VDK-40

INTERNAL ECCENTRIC GEAR PUMP

PUMP PROPERTIES

Q — Flow	5.0 m³/h at 1450 rpm (≤ 165 cSt)	T — Temperature	0 ~ 230 °C
q — Displacement	0.058 l/rev	Visc. — Viscosity	10 ~ 55,000 cSt
Δp — Differential pressure	1 ~ 16 bar	DN — Suction / Discharge	DN40 / DN40
n — Speed	175 ~ 1450 rpm	Connection	Flange EN 1092-2 PN25 (standard) · ANSI 150/300 optional
Port arrangement	90° — side inlet, top outlet	Weight, bare pump	≈ 21 kg

OPERATING PRINCIPLE AND CONSTRUCTION

VDK-40 is a positive displacement transfer pump working on the internal eccentric gear principle. The volume formed between the driven outer rotor and the freely rotating inner gear expands on the suction side to draw the fluid in and contracts on the discharge side to push it out. Flow is proportional to speed and independent of pressure. Efficiency rises with viscosity because internal slip decreases. In the bracket mounted construction the shaft bearing is separated from the casing, so drive loads and shaft overhang are not carried by the pump casing.

- Bi-directional — reversing the motor swaps suction and discharge
- Self-priming — suction lift up to 3 m at sea level
- Low speed operation — pulsation-free, quiet transfer with low wear
- Thermal oil heating jacket on casing and cover — option (code T)
- Bearings lubricated by the pumped fluid — no separate lubrication circuit
- Internals accessible by removing the cover; serviced without disturbing pipework or motor
- Suction and discharge ports at 90° to each other — side inlet, top outlet
- Rolling-element bearings in the bracket — drive loads are not carried by the pump body
- Flow regulated by the front-accessed adjusting drum

APPLICATIONS

- Bitumen, PMB, bitumen emulsion and oxidised bitumen transfer
- Fuel oil service tanks — diesel, HFO, LFO
- Thermal oil heating circuits
- Resins, polymers and adhesives
- Paint, solvent and varnish industry
- Food and feed industry — edible oils, fats, molasses, glucose syrup, chocolate (stainless version)
- Chemical industry — acids, alkalis, glycols (stainless version)
- Tanker loading and unloading lines



Representative photo — a VDK series pump. This is not an exact image of VDK-40.

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MODEL CODE

VDK40	DN40	T	BP	GP	DD	1K5	1450
family + size	port size	heating	by-pass	sealing	drive	motor kW	pump rpm

Fields are separated by a hyphen and always appear in this order. A field is written only where VDK-40 offers a choice; an omitted field means the standard of that field. A bare shaft pump carries no drive, motor or speed field.

FIELD	VALUES FOR VDK-40	MEANING
FAMILY + SIZE	VDK40	VDK-40 — fixed
PORT SIZE	DN40	Suction and discharge DN40 (1½") — fixed
HEATING	T · omitted	T — thermal oil jacket omitted — unheated casing (standard)
BY-PASS	BP · omitted	BP — integrated by-pass valve on the cover omitted — no integrated by-pass (standard) On this model the integrated by-pass and the heating jacket cannot be combined: BP or T, not both.
SEALING	GP · MS	GP — gland packing (standard) MS — mechanical seal
DRIVE	DD · BD	DD — direct coupled motor (standard) BD — belt drive Written on motor coupled units only.
MOTOR kW	IEC notation	Installed motor rating: 0K55 = 0.55 kW · 0K75 · 1K1 · 1K5 · 2K2 · 3 · 4 · 5K5. The decimal separator is written as K.
PUMP rpm	speed	Pump shaft speed, not motor speed. With belt drive (BD) the speed after the pulley ratio.

EXAMPLE	READS AS
`VDK40-DN40-GP-DD-1K5-1450`	Motor coupled unit, unheated casing, gland packing, direct coupled, 1.5 kW motor, 1450 rpm pump speed — standard unit
`VDK40-DN40-T-GP-DD-1K5-1450`	As above with thermal oil heating jacket (code T)
`VDK40-DN40-BP-MS-DD-1K5-1450`	Unheated unit with integrated by-pass valve and mechanical seal — by-pass excludes the heating jacket
`VDK40-DN40-GP`	Bare shaft pump, unheated, gland packing — no drive, motor or speed field
`VDK40-DN40-T-GP`	Bare shaft pump with thermal oil jacket

DIMENSIONS

Dimensional drawing

Dimensions in mm. Baseplate and motor dimensions depend on the selected drive and are issued with the order acknowledgement.

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CAPACITY AND POWER TABLE

CAPACITY m³/h	SPEED rpm	3 bar	6 bar	9 bar	12 bar	16 bar	VISCOSITY
2.8	800	1.1 kW	1.5 kW	2.2 kW	2.2 kW	3 kW	165 cSt
5.0	1450 ★	2.2 kW	3 kW	3 kW	4 kW	5.5 kW	165 cSt
1.7	480	1.1 kW	1.1 kW	1.5 kW	1.5 kW	2.2 kW	1,650 cSt
3.0	870	2.2 kW	2.2 kW	2.2 kW	3 kW	3 kW	1,650 cSt
1.0	280	0.75 kW	0.75 kW	1.1 kW	1.1 kW	1.1 kW	5,500 cSt
1.8	510	1.1 kW	1.5 kW	1.5 kW	2.2 kW	2.2 kW	5,500 cSt
0.6	175	0.55 kW	0.55 kW	0.75 kW	0.75 kW	0.75 kW	16,500 cSt
1.1	320	1.1 kW	1.1 kW	1.1 kW	1.5 kW	1.5 kW	16,500 cSt
0.6	175	0.75 kW	0.75 kW	0.75 kW	0.75 kW	1.1 kW	55,000 cSt

Power figures are the recommended IEC motor rating for the duty point: shaft power is the sum of hydraulic power, viscous drag and bearing/seal friction, rounded up to the next standard motor step. ★ rows are the standard drive speeds; standard motors: 1.5 kW at 1450 rpm (standard unit) · 2.2 kW at 1450 rpm. In each viscosity band the upper row is the maximum permitted speed for that band and the lower row a reduced speed; maximum speed falls as viscosity rises because filling of the pump becomes the limit. Above 50,000 cSt no suction lift is possible: flooded suction, one size larger suction line, kept as short as possible. Cold start or viscosity above 10,000 cSt: one motor step above the table value. Duty points outside the table are quoted on request.

OPERATING CONDITIONS

Suction lift	Maximum 3 m at sea level, decreasing 10 cm per 100 m of altitude. No suction lift at high viscosity or above 50,000 cSt — flooded suction is mandatory.
NPSHr	Stated for the given speed, viscosity and temperature on request.
Direction of rotation	Bi-directional — reversing the motor swaps suction and discharge.
Dry running	Not permitted. Bearings are lubricated by the fluid; a dry start damages bearings and gears.
Drive	Standard IEC motor, direct coupled (DD) or belt drive (BD) · variable frequency drive · hydraulic motor · PTO drive.
Solid particles	≤ 0.1 mm · ≤ 1 % by volume · non-abrasive.
Casing pressure	16 bar + suction pressure · hydrostatic test 1.5 × casing pressure (EN 12162).

MATERIAL OPTIONS

Casing, covers	Cast iron GG25 (standard) · ductile iron · cast steel · stainless AISI 316/316L
Gears	Ductile iron GGG49 (standard) · cast steel · stainless AISI 316/316L
Shaft	42CrMo4 / AISI 4140 tempered steel (standard) · stainless AISI 316/316L
Bearings	Casing: SNBZ 12 bronze (standard) · carbon graphite · silicon carbide · tungsten carbide. Bracket: rolling-element bearings.
Gaskets	Klingerite / graphite (standard) · PTFE · Viton
Elastomers	FKM (Viton) −20 / +200 °C (standard) · PTFE −15 / +170 °C · EPDM −40 / +120 °C · FFKM (Kalrez) −20 / +300 °C · NBR −30 / +90 °C. The elastomer limits the fluid temperature.

SEALING — CODE FIELD GP / MS

GP — Gland packing	Standard. Graphited braided packing with adjustable gland. Controlled dripping is normal and required for lubrication of the packing.
MS — Mechanical seal	Single, fluid cooled, for applications where no leakage is acceptable. Cartridge type (pre-set, no field adjustment) preferred for high temperature and bitumen service.
Double seal	Double seal arrangement with barrier fluid for zero-emission service — on request, coded MS.

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HEATING — CODE FIELD T

T — Thermal oil jacket	Option on this model. Jacketed casing and cover including the seal area · max. 250 °C / 10 bar · 1/2" connections.
Steam heating	The thermal oil jacket is also suitable for steam. With cast iron and ductile iron casings the corrosion risk from steam and condensate is assessed case by case; steam service is stated with the order and confirmed by Vimpo engineering. Coded T.
Unheated	Standard on this model. Casing without jacket for fluids that need no heating — heating field omitted in the code.

BY-PASS / PRESSURE RELIEF — CODE FIELD BP

A positive displacement pump will pump against a closed valve. If the discharge line can be closed, a pressure relief device is mandatory.

- BP — by-pass (relief) valve integrated on the cover. Returns flow internally from discharge to suction; no external pipework. Set pressure 1–2 bar above working pressure.
- The integrated valve is for short term protection. Continuous by-pass requires a separate line valve.
- In reverse running the by-pass must also be reversed; it always faces the suction port.
- At high viscosity a line mounted relief valve is preferred over the integrated one.
- Without BP in the code a relief valve in the discharge line is required by the installer.
- On this model the integrated by-pass cannot be combined with the heating jacket (BP or T). Heated installations use a line mounted relief valve.

SCOPE OF SUPPLY AND OPTIONS

Standard unit	Pump · IEC motor · steel baseplate · flexible coupling · coupling guard
Bare shaft pump	Pump only, without motor, baseplate or coupling — for connection to an existing drive. Code without drive, kW and rpm fields.
Options	thermal oil jacket (T) · integrated by-pass valve (BP) · mechanical seal (MS) · steam jacket · unheated casing · belt drive (BD) · ATEX motor · variable frequency drive · thermal insulation · stainless casing · ANSI flanges · on/off or VFD control panel
Paint	Epoxy primer 60 µm + polyurethane top coat 60 µm, total ≥ 120 µm. Hot service above 150 °C: silicone based heat resistant system. Casing RAL 5005 (Vimpo blue); other RAL with the order.
ATEX	Available in ATEX version — II ½G Ex h IIB T4 Ga/Gb, zones 0 and 1 (2014/34/EU · EN ISO 80079-36/-37); EU-type examination certificate IEP 24 ATEX 1315X Suppl. 01, notified body 2284. In the ATEX version the maximum differential pressure is limited to 12 bar. Liquid temperature max. 130 °C. The motor is of Ex d or Ex e type to EN 60079-0/-1/-7. Any temperature or pressure sensor fitted must itself be Ex protected (zone 1, IIB, min. T4). Installation and periodic maintenance by authorised personnel to the operating instructions; replacement of a part requires re-approval. Zone, gas group and temperature class stated with the order.
Documents	CE declaration of conformity · material certificate EN 10204 3.1 · hydrostatic test report · performance test report · operating and maintenance manual · spare parts list

APPLICABLE STANDARDS

API 676	Positive displacement rotary pumps — design basis (reference)
EN 809	Pumps and pump units — safety requirements
2006/42/EC	Machinery Directive — CE declaration of conformity
EN ISO 12100	Safety of machinery — risk assessment
2014/34/EU	ATEX — equipment for explosive atmospheres (optional version)
EN 12162	Hydrostatic test — casing pressure test
EN 10204 3.1	Material inspection certificate
API 682 · ISO 21049	Mechanical seal arrangement and piping plans (MS version)
EN 1092-2	Flange dimensions and pressure rating

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APPLICATION GUIDE — RECOMMENDED CONFIGURATION BY FLUID

FLUID GROUP	CASING · GEARS	BEARINGS	SEAL	HEATING	NOTES
Bitumen, PMB, oxidised bitumen 140–200 °C	Standard — GG25 casing, GGG49 gears	Bronze (standard)	GP, or high-temperature cartridge MS	T jacket essential; insulate pump and lines	Start only when the jacket is at working temperature; trace-heated suction line; keep the pump full between cycles.
Bitumen emulsion water based, 20–60 °C	Cast iron for continuous duty; stainless 316 where the pump stands idle with water inside	Carbon graphite or SiC — water lubricates poorly	MS — packing wears quickly on water	Unheated; frost protection only	Emulsion breaks under shear: lowest practical speed, no by-pass recirculation; flush with water before a long standstill.
Fuel oils HFO, LFO, diesel, gas oil	Standard	Bronze (standard); carbon graphite for distillates below 5 cSt	MS — packing leaks on thin fuels; GP acceptable on HFO	T jacket on HFO (kept at 50–80 °C); unheated on distillates	Duplex strainer on the suction side. Thin fuels increase internal slip — flow at the duty point is confirmed by Vimpo.
Thermal oil heat transfer fluid, up to 230 °C	Standard; ductile iron casing recommended above 200 °C	Bronze (standard)	Graphite GP, or high-temperature MS	No jacket	Flooded suction; pipework must take up thermal expansion; fluid degassed before start.
Resins, polymers, adhesives, hot-melt	Standard; stainless for water-based or acidic grades	Bronze; carbon graphite for poor lubricity	MS with quench, or GP with flushing	T jacket to keep the product flowable; unheated only for solvent-based grades	Product may cure in the pump: flushing connection, never left standing full. Increased clearances above 50,000 cSt.
Paints, solvents, varnishes, inks	Standard; stainless for water-based paints	Carbon graphite or SiC — solvents lubricate poorly	MS with PTFE / FFKM elastomers and solvent-resistant faces	Unheated	ATEX version for flammable solvents; PTFE gaskets. Pigmented products: see fluids with solids.
Food and feed edible oils, fats, molasses, glucose syrup, chocolate, honey	Stainless 316/316L casing, gears and shaft — no cast iron in product contact	Carbon graphite or SiC — no copper alloy (bronze) in food contact	Hygienic MS; FDA elastomers (EPDM, FKM, PTFE)	Hot water or steam jacket for chocolate, fats and syrups	Chocolate: increased clearances and low speed. Drainable installation, food-grade preservation oil. Not a hygienic-design (CIP) pump.
Chemicals acids, alkalis, caustic soda, glycols, brine	Stainless 316/316L; compatibility checked for each fluid	SiC or tungsten carbide	MS with SiC/SiC faces and FFKM / PTFE elastomers; double seal for hazardous fluids	As the fluid requires	Safety data sheet and concentration/temperature sent with the enquiry; ATEX version where flammable.
Fluids with fine solids filled resins, pigmented products, contaminated oils	Ductile iron or cast steel casing; hardened gears	Tungsten carbide	GP with flushing, or double MS with clean barrier fluid	As the fluid requires	Speed reduced to 50 % of the table value. Particles ≤ 0.1 mm, non-abrasive only — abrasive slurries are not suitable for internal gear pumps.
Zero-leakage service toxic, flammable, odorous fluids	As the fluid requires	As the fluid requires	Double MS with barrier fluid (API 682 Plan 53A); leakage monitoring	As the fluid requires	ATEX II ½G version; where temperature monitoring is fitted the sensor must itself be Ex protected; soft start with variable frequency drive.

Typical starting points. The final configuration is confirmed by Vimpo engineering against the fluid data given in the enquiry: viscosity at operating temperature, temperature range, solids content and chemical composition.

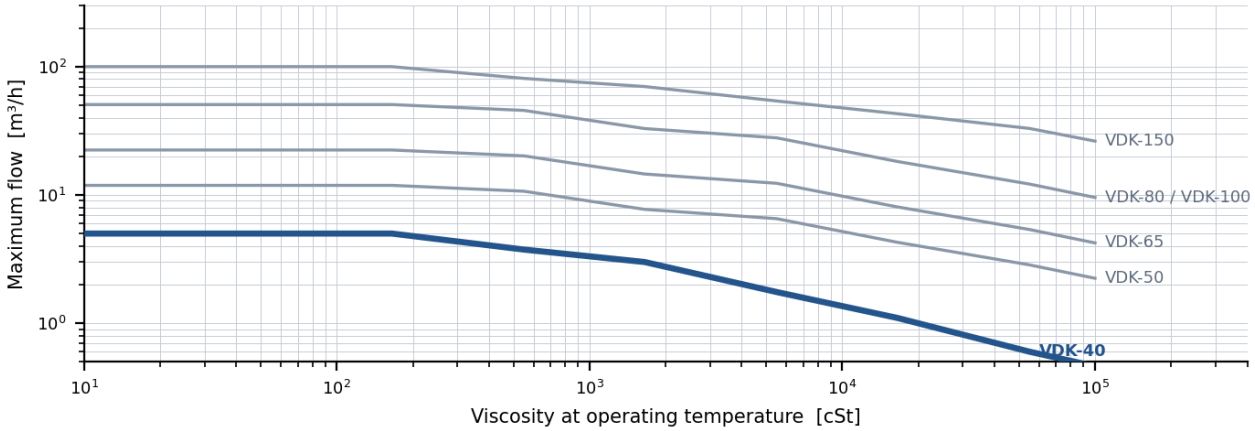
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TYPICAL VISCOSITY OF COMMON FLUIDS AT PUMPING TEMPERATURE

PRODUCT	PUMPING TEMPERATURE	VISCOSITY [cSt = mm²/s]	CAPACITY TABLE COLUMN
BITUMEN			
Paving grade bitumen 50/70	150 · 180 °C	≈ 300 · ≈ 90	165
Paving grade bitumen 35/50	150 · 180 °C	≈ 450 · ≈ 130	165 · 1,650
Polymer modified bitumen (SBS)	160 · 180 °C	≈ 2,000 · ≈ 500	1,650
Oxidised bitumen 85/25	170 · 200 °C	≈ 4,000 · ≈ 800	5,500 · 1,650
Cut-back bitumen (MC / RC)	60 · 100 °C	≈ 1,000 · ≈ 100	1,650 · 165
Bitumen emulsion 60–65 %	20–60 °C	≈ 20 – 100	165 (low lubricity)
FUELS AND OILS			
Heavy fuel oil HFO 380	50 · 80 °C	≈ 380 · ≈ 90	1,650 · 165
Light fuel oil, kerosene, diesel	20 °C	≈ 2 – 6	165 (thin — flow reduced)
Lube oil ISO VG 46	20 · 40 °C	≈ 120 · ≈ 46	165
Lube oil ISO VG 320 · gear oil	20 · 40 °C	≈ 1,500 · ≈ 320	1,650 · 165
Thermal oil (heat transfer fluid)	20 · 200 °C	≈ 40 · ≈ 1	165
CHEMICAL AND PROCESS			
Glycerine 99 %	20 · 40 °C	≈ 1,200 · ≈ 280	1,650 · 165
Polyol, plasticiser (DOP)	25 °C	≈ 300 – 3,000	1,650 · 5,500
Alkyd / epoxy resin, liquid	20–25 °C	≈ 5,000 – 15,000	5,500 · 16,500
Hot-melt adhesive (EVA)	160–180 °C	≈ 2,000 – 20,000	5,500 · 16,500
Solvent-based paint · printing ink	20 °C	≈ 100 – 500 · 10,000 – 50,000	165 · 16,500 – 55,000
FOOD			
Vegetable oil (sunflower, soybean)	20 · 60 °C	≈ 65 · ≈ 15	165
Molasses (cane)	20 · 40 °C	≈ 5,000–10,000 · ≈ 1,000–2,000	5,500 · 1,650
Glucose syrup 80 % DS	20 · 50 °C	≈ 20,000–50,000 · ≈ 2,000–5,000	16,500 – 55,000 · 5,500
Honey	20 · 40 °C	≈ 5,000–10,000 · ≈ 500–1,000	5,500 · 1,650
Chocolate mass	40–45 °C	≈ 2,000 – 10,000 (non-Newtonian)	5,500 · 16,500
Melted animal fat, tallow, palm oil	50–60 °C	≈ 25 – 50	165

Indicative values; the fluid supplier's data sheet governs the selection. Where two temperatures are given the two viscosities correspond in the same order (e.g. 150 · 180 °C → ≈ 300 · ≈ 90 cSt). Conversion: mPa·s (cP) ÷ density (kg/dm³) = cSt. Oils roughly halve their viscosity every 10–15 °C; bitumen falls about tenfold between 120 °C and 180 °C. Select the capacity table column equal to or above the viscosity at the lowest pumping temperature (cold start).

VDK SERIES — PUMP SELECTION DIAGRAM



Maximum flow of each model at the maximum permitted speed for the viscosity at operating temperature. The smallest model whose curve lies above the duty point is the selection. Duty point values are confirmed with the order acknowledgement. Technical data subject to change without notice.

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