

#### **HPLC & UHPLC**

# Vanquish Pumps

### LC that takes your productivity to new heights

#### Vanquish platform benefits

- Precision and reproducibility to meet every application demand
- Widest portfolio of detection technologies
- Less maintenance, and reliable set up with Thermo Scientific<sup>™</sup> Viper<sup>™</sup> TQ UHPLC Fittings
- Dedicated solutions for exceptional LC-MS performance



## Solvent delivery for highest confidence in peak identification and quantification

Thermo Scientific™ Vanquish™ HPLC and UHPLC pumps offer more performance without any tradeoff on durability and robustness, for highest system up-time and lowest total cost of ownership. The industry-leading Thermo Scientific™ SmartFlow™ pumping technology of the Vanquish pumps always provides you with unmatched retention time, reproducibility, and lowest baseline noise for highest detection sensitivity, independent of eluent composition and for backpressures up to 150 MPa (1500 bar, 22,000 psi). The productivity can be maximized using two pumps with Vanquish Duo HPLC and UHPLC workflows.

- Thermo Scientific<sup>™</sup> Vanquish<sup>™</sup> Horizon UHPLC System—more
  pressure capabilities than ever before, without any tradeoff on
  durability and robustness, from ultra-fast to extremely shallow
  binary gradients at pressures up to 150 MPa
- Thermo Scientific™ Vanquish™ Flex UHPLC System biocompatible binary, quaternary and dual-gradient pumps for maximum flexibility and advanced performance in LC-MS and LC applications
- Thermo Scientific<sup>™</sup> Vanquish<sup>™</sup> Core HPLC System—binary, quaternary, dual-gradient and isocratic pumps for standard, routine and highly productive HPLC applications

#### **Specifications**

	Binary Pump H	Binary Pump F	Binary Pump C	Isocratic Pump C
Operating principle	Parallel dual piston with independent piston drives and variable stroke volume	Serial dual-piston pump		
Flow range (settable)	0.001-5 mL/min, in 1 µL/min increments	0.001-8 mL/min, in 1 µL/min increments	0.001-10 mL/min, in	1 μL/min increments
Pressure range	5–151 MPa, (50–1517 bar, 700–22,000 psi)	2–103 MPa (20–1034 bar, 290–15,000 psi) With a flow rate above 5 mL/min, the pressure range decreases linearly down to 80 MPa (800 bar, 11,600 psi)	2–70 MPa (20–700 b) With a flow rate abov pressure range decre 30 MPa (300 bar, 4,350 psi)	
Compressibility compensation	Fully automated, independent	dent of mobile phase compos	sition	
Flow accuracy	±0.1%			
Flow precision	<0.05% RSD or <0.01 min	n SD, whichever is greater		
Pulsation	<0.4% or <0.2 MPa, whichever is greater; Typically <0.2% or <0.05 MPa, whichever is greater	Typically <1.0% or <0.2 MPa	a, whichever is greater	
Gradient formation	High-pressure gradient pr	roportioning		_
Proportioning accuracy	±0.2% of full-scale			_
Proportioning precision	<0.15% SD			_
Number of solvent lines	2 out of 6			1
Mixer volume	25 μL (default configuration)	200 μL (50 μL proprietary capillary mixer and 150 μL static mixer, default configuration)	400 μL (50 μL proprietary capillary mixer and 350 μL static mixer, default configuration)	200 μL (50 μL proprietary capillary mixer and 150 μL static mixer, default configuration)
Dwell volume (contribution of the pump to the system gradient delay volume)	35 μL (25 μL proprietary capillary mixer and 10 μL filter, default configuration)	200 μL (default configuration)	400 μL (default configuration)	_
Solvent degassing	Built-in, 2 channels			Optional (1 channel)
Wetted parts	MP35N, DLC, titanium, ceramics, PEEK, UHMW PE, fluoropolymers	MP35N, titanium, ceramics, sapphire, PEEK, UHMW PE, fluoropolymers	Stainless steel, titanium, ceramics, sapphire, PEEK, UHMW PE, fluoropolymers	
Biocompatible	Yes; pH range 1.5–12, chloride concentration up to 1 mol/L	Yes; pH range 1.5–12, chloride concentration up to 1 mol/L	No; pH range 1–13, chloride concentration up to 0.1 mol/L	
Normal-Phase compatible	No	Yes; with hardware modification by 6036.3501 Normal-Phase (NP) kit VF System	Yes; with hardware modification by 6036.3972 Normal-Phase (NP) kit VC System	
Safety features	Leak detection and safe le	eak handling, excess pressure	e monitoring	
PC connection	USB 2.0 3-port-HUB to connect further Vanquish modules			
I/O Interfaces	2 × 6 pin Mini-DIN connecto	ors each having functionality: 1 in	put, 1 relay out, 1 bidired	ctional input/output
GLP	actual operating and usag	unctions for scheduling mainte ge conditions of the pump. All neleon™ Chromatography Data	system parameters log	

#### Specifications (continued)

Binary Pump H	Binary Pump F	Binary Pump C	Isocratic Pump C
5–35 °C; 20–80% RH (non condensing) max. 2000 m above sea-level, Storage: -20–45 °C max. 60% RH (non condensing)			
100-240 V AC, 50/60 Hz, max. 525 W/550 VA	100-240 V AC, 50/60 Hz, max. 245 W/255 VA		
192 × 420 × 620 mm (7.6 × 16.5 × 24.4 in.)			
32 kg (70.5 lbs)	20 kg (44.1 lbs)	20 kg (44.1 lbs)	17kg (37.5 lbs)
	5-35 °C; 20-80% RH (n Storage: -20-45 °C max 100-240 V AC, 50/60 Hz, max. 525 W/550 VA 192 × 420 × 620 mm (7.	5–35 °C; 20–80% RH (non condensing) max. 200 Storage: -20–45 °C max. 60% RH (non condensing) 100–240 V AC, 50/60 Hz, max. 525 W/550 VA 192 × 420 × 620 mm (7.6 × 16.5 × 24.4 in.)	5–35 °C; 20–80% RH (non condensing) max. 2000 m above sea-level, Storage: -20–45 °C max. 60% RH (non condensing)  100–240 V AC, 50/60 Hz, max. 525 W/550 VA  192 × 420 × 620 mm (7.6 × 16.5 × 24.4 in.)

#### **Specifications**

	Quaternary Pump F	Quaternary Pump C/CN	
Operating principle	Serial dual-piston pump		
Flow range (settable)	0.001-8 mL/min, in 1 $\mu$ L/min increments	0.001-10 mL/min, in 1 µL/min increments	
Pressure range	2-103 MPa (20-1034 bar, 290-15,000 psi). With a flow rate of above 5 mL/min, the pressure range decreases linearly down to 80 MPa (800 bar, 11,600 psi)	2–70 MPa (20–700 bar, 290–10,100 psi). With a flow rate above 5 mL/min, the pressure range decreases linearly down to 30 MPa (300 bar, 4,350 psi)	
Compressibility compensation	Fully automated, independent of mobile phase co	omposition	
Flow accuracy	±0.1%		
Flow precision	<0.05% RSD or <0.01 min SD, whichever is great	er	
Pulsation	Typically <1.0% or <0.2 MPa, whichever is greater		
Gradient formation	Low-pressure gradient proportioning		
Proportioning accuracy	±0.5% of full-scale		
Proportioning precision	<0.15% SD		
Number of solvent lines	4		
Mixer volume	400 μL (50 μL proprietary capillary mixer and 350	μL static mixer, default configuration)	
Dwell volume (contribution of the pump to the system gradient delay volume)	679 μL (default configuration)		
Solvent degassing	Built-in, 4 channels		
Wetted parts	MP35N, titanium, ceramics, sapphire, PEEK, UHMW PE, fluoropolymers	Stainless steel, titanium, ceramics, sapphire, PEEK, UHMW PE (only Pump C), carbon-fibre filled PTFE (only Pump CN), fluoropolymers	
Biocompatible	Yes; pH range 1.5-12, chloride concentration up to 1 mol/L	No; pH range 1–13, chloride concentration up to 0.1 mol/L	
Normal-Phase compatible	Yes; with hardware modification by 6036.3501 Normal-Phase (NP) kit VF System	Yes; with hardware modification by 6036.3972 Normal-Phase (NP) kit VC System	
Safety features	Leak detection and safe leak handling, excess pressure monitoring		
PC Connection	USB 2.0; 3-port-HUB to connect further Vanquish modules		
I/O Interfaces	2 × 6 pin Mini-DIN connectors each having function	nality: 1 input, 1 relay out, 1 bidirectional input/output	
GLP	GLP Predictive Performance functions for scheduling maintenance procedures based on the actual operating and usage conditions of the pump. All system parameters logged in the Chromeleon CDS Data System Audit Trail.		
Environmental conditions	5–35 °C; 20–80% RH (non condensing) max. 2000 m above sea-level, Storage: -20–45 °C max. 60% RH (non condensing)		
Power requirements	100-240 V AC, 50/60 Hz, max. 245 W/255 VA		
Dimensions (h × w × d)	192 × 420 × 620 mm (7.6 × 16.5 × 24.4 in.)		
Weight	17 kg (37.5 lbs)		

#### **Specifications**

	Dual Pump F	Dual Pump C/CN	
Number of pump units	2		
Operating principle	Serial dual-piston pump		
Flow range (settable)	0.001-8 mL/min, in 1 µL/min increments	0.001-10 mL/min, in 1 µL/min increments	
Pressure range	2-103 MPa (20-1034 bar, 290-15,000 psi). With a flow rate of above 5 mL/min, the pressure range decreases linearly down to 80 MPa (800 bar, 11,600 psi)	2-70 MPa (20-700 bar, 290-10,100 psi). With a flow rate above 5 mL/min, the pressure range decreases linearly down to 30 MPa (300 bar, 4,350 psi)	
Compressibility compensation	Fully automated, independent of mobile phase co	mposition	
Flow accuracy	±0.1%		
Flow precision	<0.05% RSD or <0.01 min SD, whichever is great	er	
Pulsation	Typically <1.0% or <0.2 MPa, whichever is greate	r	
Gradient formation	Dual low-pressure gradient proportioning		
Proportioning accuracy	±0.5% of full-scale		
Proportioning precision	<0.15% SD		
Number of solvent lines	2 × 3		
Mixer volume	400 μL (50 μL proprietary capillary mixer and 350	μL static mixer, default configuration)	
Dwell volume	679 μL (default configuration)		
Solvent degassing	Built-in, 6 channels		
Wetted parts	MP35N, titanium, ceramics, sapphire, PEEK, UHMW PE, fluoropolymers	Stainless steel, titanium, ceramics, sapphire, PEEK, UHMW PE (only Pump C), carbon-fibre filled PTFE (only Pump CN), fluoropolymers	
Biocompatible	Yes; pH range 1.5–12, chloride concentration up to 1 mol/L	No; pH range 1–13, chloride concentration up to 0.1 mol/L	
Normal-Phase compatible	Yes; with hardware modification by 6036.3501 Normal-Phase (NP) kit VF System	Yes; with hardware modification by 6036.3972 Normal-Phase (NP) kit VC System	
Safety features	Leak detection and safe leak handling, excess pre-	essure monitoring	
Pc connection	USB 2.0; 3-port-HUB to connect further Vanquish modules		
I/O Interfaces	2 × 6 pin Mini-DIN connectors each having function	ality: 1 input, 1 relay out, 1 bidirectional input/output	
GLP	GLP Predictive Performance functions for scheduling maintenance procedures based on the actual operating and usage conditions of the pump. All system parameters logged in the Chromeleon CDS Data System Audit Trail.		
Environmental conditions	5–35 °C; 20–80% RH (non condensing), max. 2000 m above sea-level, Storage: -20–45 °C max. 60% RH (non condensing)		
Power requirements	100-240 V AC, 50/60 Hz, max. 245 W/255 VA		
Dimensions (h × w × d)	192 × 420 × 620 mm (7.6 × 16.5 × 24.4 in.)		
Weight	20 kg (44.1 lbs)		

#### Ordering information

Neternary Pump F  Neternary Pump F  Neternary Pump F  Neternary Pump C  Neternary Pump C  Neternary Pump C  Neternary Pump C  Neternary Pump CN	P10-A-02 P10-A-01 P20-A P32-A-01 P10-A-01 P20-A-01 P21-A-01 P32-A-01 P33-A-01 P40-A-01
VERIAL Pump F  Inary Pump C  Inary Pump H)  Inar	P20-A P32-A-01 -P10-A-01 -P20-A-01 -P21-A-01 -P32-A-01 -P33-A-01 -P40-A-01
ral Pump F  harry Pump C  raternary Pump C  vC  raternary Pump CN  ra	P32-A-01 P10-A-01 P20-A-01 P21-A-01 P32-A-01 P33-A-01 P40-A-01
nary Pump C  paternary Pump C  paternary Pump CN  paternary Pump CN  paratic Pump C  paternary Pump CN  paratic Pump CN  paratic Pump C  paternary Pump CN  pate	P10-A-01 P20-A-01 P21-A-01 P32-A-01 P33-A-01 P40-A-01
Internary Pump C Internary Pump CN Internary Pump CN Internary Pump CN Internary Pump CN Internation C Internation Control Control CN Internation CN Intern	P20-A-01 P21-A-01 P32-A-01 P33-A-01 P40-A-01
vc al Pump CN vc al Pump CN vc al Pump CN vc al Pump CN vc actic Pump C vc ac	P21-A-01 P32-A-01 P33-A-01 P40-A-01
VC paral Pump C Pump C VC paral Pump C Pu	P32-A-01 P33-A-01 P40-A-01
VC paratic Pump C VC vcessories  It inline filter, 35 μL, VH-P1 (includes 25 μL capillary mixer and 10 μL inline filter) (Binary Pump H) 604 obtional mixing system kit for TFA applications, volume 200 μL (Binary Pump H) 624 obtional mixing system kit for TFA applications, volume 400 μL (Binary Pump H) 624 obtional mixing system kit for TFA applications, volume 400 μL (Binary Pump H) 625 obtional mixing system kit for TFA applications, volume 400 μL (Binary Pump H) 626 obtional mixing system, 100μL, VF-P1 (includes 25 μL capillary mixer and 10 μL inline filter), MP35N (Binary Pump F) 604 obtional mixing system, 100μL, VF-Px (includes 25 μL capillary mixer and 75 μL static mixer), MP35N 604 obtional mixing system, 100μL, VC-Px (includes 25 μL capillary mixer and 10 μL inline filter), and ainless steel (Binary Pump C) 604 obtional mixing system, 150μL, 150MPa (for total volume of mixing system: 200 μL*) 604 obtional mixing system: 200 μL*) 604 obtional mixing system: 400 μL*)	P33-A-01 P40-A-01
veratic Pump C  tinline filter, 35 μL, VH-P1 (includes 25 μL capillary mixer and 10 μL inline filter) (Binary Pump H)  tinline filter, 35 μL, VH-P1 (includes 25 μL capillary mixer and 10 μL inline filter) (Binary Pump H)  tinline mixing system kit for TFA applications, volume 200 μL (Binary Pump H)  tinline filter, 35μL, VF-P1 (includes 25 μL capillary mixer and 10 μL inline filter), MP35N (Binary Pump F)  tinline filter, 35μL, VF-Px (includes 25 μL capillary mixer and 75 μL static mixer), MP35N  tinline filter, 35μL, VC-Px (includes 25 μL capillary mixer and 10 μL inline filter),  ainless steel (Binary Pump C)  xing system, 100μL, VC-Px (includes 25 μL capillary mixer and 75 μL static mixer), Stainless steel  60-  atic mixer, 150μL, 150MPa (for total volume of mixing system: 200 μL*)  60-  atic mixer, 350μL, 150MPa (for total volume of mixing system: 400 μL*)	P40-A-01
t inline filter, 35 µL, VH-P1 (includes 25 µL capillary mixer and 10 µL inline filter) (Binary Pump H)  otional mixing system kit for TFA applications, volume 200 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system, HD (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  otional mixing system kit for TFA applications, volume 400 µL (Binary Pump H)  oti	
t inline filter, 35 µL, VH-P1 (includes 25 µL capillary mixer and 10 µL inline filter) (Binary Pump H)  600  610  610  610  610  610  610  61	14 50184
bitional mixing system kit for TFA applications, volume 200 μL (Binary Pump H)  626  626  626  626  626  626  626  6	14 50184
bitional mixing system kit for TFA applications, volume 400 μL (Binary Pump H)  t inline filter, 35μL, VF-P1 (includes 25 μL capillary mixer and 10 μL inline filter), MP35N (Binary Pump F)  xing system, 100μL, VF-Px (includes 25 μL capillary mixer and 75 μL static mixer), MP35N  t inline filter, 35μL, VC-Px (includes 25 μL capillary mixer and 10 μL inline filter),  ainless steel (Binary Pump C)  xing system, 100μL, VC-Px (includes 25 μL capillary mixer and 75 μL static mixer), Stainless steel  604  atic mixer, 150μL, 150MPa (for total volume of mixing system: 200 μL*)  604  atic mixer, 350μL, 150MPa (for total volume of mixing system: 400 μL*)	14.50 TOA
t inline filter, 35µL, VF-P1 (includes 25 µL capillary mixer and 10 µL inline filter), MP35N (Binary Pump F) 604 xing system, 100µL, VF-Px (includes 25 µL capillary mixer and 75 µL static mixer), MP35N 604 t inline filter, 35µL, VC-Px (includes 25 µL capillary mixer and 10 µL inline filter), ainless steel (Binary Pump C) (Binary Pump C) xing system, 100µL, VC-Px (includes 25 µL capillary mixer and 75 µL static mixer), Stainless steel 604 atic mixer, 150µL, 150MPa (for total volume of mixing system: 200 µL*) 604 atic mixer, 350µL, 150MPa (for total volume of mixing system: 400 µL*)	88.5120A
xing system, 100μL, VF-Px (includes 25 μL capillary mixer and 75 μL static mixer), MP35N  604 t inline filter, 35μL, VC-Px (includes 25 μL capillary mixer and 10 μL inline filter), ainless steel (Binary Pump C)  xing system, 100μL, VC-Px (includes 25 μL capillary mixer and 75 μL static mixer), Stainless steel atic mixer, 150μL, 150MPa (for total volume of mixing system: 200 μL*)  604 atic mixer, 350μL, 150MPa (for total volume of mixing system: 400 μL*)	88.5310A
t inline filter, 35µL, VC-Px (includes 25 µL capillary mixer and 10 µL inline filter), ainless steel (Binary Pump C)  xing system, 100µL, VC-Px (includes 25 µL capillary mixer and 75 µL static mixer), Stainless steel  604  atic mixer, 150µL, 150MPa (for total volume of mixing system: 200 µL*)  604  atic mixer, 350µL, 150MPa (for total volume of mixing system: 400 µL*)	4.3870A
ainless steel (Binary Pump C)  xing system, 100μL, VC-Px (includes 25 μL capillary mixer and 75 μL static mixer), Stainless steel  atic mixer, 150μL, 150MPa (for total volume of mixing system: 200 μL*)  atic mixer, 350μL, 150MPa (for total volume of mixing system: 400 μL*)  60-	14.5100A
atic mixer, 150μL, 150MPa (for total volume of mixing system: 200 μL*)  604  atic mixer, 350μL, 150MPa (for total volume of mixing system: 400 μL*)	15.3020A
atic mixer, 350μL, 150MPa (for total volume of mixing system: 400 μL*)	15.5100A
	14.5110A
	14.5310A
atic mixer, 750μL, 100MPa (for total volume of mixing system: 800 μL*)	14.5750B
atic mixer, 1500μL, 100MPa (for total volume of mixing system: 1550 μL*)	4.5450B
pillary mixer, VF-pumps, volume 50 $\mu$ L r use with static mixers, volumes: 150 $\mu$ L up to 1500 $\mu$ L), MP35N	14.5026
pillary mixer, VC-pumps, volume 50 $\mu$ L r use with static mixers, volumes: 150 $\mu$ L up to 1500 $\mu$ L), Stainless steel	14.3015
per TQ MP35N 0.100 x 250 mm, capillary to connect the pump to the autosampler, use with the 100 µL mixing system (Binary and Quaternary VF-pumps)	5.1025
per TQ SST 0.130 x 250 mm, capillary to connect the pump to the autosampler, use with the 100 µL mixing system (VC-pumps)	
ormal-Phase (NP) kit VC System 603	1.1325
ormal-Phase (NP) kit VF System 600	1.1325

 $<sup>^{\</sup>star}$  Static mixers for use with 50  $\mu L$  capillary mixer

For more information on Vanquish Pumps click **here** 



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