Digitized Automation for a Changing World

Delta Hybrid Energy Saving System HES-C Series

www.deltaww.com

DELTA

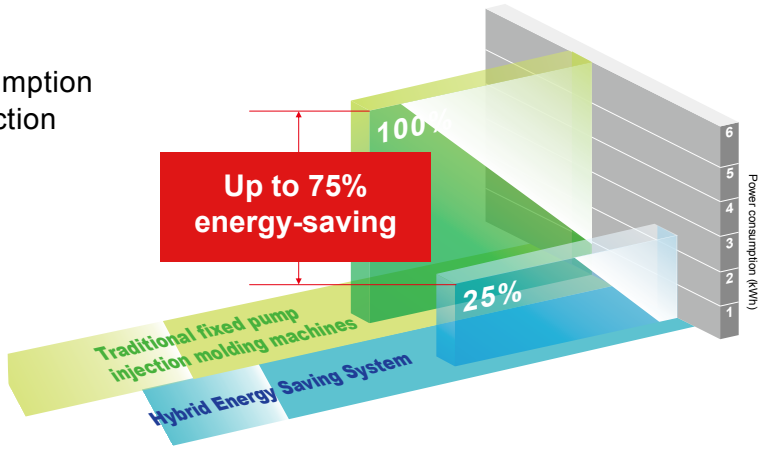
Smarter. Greener. Together.

Delta Hybrid Energy Saving System
HES-C Series

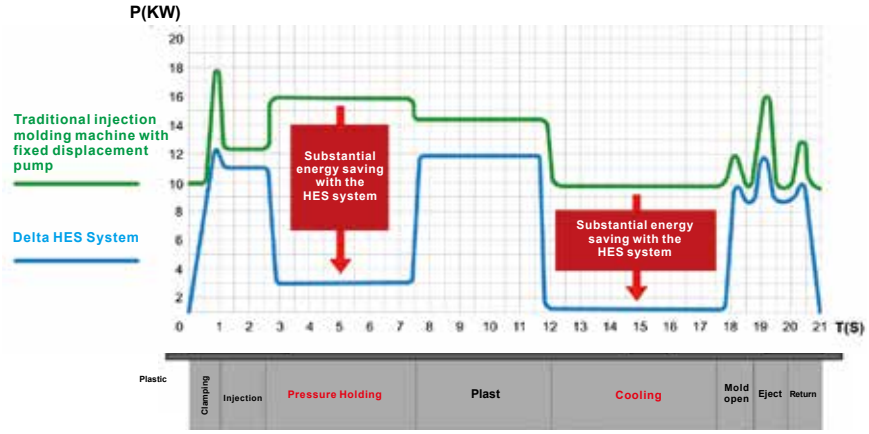
Based on the mission statement, "To provide innovative, clean and energy-efficient solutions for a better tomorrow", Delta is committed to developing advanced variable frequency control technology for enhanced efficiency and greater energy-savings. Plastic products are widely used in our living environment for daily commodities, electronic devices and automotive components. Injection molding machines play a key role in plastic products production. There are four major energy consuming units in a traditional injection molding machine including the hydraulic pump, the heating unit, the cooling system, and the control system components. The hydraulic pump system consumes the most energy and accounts for more than 75% of the total power consumption in an injection molding manufacturing process. An injection molding cycle consists of several stages from mold closing, injection, pressure holding, plasticization, mold opening to ejection. Each stage requires a different pressure and flow. The oil pump motor is under variable loading. Traditionally, the overflow valve and the ratio valve adjust the excess pressure and flow that occurs at each stage. This process is known as "high-pressure throttle". It accounts for 40%~75% of the energy lost. The Delta Hybrid Energy Saving System HES-C Series provides precise pressure and flow control, eliminating energy loss in the high pressure throttle process. It helps injection molding machines save energy while enhancing productivity and precision. The Delta HES Series provides the best solution for injection molding machines.

Ultra Energy-Saving

- Saves up to 75% power consumption depending on the different injection conditions



Energy Consumption Curve of the Injection Molding Process



System Features

(1) Significant Energy Reduction

- A field test with an 850-ton injection molding machine adopted the Delta HES250M43 double-pump confluence hydraulic system.
- The Delta HES-C Series saved up to 109,500 kWh in energy consumption and reduced 69,861 kg CO_2e emissions in a year compared with competing products operating 24 hours per day.

850T Injection Molding Machine	Delta		Competitor 1		Competitor 2	
Double-Pump Operation Hydraulic System	Master Pump 125cc	Slave Pump 125cc	Master Pump 125cc	Slave Pump 125cc	Master Pump 100cc	Slave Pump 100cc
Power Consumption (kWH)	**5.63**	**5.22**	8.01	6.96	11.84	11.52

(2) Excellent Overload Capability

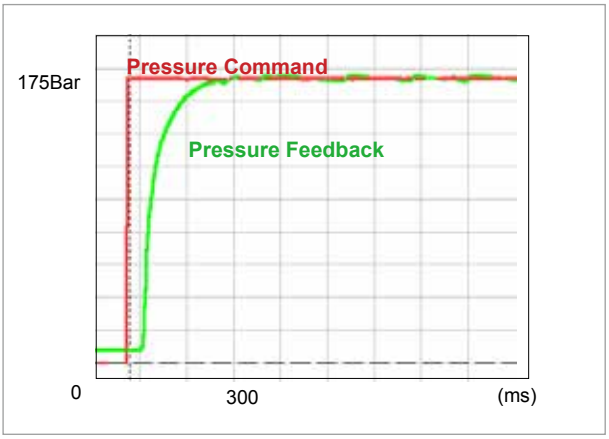
- All HES-C models feature overload capability of max. pressure 175bar for 60 seconds, and some of the advanced models can reach max. 8 minutes. All these models are especially suitable for thick products production. Please refer to the Pressure-Flow Characteristic Chart on the following pages for more details.

(3) Cost-Effective System

- Delta Hybrid Energy Saving System HES-C adopts Hybrid Servo Drive VFD-VJ Series and Fan Cooling Servo Motor MSJ Series, and features high torque and low inertia. This allows users to select the Hybrid Servo Drive VFD-VJ Series and Servo motor MSJ Series with lower power ratings to save system cost.

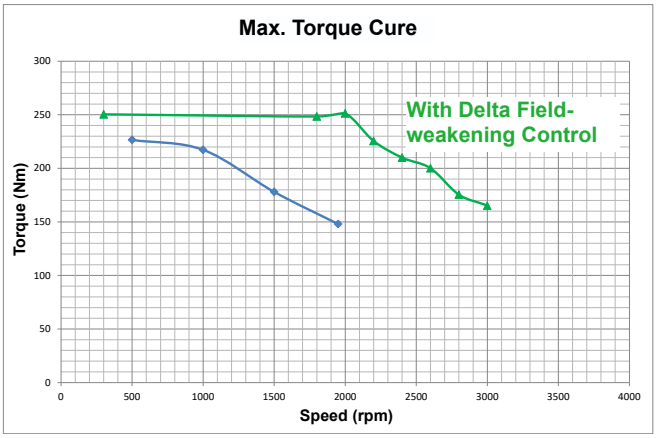
(4) PID Pressure Control

- Using Delta's special PID control technique, the system is able to perform pressure overshoot under 3 bar with optimized response time and stable product weight.



(5) Field-Weakening Control of a Motor

- Delta's servo drive uses motor field-weakening control to effectively extend the motor operation scope, increase system flow and ensure productivity of the injection molding machine.



(6) Easy Commissioning

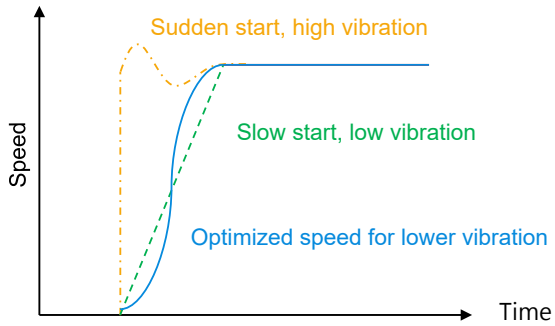
- Users can directly use the Delta preset motor and hydraulic system parameters without the need for additional tuning. Simply install the drive to easily begin the operation.

(7) Excellent Performance

- Short response time enhances response speed of the system
- Great V/P transfer capability elevates product yield rate
- Lower noise compared with traditional dosing pump
- Stable oil temperature rise

(8) S-Curve Control

- Smooth operation reduces machine vibration



(9) Multiple Protections

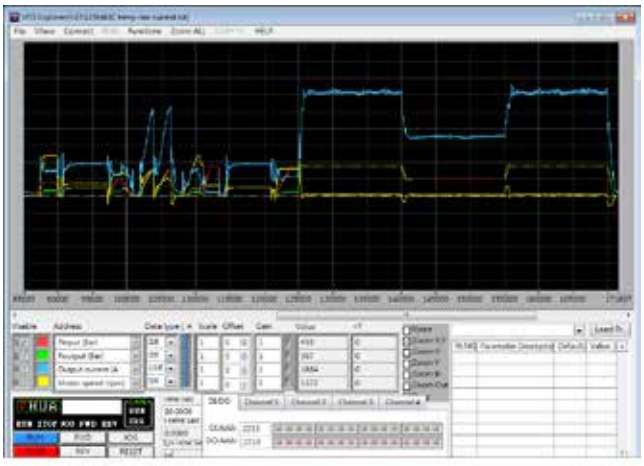
- Multiple protection functions, including over current, over/low voltage, over heating, brake protection, insufficient pump oil protection. Complete protection prevents the equipment from anomalies and serious malfunction, and enhances system lifetime.
- Real-time monitoring of the motor temperature is via a KTY84-130 temperature sensor embedded in the motor winding.

(10) Multiple Pumps Control

- Capable of controlling up to 12 pumps and multiple master/slave pumps system architecture. Users can integrate systems with a different HES-C flow rate depending upon the system requirements of the machines.

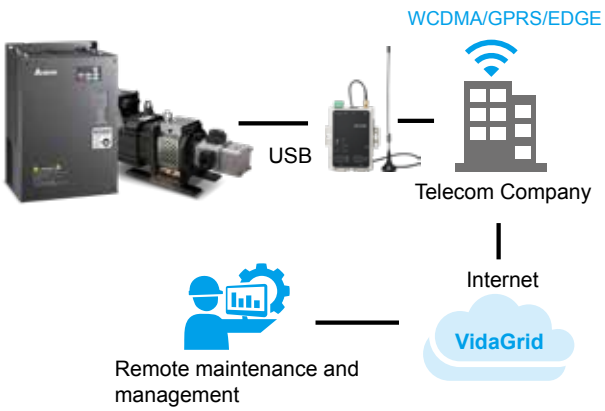
(11) User-Friendly Software

- User-friendly software for machine commissioning. The software presents real-time system parameters such as pressure, flow, motor current and motor speed.



(12) System Monitoring and Controller Integration

- Built-in PG and communication card, and USB port to connect industrial 3G routers for system monitoring and software upgrade.
- Supports CANopen communication protol, enhancing integration with the controllers

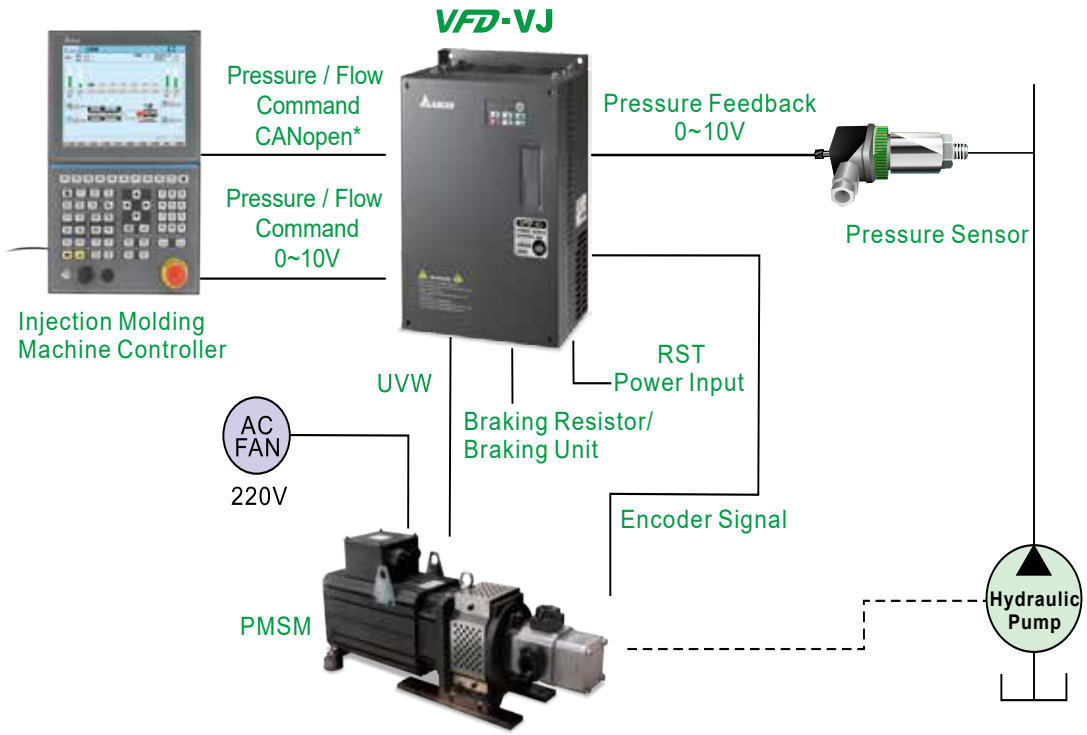


* CANopen only applicable for VJ-C

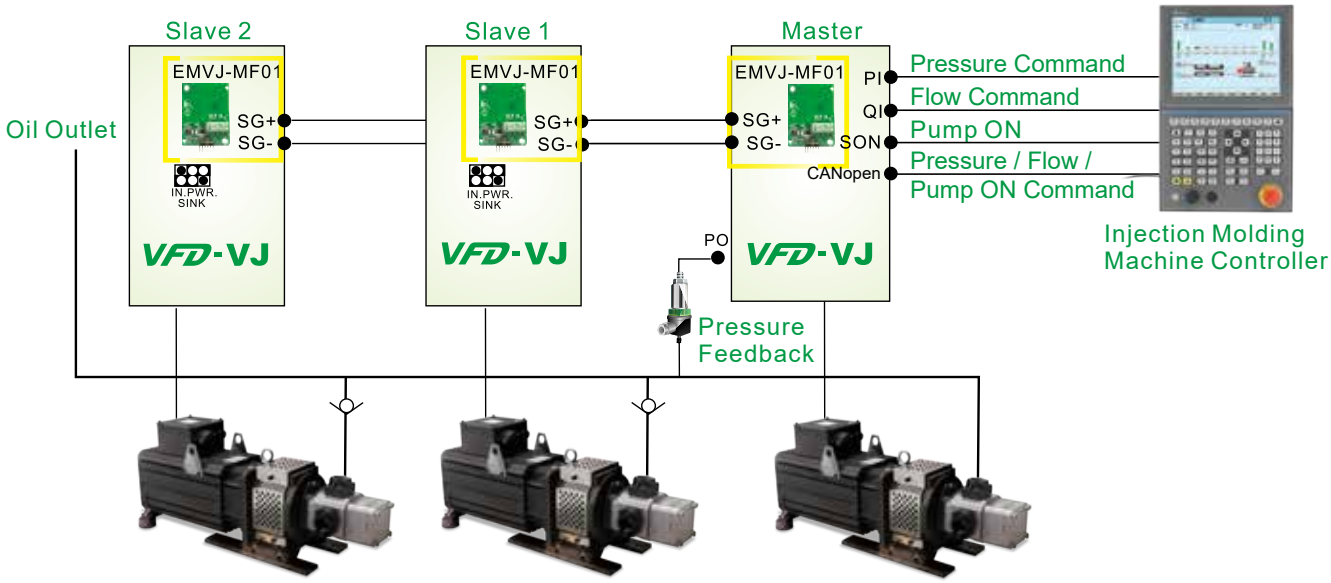
System Structure

Hybrid Servo Drive + AC Servo Motor + Internal Gear Pump + Pressure Sensor with PID controls

The system provides precise pressure and speed control and fast response time to ensure high duplication accuracy.

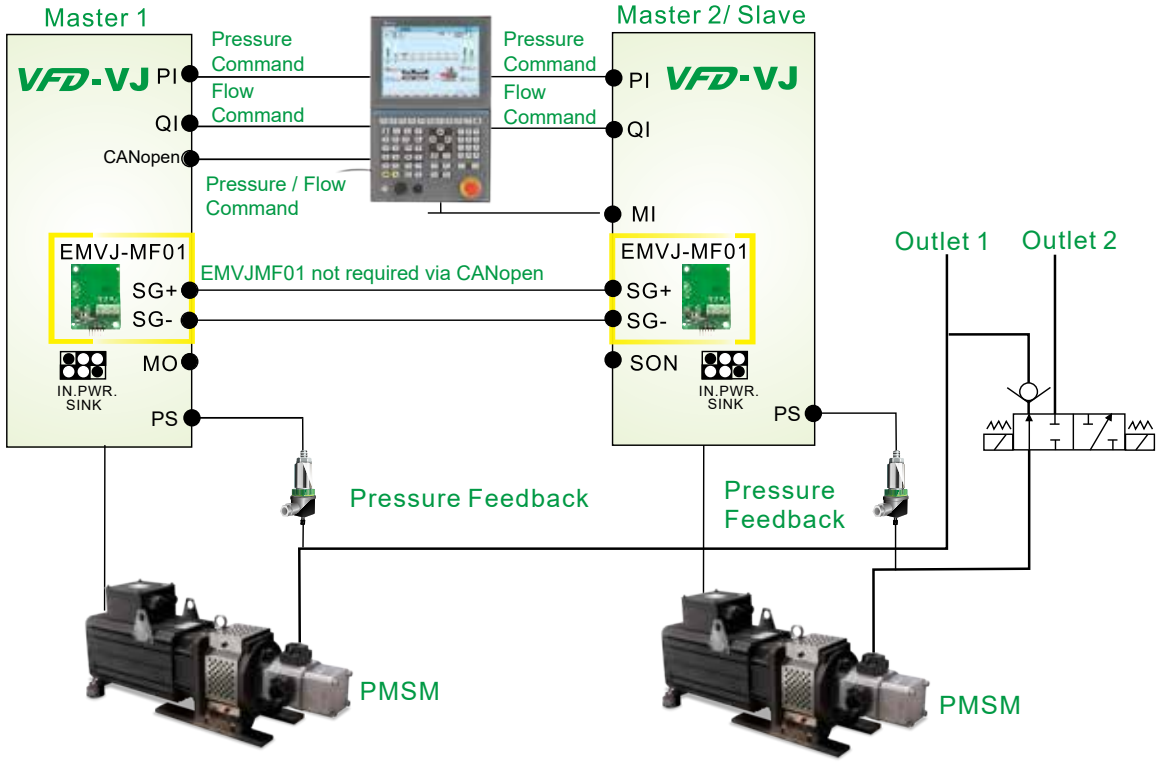


Multi-pump Convergent Flow Control



* No additional EMVJ-MF01 required for VJ-C

Multi-pump Control



Note 1 : EMVJ-MF01 is not required for the Servo Drive VFD-VJ-C Series.

Note 2 : The pressure sensor terminal of the Servo Drive VJ-A Series is PO. The pressure sensor terminal of the Servo Drive VJ-C Series is PS.

Model Number Explanation

HES | __ | H | 43 | C

Series

System Flow

063	63 L/min	160	160 L/min
080	80 L/min	200	200 L/min
100	100 L/min	250	250 L/min
125	125 L/min	320	320 L/min

System Pressure / Speed

G	140 bar/2500 rpm
H	180 bar/2500 rpm
M	180 bar/2000 rpm

Input Voltage

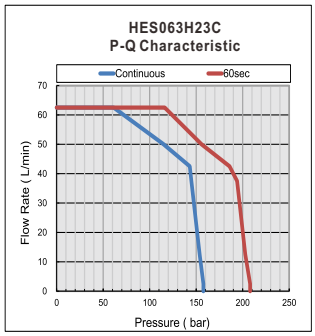
23	230 V 3-phase
43	460 V 3-phase

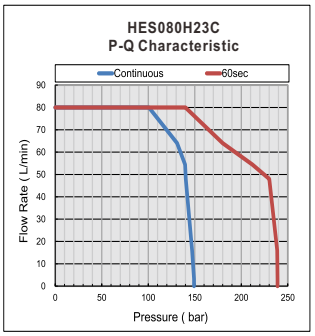
Version

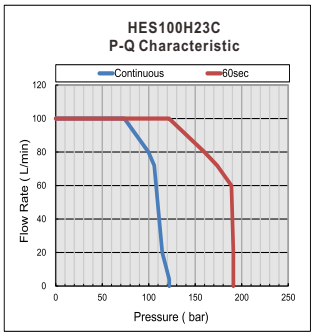
C	Version C

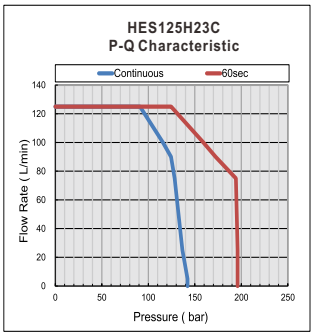
Pressure/Flow Characteristic Chart

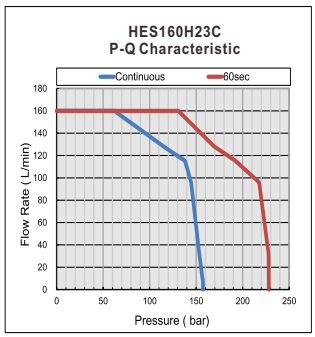
230V System (Under normal operating conditions)*

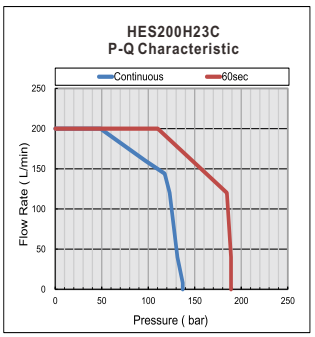


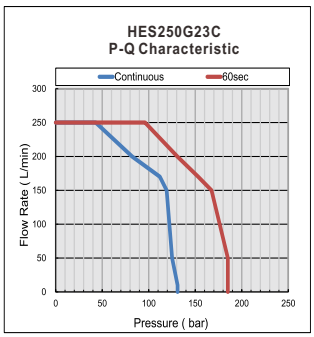






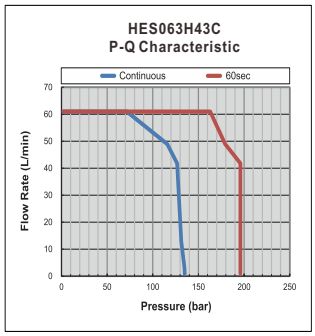


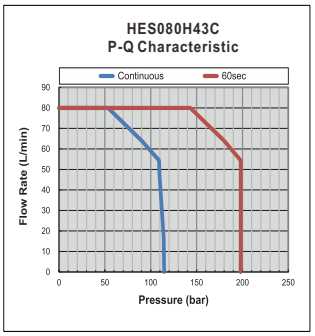


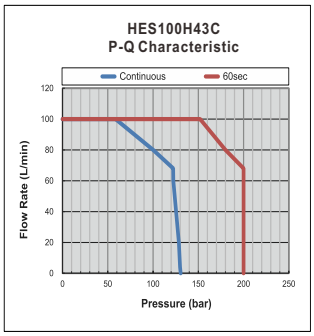


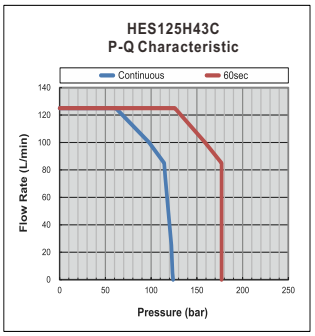
* This is an example of injection molding machine operating at 220VAC in normal conditions. The performance may vary if applied under special conditions or in a harsh environment.

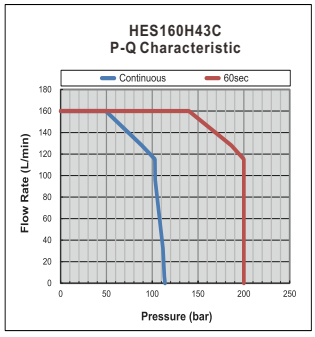
460V System (Under normal operating conditions)*

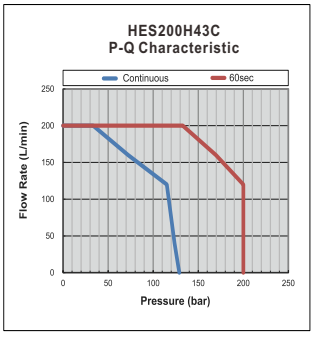


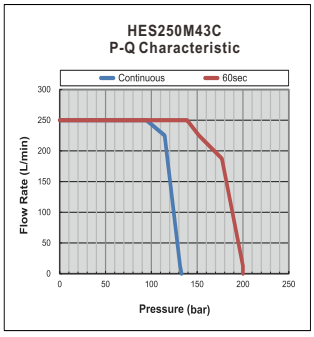


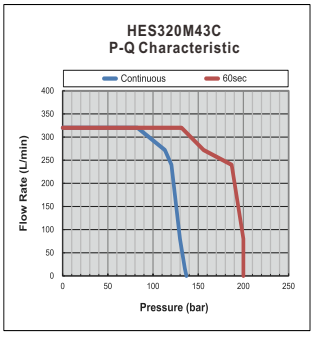












* This is an example of an injection molding machine operating at 380VAC in normal conditions. The performance may vary upon environment conditions.

System Specifications

230V									
Model HES____23C			063H	080H	100H	125H	160H	200H	250G
Flow	Pump Volume	cc/rev	25	32	40	50	64	80	100
	Flow Rate	L/min	63	80	100	125	160	200	250
	Linearity	%	Lower than 1% F.S.						
	Hysteresis	%	Lower than 1% F.S.						
Pressure	Max. Pressure	Mpa	18						14
	Min. Pressure	Mpa	0.1						
	Linearity	%	Lower than 1% F.S.						
	Hysteresis	%	Lower than 1% F.S.						
Motor	Power	kW	10	14		18	23	27	27
	Insulation Class		Class F						
	Certifications		CE						
	Cooling Method		Forced Air Cooling						
	Operating Environment		Ambient Temperature 0~40°C, Ambient Humidity 20~90% RH(Non-condensation), Altitude <1000m						
	Weight of Pump and Motor	kg	83	90		97	105	121	145
Hybrid Servo Controller	Model VFD-____VL23A (_) VFD-____VJ23C(_)		110A (06HC)	150A (08HC)	150A (10HC)	220A (12HC)	300C (16HC)	300C (20HC)	370C (25GC)
	Operation Voltage		3-phase voltage: 220~240VAC,50/60Hz						
	Output Power	kW	11	15	15	22	30	30	37
	Braking Unit		Built-in						
	Braking Resistor	W	300	1000					
		Ω	8.3	5.8					
	Speed Detector		Resolver						
	Pressure Input		0 ~ 10V support 3-point adjustment for analog inputs				0 ~ 10V support 3-point adjustment for analog inputs/CANopen		
	Flow Input		0 ~ 10V support 3-point adjustment for analog inputs				0 ~ 10V support 3-point adjustment for analog inputs/CANopen		
	Multi-function Input Terminal		5ch DC24V 8mA				6ch DC24V 8mA / 1 RJ45 (RS485) 1 RJ45 (CANopen)		
	Multi-function Output Terminal		2 ch DC24V 50mA, 1 ch Relay output				2 ch DC48V 50mA (max) · 1 ch Relay output / 1 RJ45 (RS485) 1 RJ45 (CANopen)		
	Analog Output Voltage		2 ch DC 0 ~ 10V				1ch DC 0~10V (AFM1) 1ch DC -10~10V (AFM2) / 1 RJ45 (RS485) 1 RJ45 (CANopen)		
	Cooling System		Forced air cooling						
	Protections		Over current, over voltage, low voltage, overload or overheating of servo controller, overload or overheating of motor, operation speed error, insufficient pump oil						
	Certifications		UL				CE		
Oil	Working Fluid		HL-HLP DIN51524 Part1/2 R68, R46						
	Operation Temperature	°C	-12 to 100°C						
	Viscosity	@40°C	67.83						
		@100°C	8.62						
Others			Optional: safety valve, reactor and EMC filters						

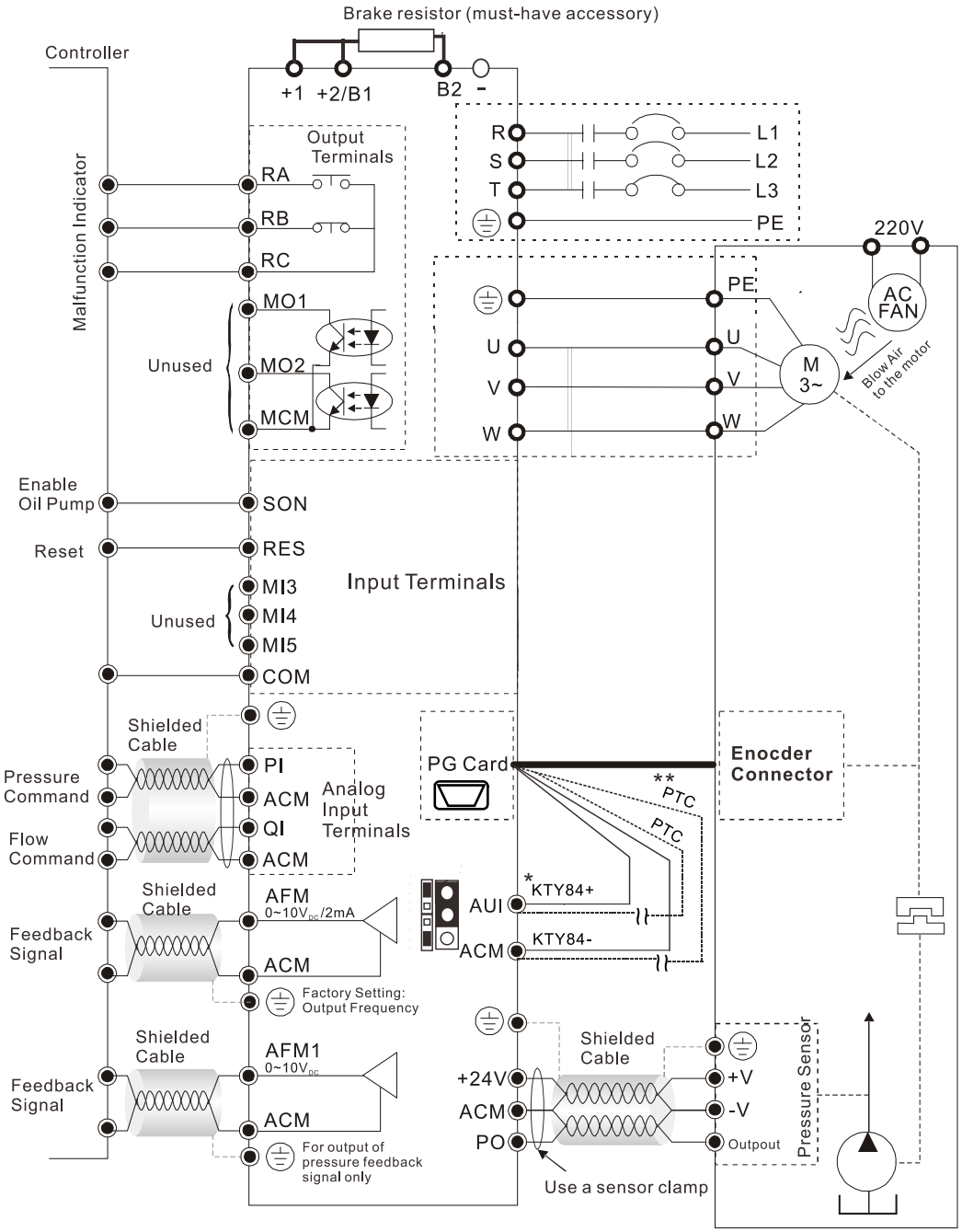
*Note 1: Delta reserves the right to change product specifications.

460V									
Model HES____43C			063H	080H	100H	125H	160H	200H	250M	320M
Flow	Pump Volume	cc/rev	25	32	40	50	64	80	125	160
	Flow Rate	L/min	63	80	100	125	160	200	250	320
	Linearity	%	Lower than 1% F.S.							
	Hysteresis	%	Lower than 1% F.S.							
Pressure	Max. Pressure	Mpa	18							
	Min. Pressure	Mpa	0.1							
	Linearity	%	Lower than 1% F.S.							
	Hysteresis	%	Lower than 1% F.S.							
Motor	Power	kW	10		14	18	23	25	45	52
	Insulation Class		Class F							
	Certifications		CE							
	Cooling Method		Forced Air Cooling							
	Operating Environment		Ambient Temperature 0~40°C, Ambient Humidity 20~90% RH(Non-condensation), Altitude <1000m							
	Weight of Pump and Motor	kg	83		90	97	105	121	206	224
Hybrid Servo Controller	Model VFD-____VJ43_ (_)		110C (06HC)	150C (08HC)	185C (10HC)	220C (12HC)	300C (16HC)	300C (20HC)	550C (25MC)	550C (32MC)
	Operation Voltage		3-phase voltage: 380~460 VAC, 50/60Hz							
	Output Power	kW	11	15	18.5	22	30	30	55	55
	Braking Unit		Built-in							
	Braking Resistor	W	300		1000				1500	
		Ω	25				19		13	
	Speed Detector		Resolver							
	Pressure Input		0 ~ 10 V support 3-point adjustment for analog inputs/CANopen							
	Flow Input		0 ~ 10 V support 3-point adjustment for analog inputs/CANopen							
	Multi-function Input Terminal		6 ch DC24V 8mA / 1 RJ45 (RS485) 1 RJ45 (CANopen)							
	Multi-function Output Terminal		2 ch DC48V 50mA (max) · 1 ch Relay output / 1 RJ45 (RS485) 1 RJ45 (CANopen)							
	Analog Output Voltage		1ch DC 0~10V (AFM1) 1ch DC -10~10V (AFM2) / 1 RJ45 (RS485) 1 RJ45 (CANopen)							
	Cooling System		Forced air cooling							
	Protections		Over current, over voltage, low voltage, overload or overheating of servo controller, overload or overheating of motor, operation speed error, insufficient pump oil							
	Certifications		CE UL							
Oil	Working Fluid		HL-HLP DIN51524 Part1/2 R68, R46							
	Operation Temperature	°C	-12 to 100 °C							
	Viscosity	@40 °C	67.83							
		@100°C	8.62							
Others			Optional: safety valve, reactor and EMC filters							

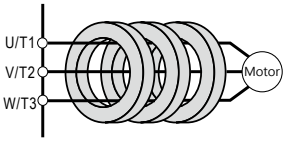
*Note 1: Delta reserves the right to change product specifications.

Wiring

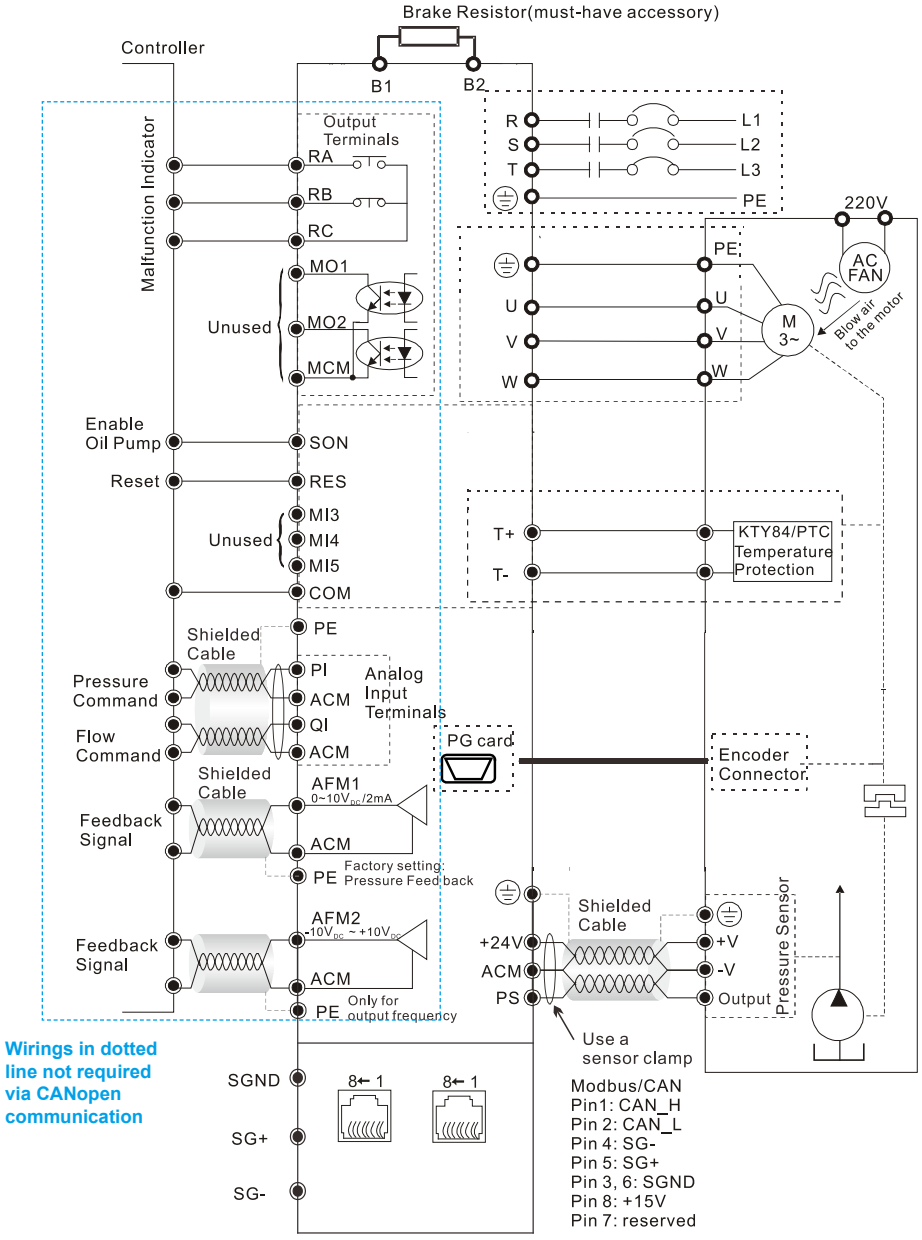
HES063H23C~HES125H23C



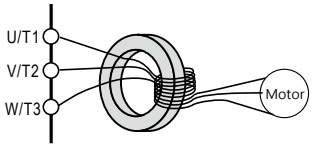
*Note : For **HES063H23C ~ HES250G23C**
HES125H43C ~ HES320M43C



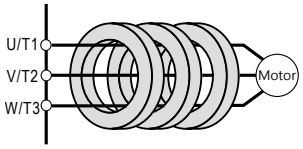
HES160H23C~HES250G23C
HES063H43C~HES320M43C



***Note 1 :** For **HES063H43C ~ HES100H43C** (Please wind the wire through the zero phase reactor at least 3 turns before connecting to the motor)



For **HES063H23C ~ HES250G23C**
HES125H43C ~ HES320M43C

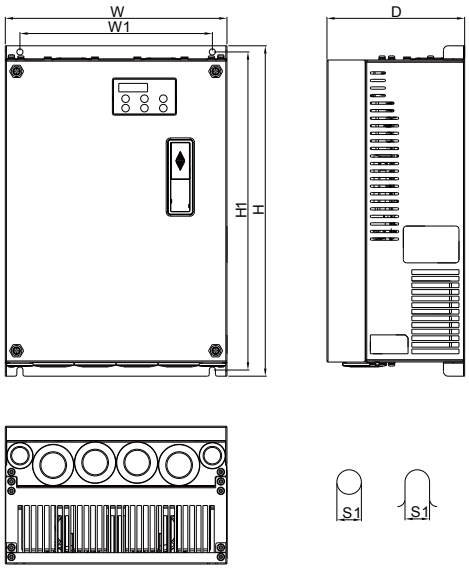


***Note 2:** The KTY84 temperature sensor is used; be aware of the polarities. The colors of the motor encoder wire CBHE-E5M are: black/white for KTY-, red/white for KTY+, yellow/black for PTC, and yellow for PTC.

Dimensions

Hybrid Servo Controller

Frame C

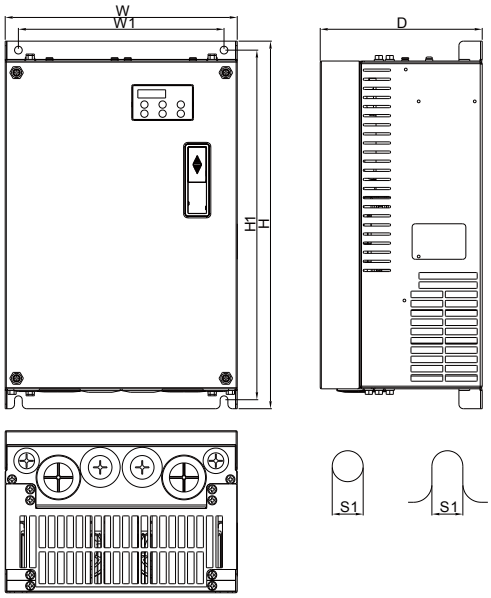


MODEL
VFD110VL23Axxxx
VFD110VJ43Cxxxx
VFD150VJ43Cxxxx
VFD185VJ43Cxxxx
VFD220VJ43Cxxxx

Unit: mm [inch]

Frame		W	H	D	W1	H1	S1
C	mm	235	350	146	204	337	6.5
	inch	9.25	13.78	5.75	8.03	13.27	0.26

Frame D

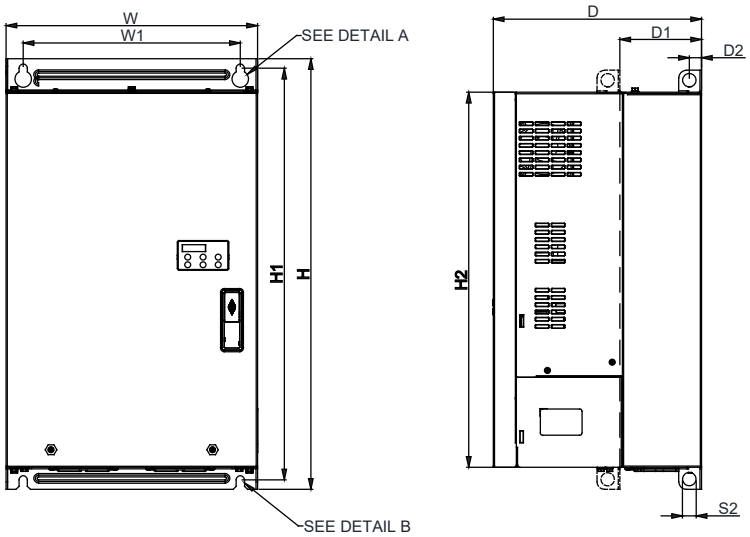


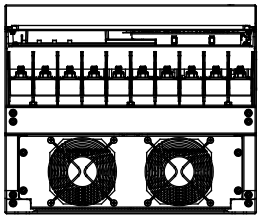
MODEL
VFD150VL23Axxxx
VFD220VL23Axxxx
VFD300VJ43Cxxxx

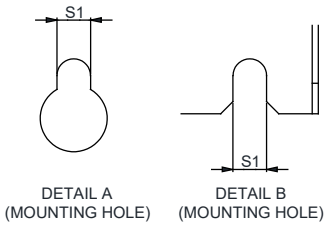
Unit: mm [inch]

Frame		W	H	D	W1	H1	S1
D	mm	255	403.8	178	226	384	8.5
	inch	10.04	15.90	6.61	8.90	15.12	0.33

Frame E4







MODEL

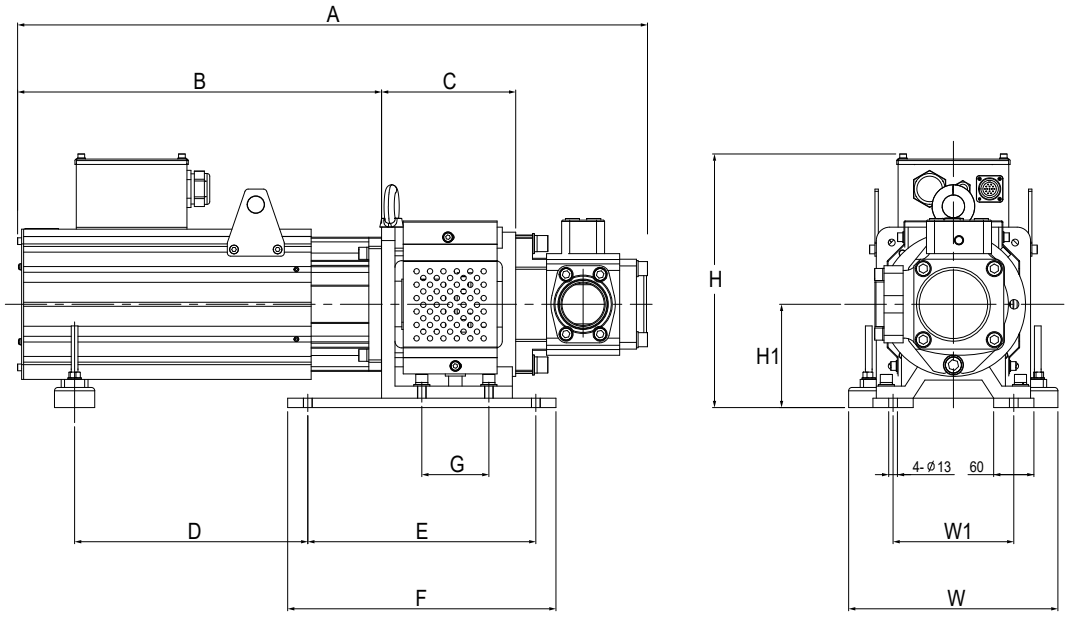
VFD300VJ23Cxxxx
VFD370VJ23Cxxxx
VFD550VJ43Cxxxx

Unit: mm [inch]

Frame		W	W1	H	H1	H2	D	D1*	D2	S1	S2
E4	mm	330.0	285.0	565.0	540.0	492.0	273.4	107.2	16.0	11.0	18.0
	inch	12.99	11.22	22.24	20.67	19.37	10.76	4.22	0.63	0.43	0.71

Dimensions

Servo Pump



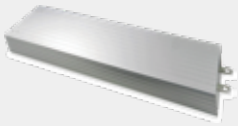
Unit : mm

HES Model	A	B	C	D	E	F	G	H	H1	W	W1	Inlet	Outlet
HES063H23C	695	381	170	194	340	400	95	376	154	314	180	1-1/4" PT	3/4" PT
HES080H23C	741	417	170	219	340	400	95	376	154	314	180	1-1/4" PT	3/4" PT
HES100H23C	752	417	170	219	340	400	95	376	154	314	180	1-1/4" PT	1" PT
HES125H23C	802	453	170	259	340	400	95	376	154	314	180	1-1/4" PT	1" PT
HES160H23C	859	489	170	304	340	400	95	376	154	314	180	1-1/4" PT	1" PT
HES200H23C	956	575	200	399	340	400	100	376	154	314	180	2" PT	1-1/4" PT
HES250G23C	972	575	200	399	340	400	100	376	154	314	180	2-1/2" PT	1-1/4" PT
HES063H43C	695	381	170	194	340	400	95	376	154	314	180	1-1/4" PT	3/4" PT
HES080H43C	705	381	170	194	340	400	95	376	154	314	180	1-1/4" PT	3/4" PT
HES100H43C	752	417	170	219	340	400	95	376	154	314	180	1-1/4" PT	1" PT
HES125H43C	802	453	170	259	340	400	95	376	154	314	180	1-1/4" PT	1" PT
HES160H43C	859	489	170	304	340	400	95	376	154	314	180	1-1/4" PT	1" PT
HES200H43C	956	575	200	399	340	400	100	376	154	314	180	2" PT	1-1/4" PT
HES250M43C	1028	577	230	275	420	500	140	458	184	426	250	2-1/2" PT	1-1/2" PT
HES320M43C	1098	631	230	327	420	500	140	456	184	426	250	3" PT	1-1/2" PT

*Note: Size of the Model D can be adjusted based on requirements

Accessories

Accessory Pack

A. Brake Resistor	C. Pressure Sensor	D. Magnetic Ring	E. Sensor Clamp
			

Product Packages

Model Name	Package Items		
	Hybrid Servo Controller	Servo Pump*	Accessory Items**
			
HES063H23C	VFD110VL23A06HC	HSP-025-100-23C	HESP-063-H-NC23 Item: A, C, Dx3, E
HES080H23C	VFD150VL23A08HC	HSP-032-140-23C	HESP-080-H-NC23 Item: A, C, Dx3, E
HES100H23C	VFD150VL23A10HC	HSP-040-140-23C	HESP-100-H-NC23 Item: A, C, Dx3, E
HES125H23C	VFD220VL23A12HC	HSP-050-180-23C	HESP-125-H-NC23 Item: A, C, Dx3, E
HES160H23C	VFD300VJ23C16HC	HSP-064-230-23C	HESP-160-H-NC23 Item: A, C, Dx3, E
HES200H23C	VFD300VJ23C20HC	HSP-080-270-23C	HESP-200-H-NC23 Item: A, C, Dx3, E
HES250G23C	VFD370VJ23C25GC	HSP-100-270-23C	HESP-250-G-NC23 Item: A, C, Dx3, E
HES063H43C	VFD110VJ43C06HC	HSP-025-100-43C	HESP-063-H-NC43 Item: A, C, D, E
HES080H43C	VFD150VJ43C08HC	HSP-032-100-43C	HESP-080-H-NC43 Item: A, C, D, E
HES100H43C	VFD185VJ43C10HC	HSP-040-140-43C	HESP-100-H-NC43 Item: A, C, D, E
HES125H43C	VFD220VJ43C12HC	HSP-050-180-43C	HESP-125-H-NC43 Item: A, C, Dx3, E
HES160H43C	VFD300VJ43C16HC	HSP-064-230-43C	HESP-160-H-NC43 Item: A, C, Dx3, E
HES200H43C	VFD300VJ43C20HC	HSP-080-250-43C	HESP-200-H-NC43 Item: A, C, Dx3, E
HES250M43C	VFD550VJ43C25MC	HSP-125-450-43C	HESP-250-M-NC43 Item: A, C, Dx3, E
HES320M43C	VFD550VJ43C32MC	HSP-160-520-43C	HESP-320-M-NC43 Item: A, C, Dx3, E

*Note 1: Encoder cables (CBHE-E5M, P/N: 3865345000) included in the Servo Pump HSP package

**Note 2: The standard thread for pressure sensor is PT thread. G thread is available upon request, please contact Delta sales for details.

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