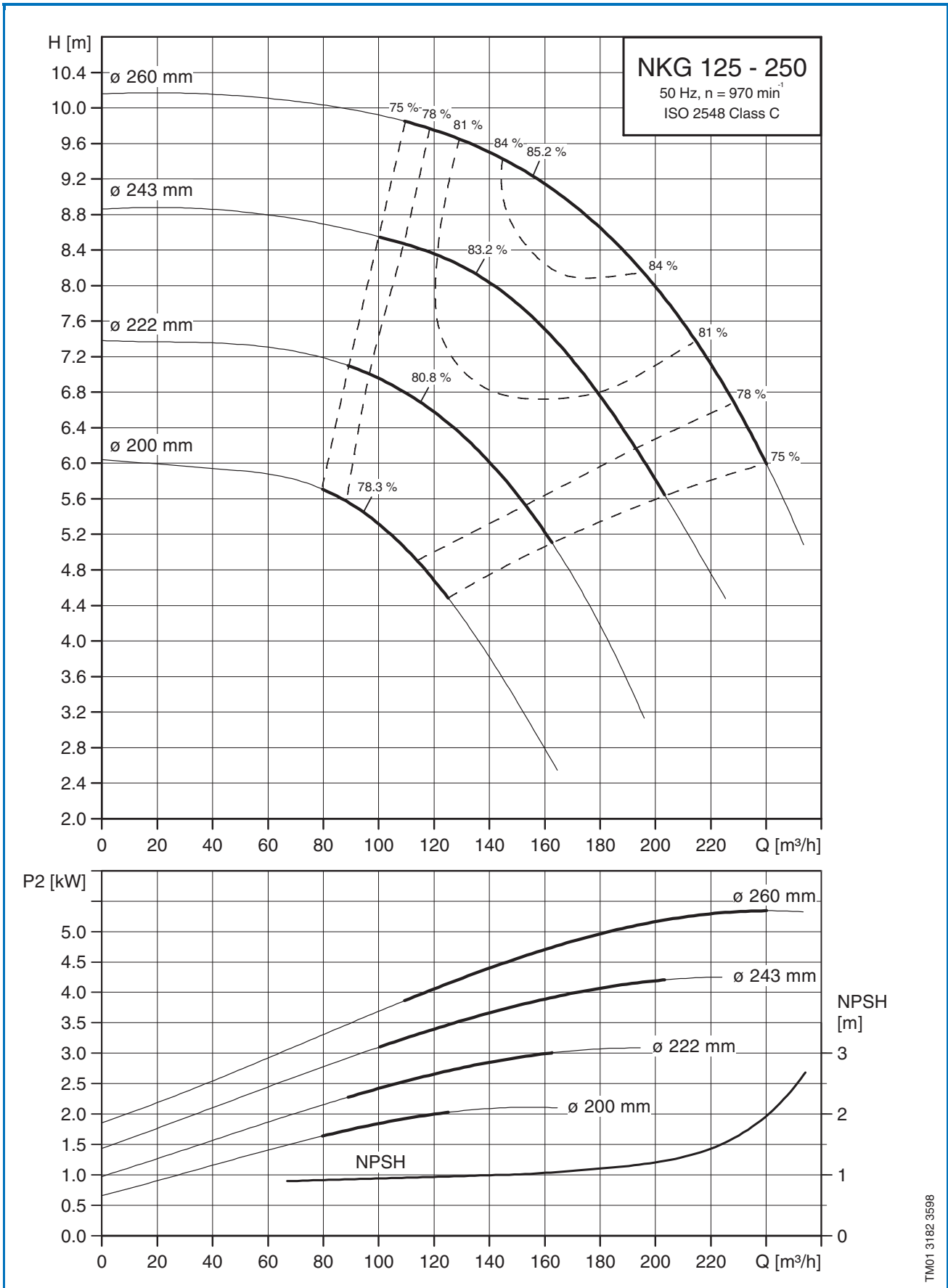
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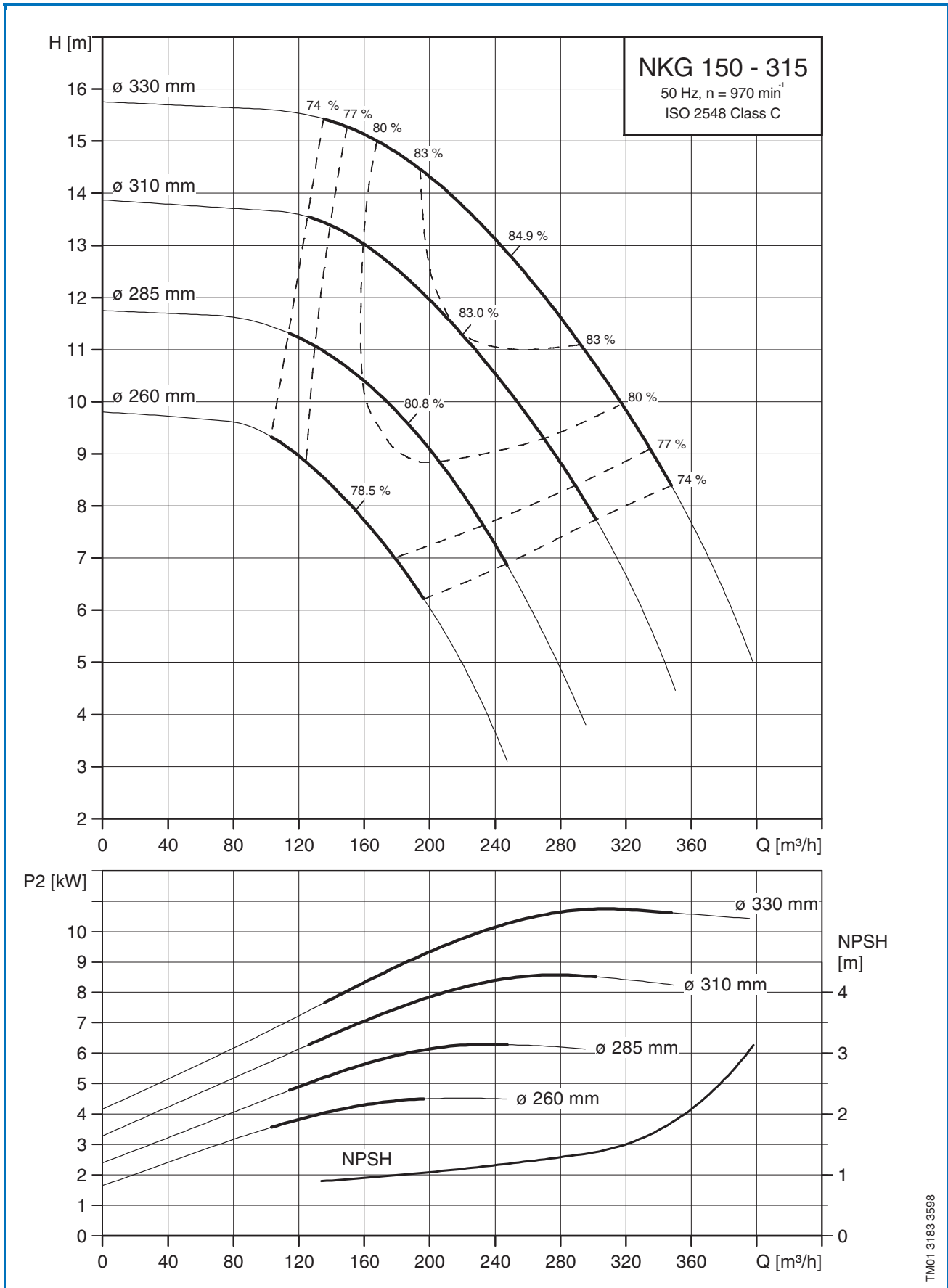
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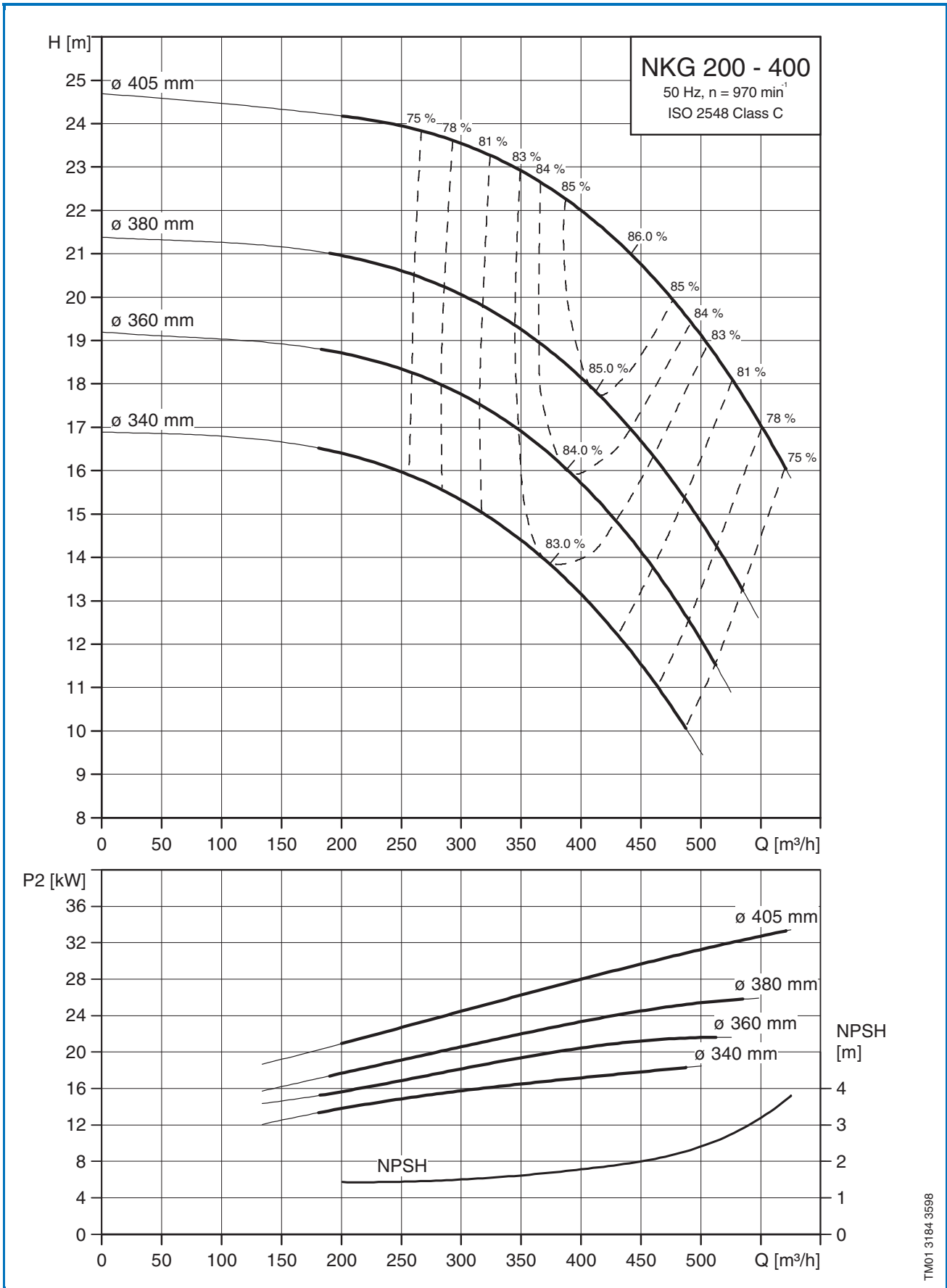
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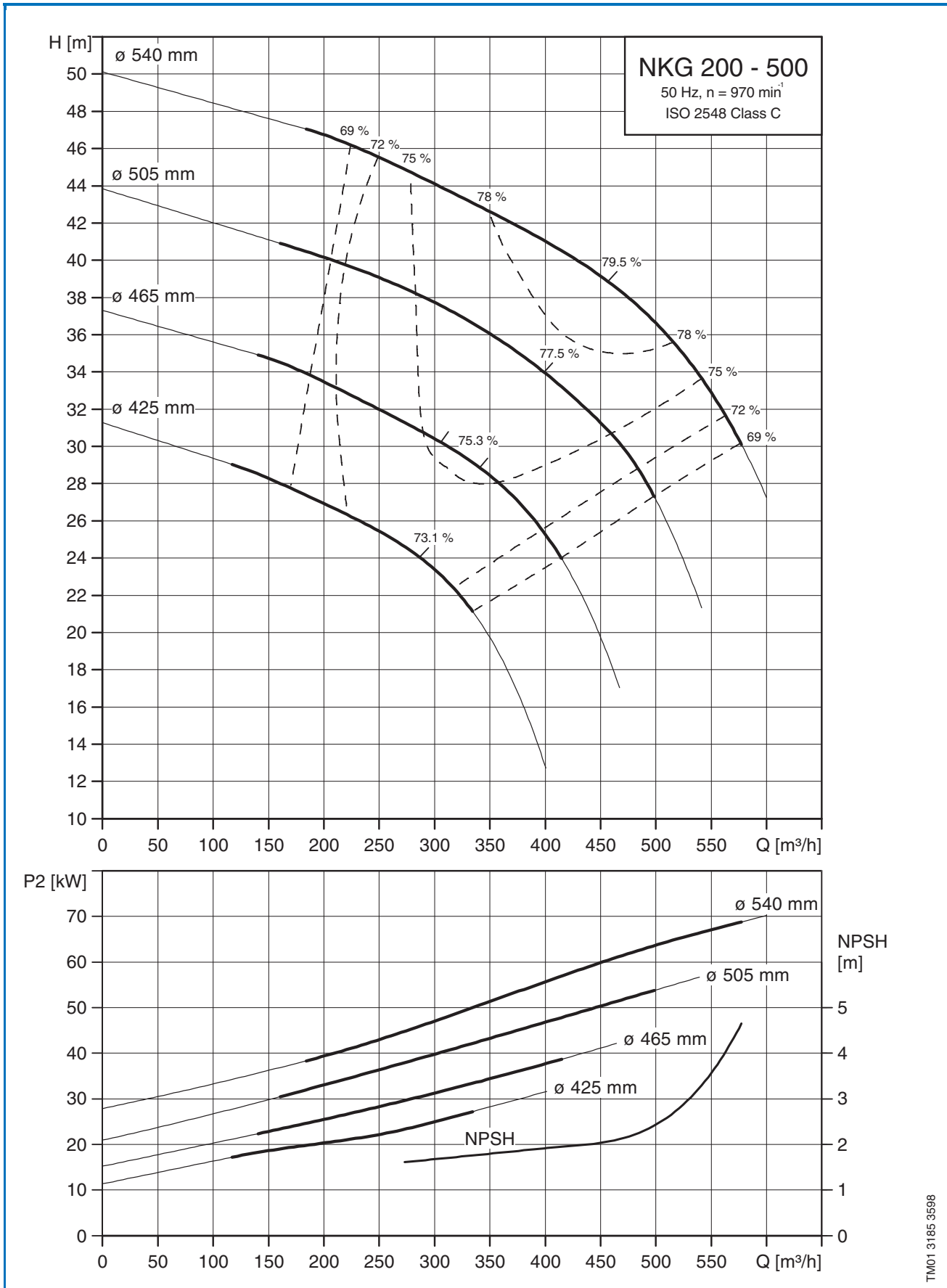
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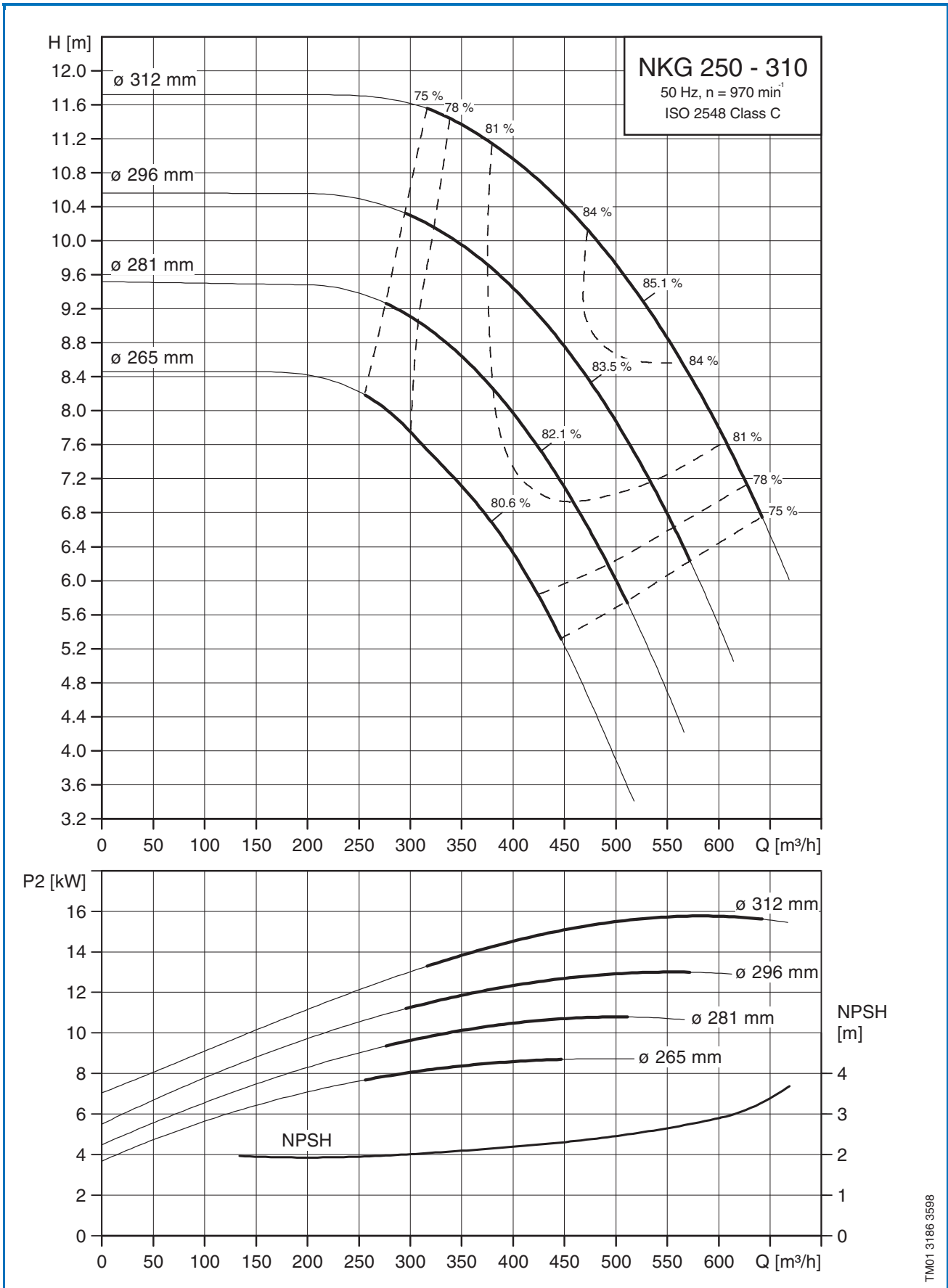
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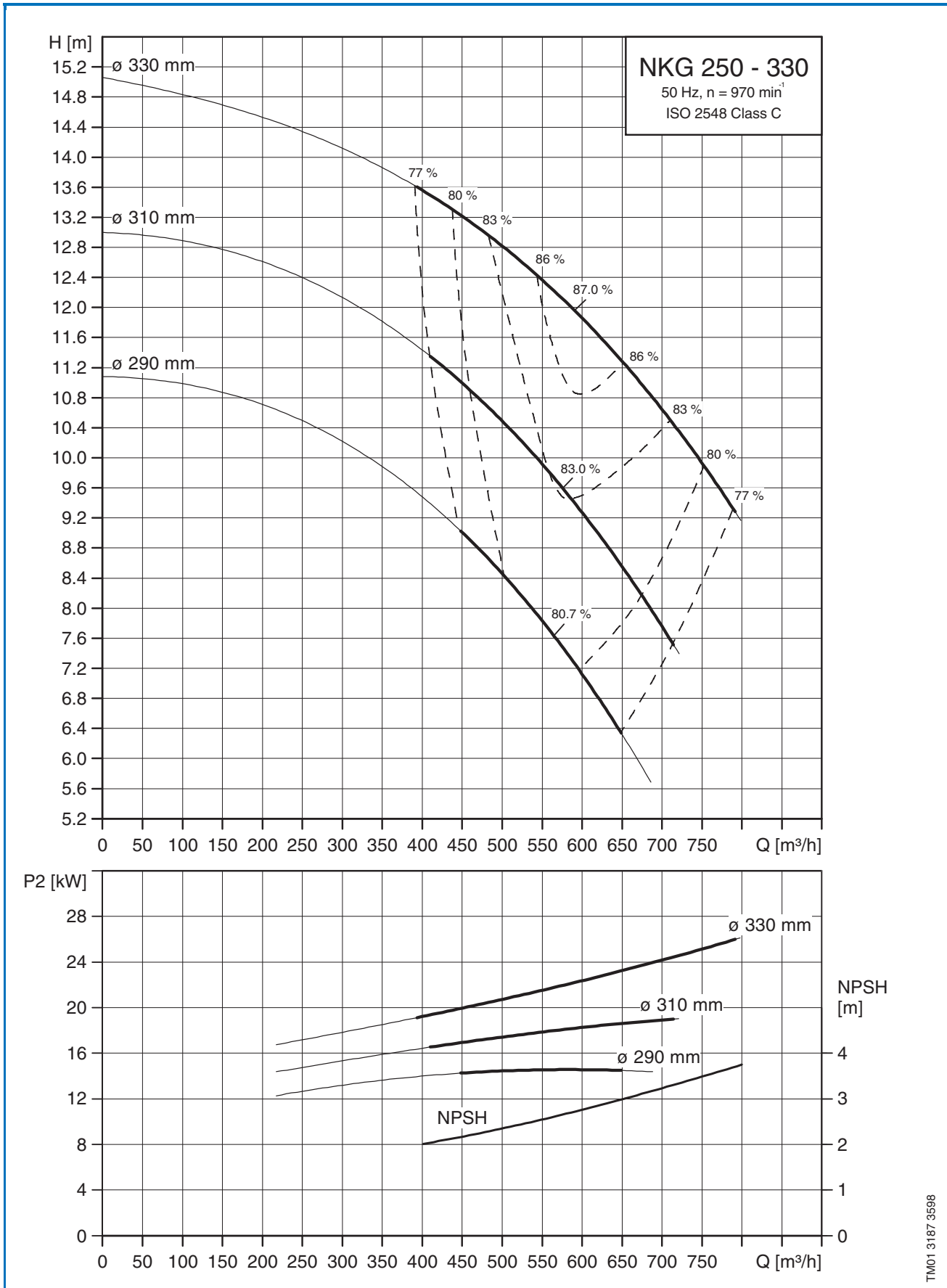
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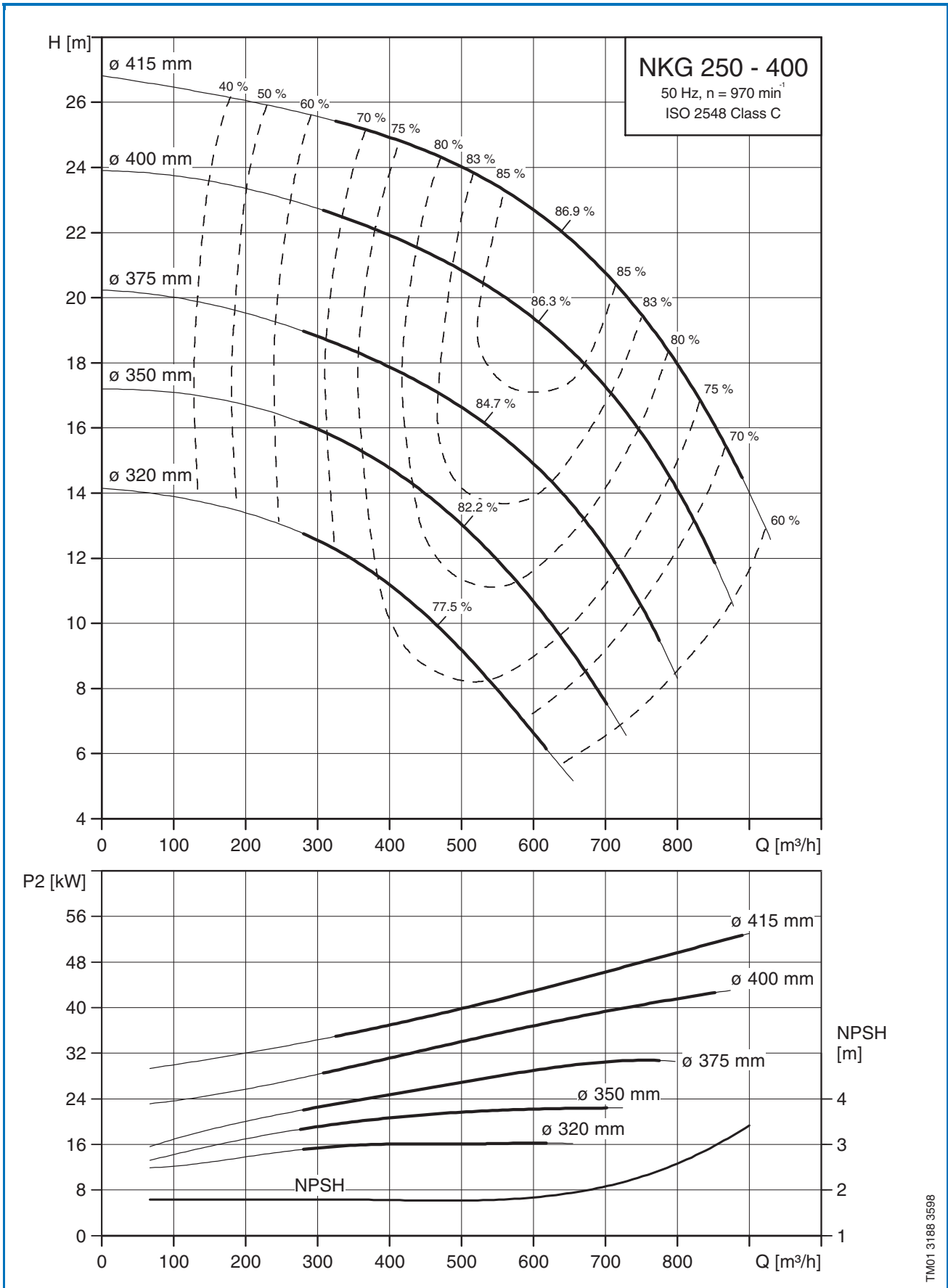
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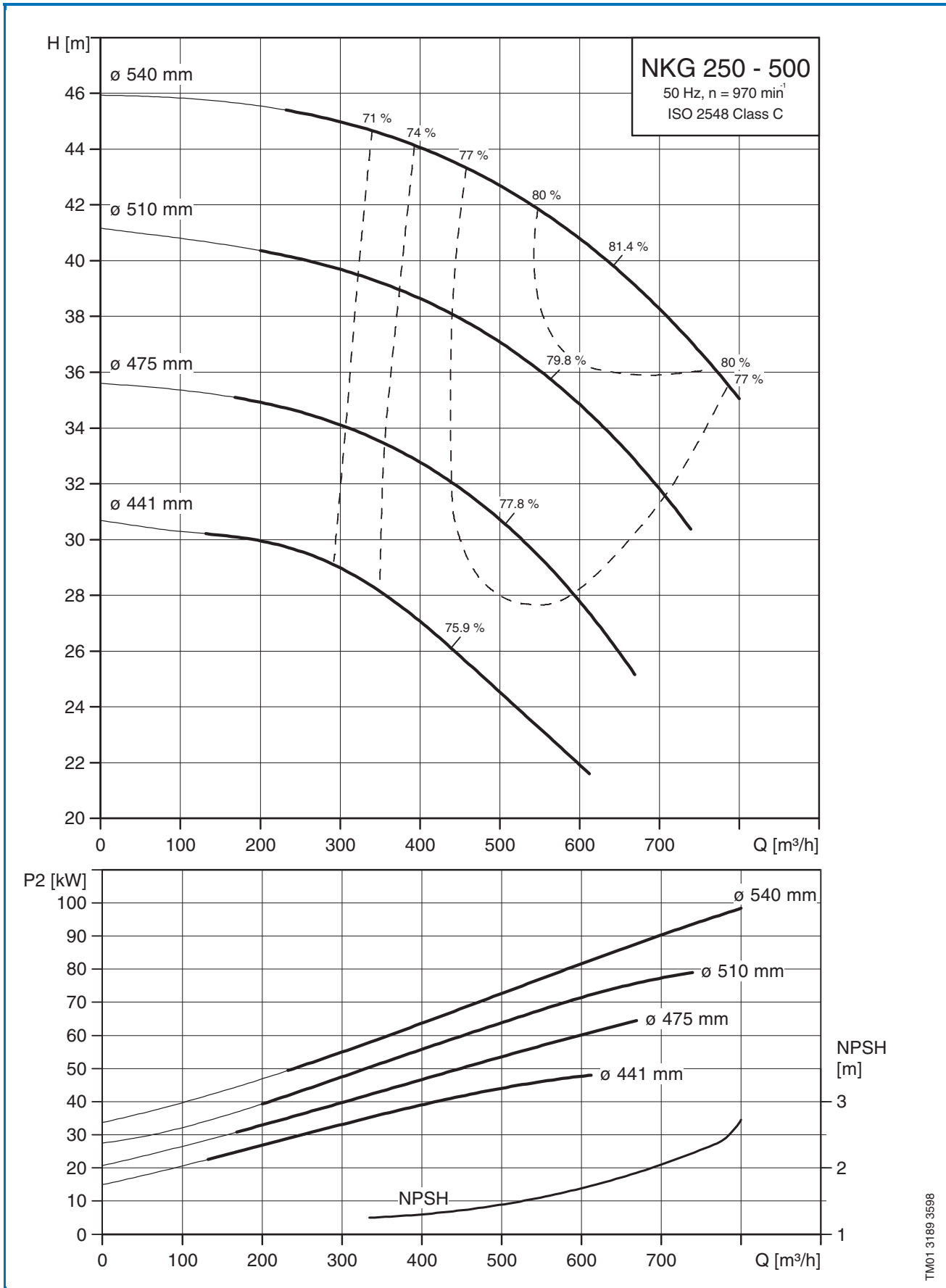
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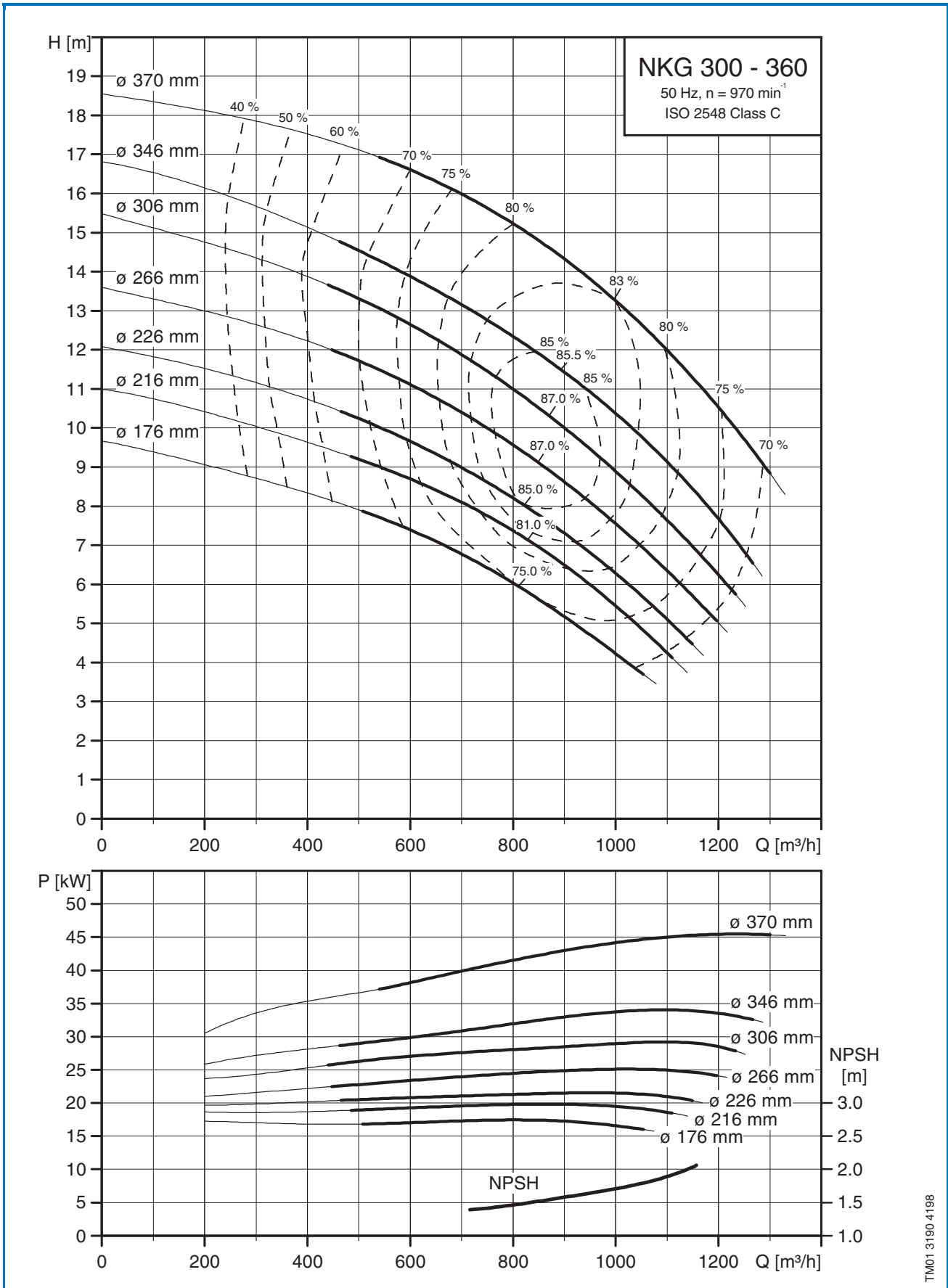
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Subject to alterations.