



Automation for a Changing World

Delta Hybrid Energy Saving System HES-C Series



www.deltaww.com

 **DELTA**
Smarter. Greener. Together.

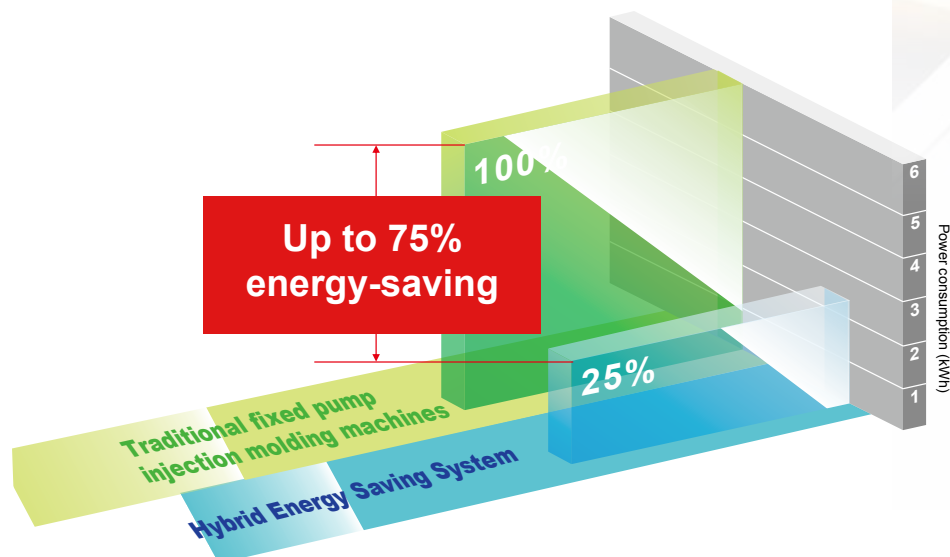
Delta Hybrid Energy Saving System HES-C Series

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



System Features

(1) Superior Energy-saving Results

- 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** CO2e 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) High Overload Capability

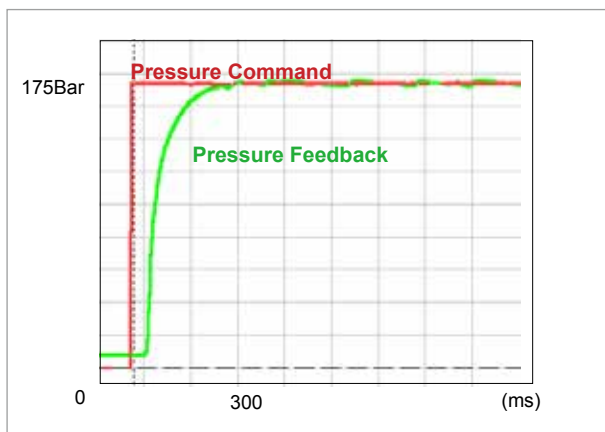
- All HES models feature overload capability of max. pressure 175bar for 60 seconds which is especially suitable for thick products production. Please refer to the Pressure-Flow Characteristic Chart on the following pages for more details.

(3) High Speed Machine Applications

- Delta Hybrid Energy Saving System HES-C adopts Hybrid Servo Drive VFD-VJ Series and Fan Cooling Servo Motor MSJ Series (SPM motor), and features high torque and low inertia. The HES-C realizes high speed operation without using IPM motors, allowing users to select Hybrid Servo Drive VFD-VJ Series and Servo motor MSJ Series with lower power rating to save system cost.

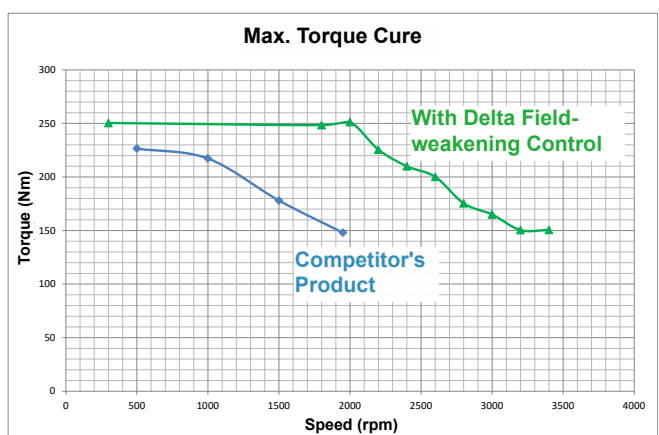
(4) PID Pressure Control

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



(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) Multiple Protections

- Prolong system service life by providing protections from over-current, over-voltage, overheating, braking current and more.
- Real-time monitoring of the motor temperature via KTY84-130 temperature sensor embedded in the motor winding.

(8) Multiple Pumps Control

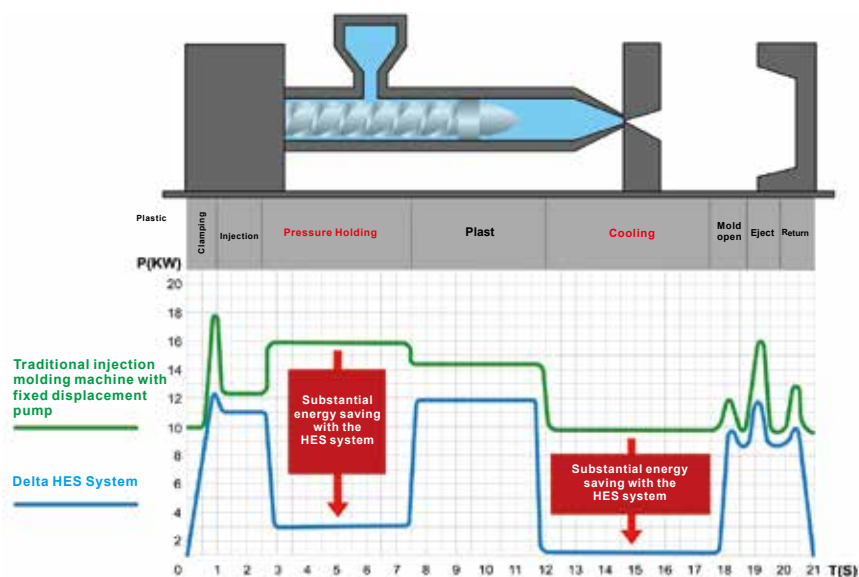
- Capable of controlling up to 12 pumps and multiple master/slave pumps system architecture. Users can integrate systems with a different HES flow rate depending upon the system requirements of the machines.

(9) 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.

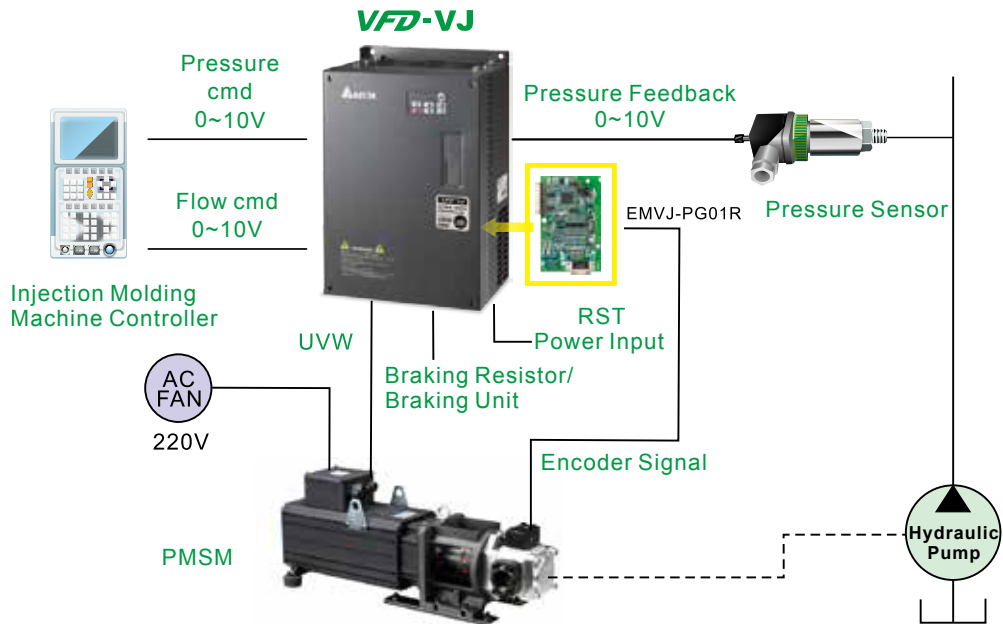


Energy Consumption Curve of the Injection Molding Process

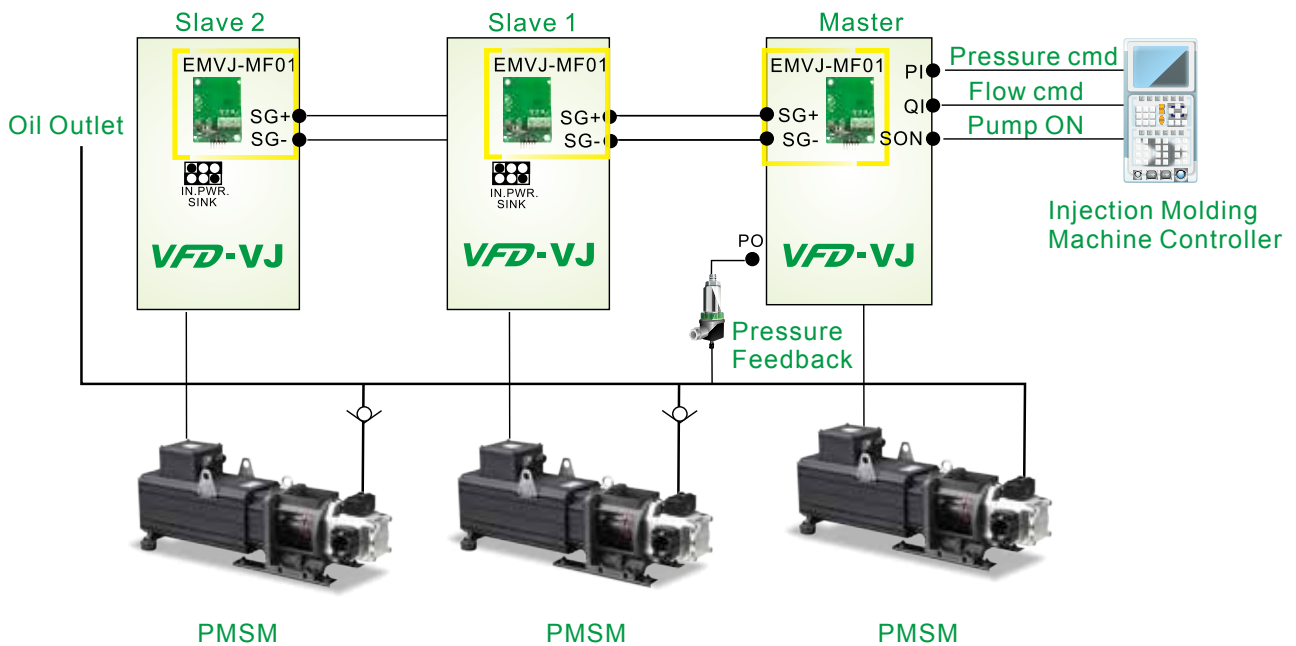


System Structure

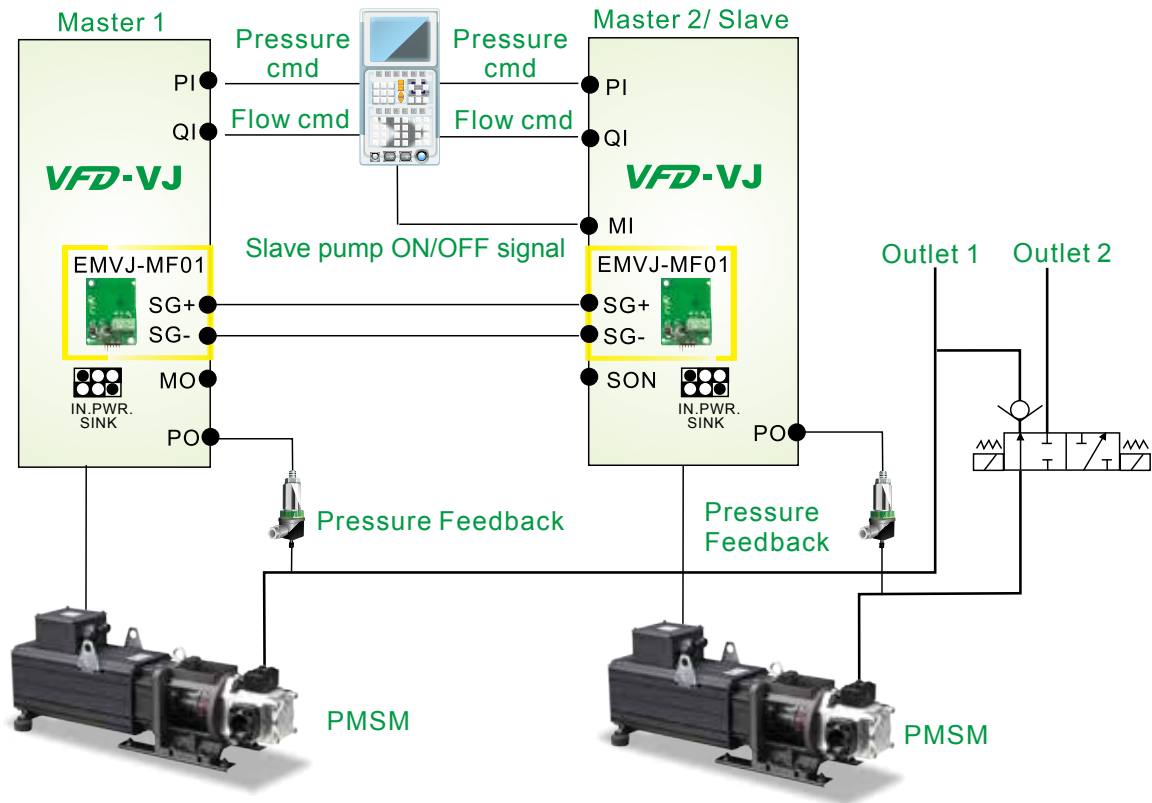
Hybrid Servo Drive + AC Servo Motor + Internal Gear Pump + Pressure Sensor with PID controls
 The system provides precise pressure and speed control and fast response time to ensure high duplication accuracy.



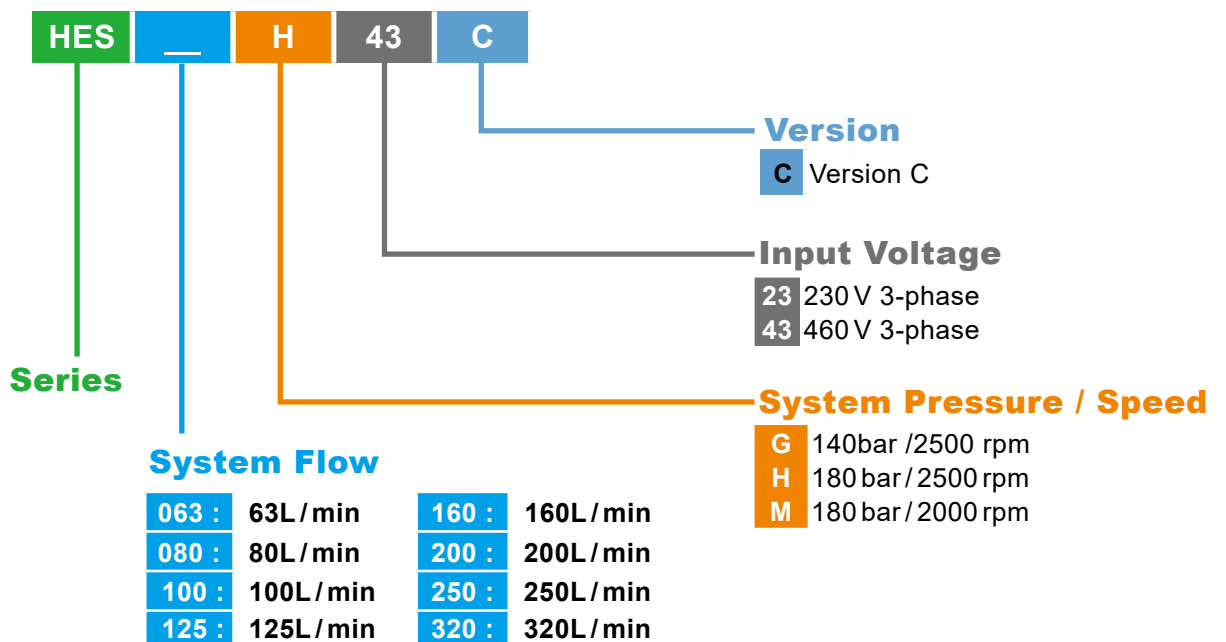
Multi-pump Convergent Flow Control



Multi-pump Control

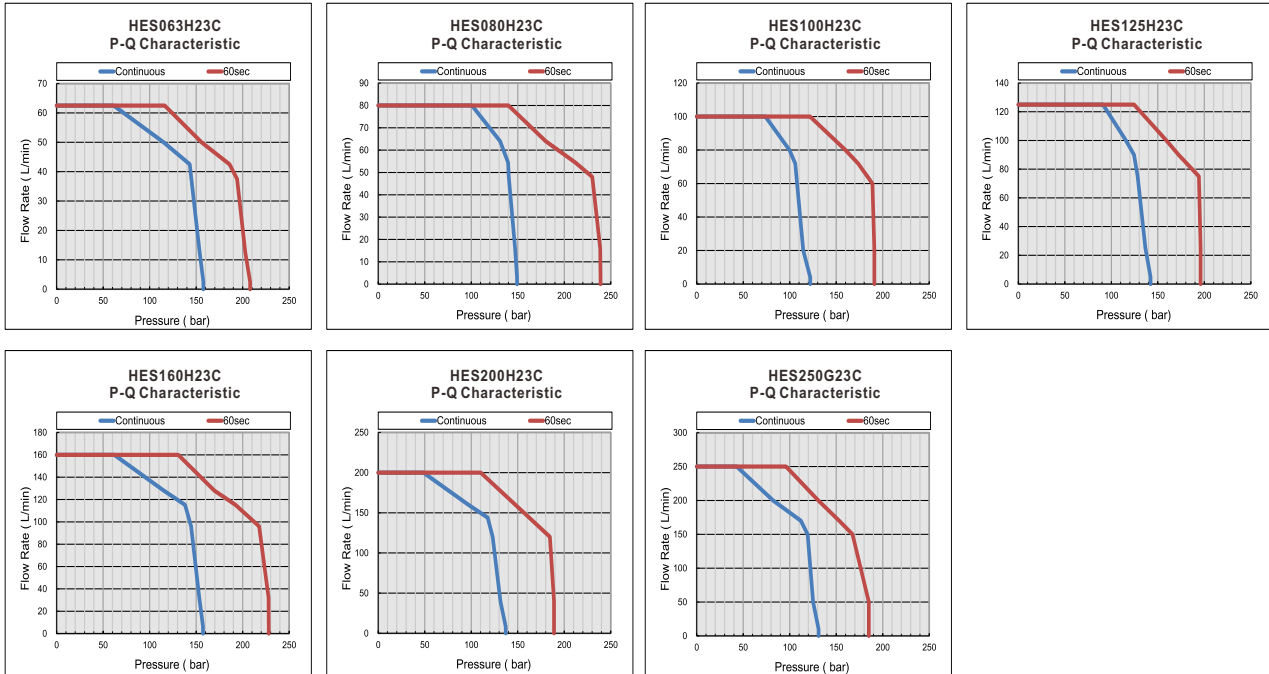


Model Number Explanation



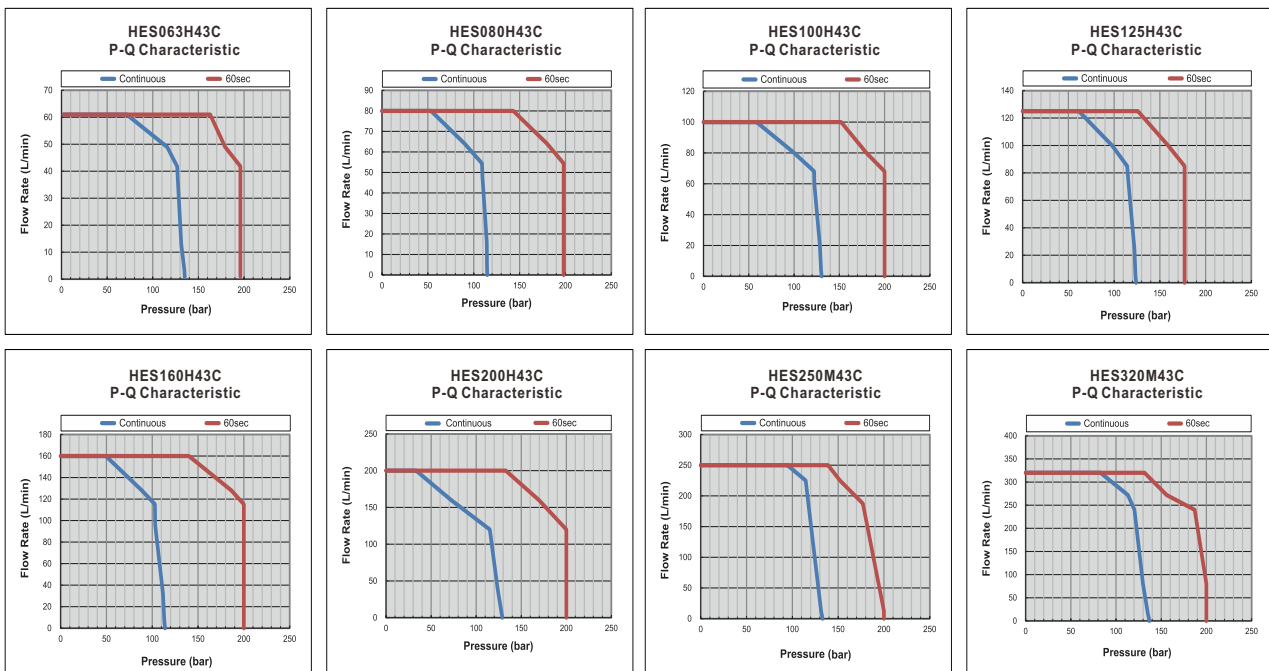
Pressure/Flow Characteristic Chart

230V System (Under normal operating conditions)*






* This is an example of injection molding machine operating at 220VAC in normal condition. The performance may vary if applied under special conditions or in 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	10.4	14.6	18.4	23.1	27.6	27.6		
	Insulation Class		Class F							
	Certifications									
	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-____VL23 A ()		110A (06HC)	150A (08HC)	150A (10HC)	220A (12HC)	300A (16HC)	300A (20HC)	370A (25GC)	
	Operation Voltage		3-phase voltage: 220~240 VAC · 50/60 Hz							
	Output Power	kW	11	15	15	22	30	30	37	
	Braking Unit		Built-in				VFDB2022			
	Braking Resistor	W	300	1000						
		Ω	8.3	5.8						
	Speed Detector		Resolver							
	Pressure Input		0 ~ 10 V support 3-point adjustment for analog inputs							
	Flow Input		0 ~ 10 V support 3-point adjustment for analog inputs							
	Multi-function Input Terminal		5ch DC24V 8mA							
	Multi-function Output Terminal		2 ch DC24V 50mA, 1 ch Relay output							
	Analog Output Voltage		2 ch DC 0 ~ 10 V							
	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		 								
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: Delta reserves the right to change product specifications.

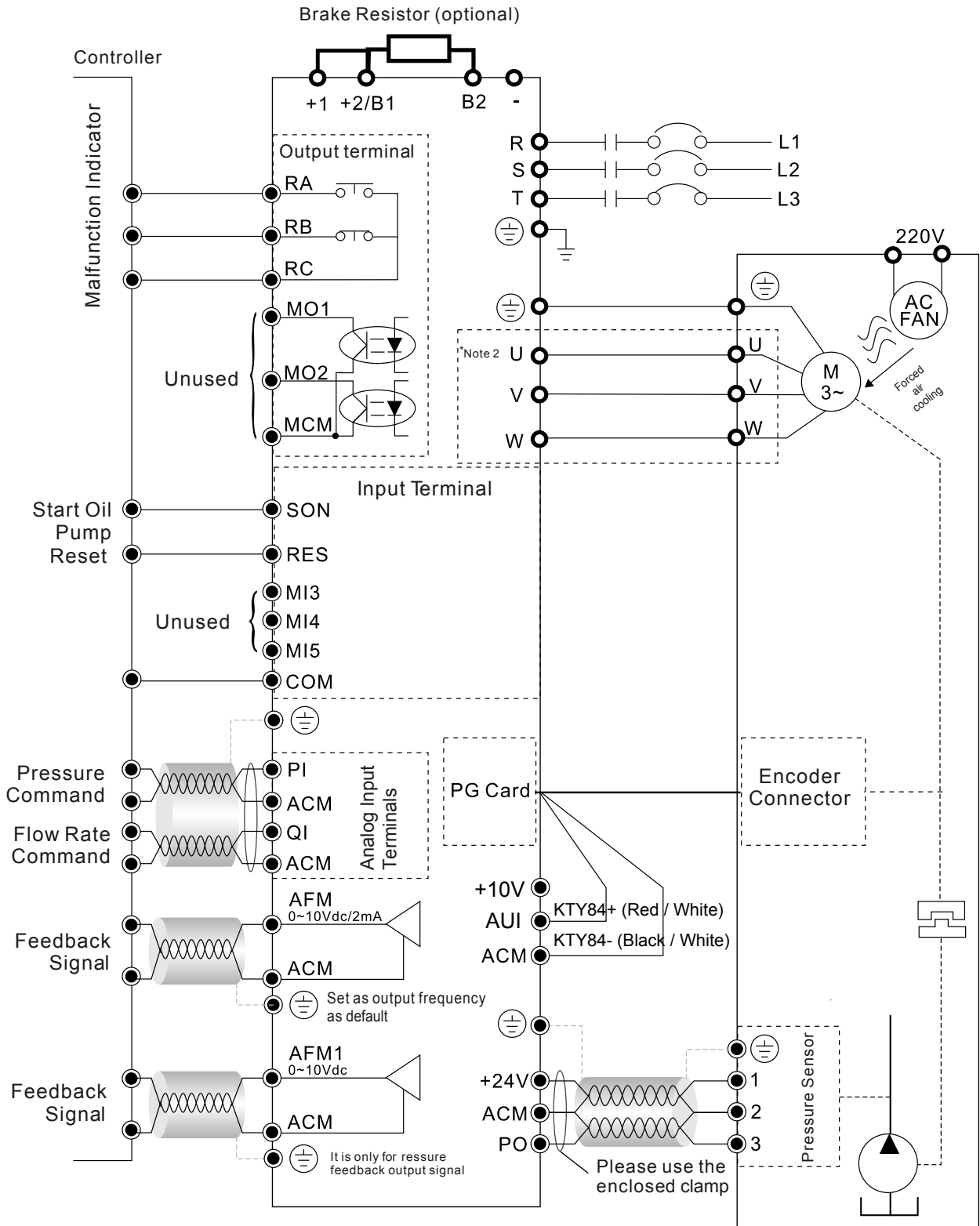
460V											
Model HES___43C			063H	080H	100H	125H	160H	200H	250M	320M	
Flow	Pump Volume	cc/rev	25	32	40	50	64	80	125	160	
	Flow Rate	L/min	63	80	100	125	160	200	250	320	
	Linearity	%	Lower than 1% F.S.								
	Hysteresis	%	Lower than 1% F.S.								
Pressure	Max. Pressure	Mpa	18								
	Min. Pressure	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										
	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-___VL43  ()		110  (06HC)	150  (08HC)	185  (10HC)	220  (12HC)	300  (16HC)	300  (20HC)	550  (25MC)	550  (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						VFDB4045		
	Braking Resistor	W	300		1000				1500		
		Ω	25				14			13	
	Speed Detector		Resolver								
	Pressure Input		0 ~ 10V support 3-point adjustment for analog inputs								
	Flow Input		0 ~ 10V support 3-point adjustment for analog inputs								
	Multi-function Input Terminal		5 ch DC24V 8mA								
	Multi-function Output Terminal		2 ch DC24V 50mA · 1 ch Relay output								
	Analog Output Voltage		2 ch DC 0 ~ 10V								
	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		 									
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: Delta reserves the right to change product specifications.

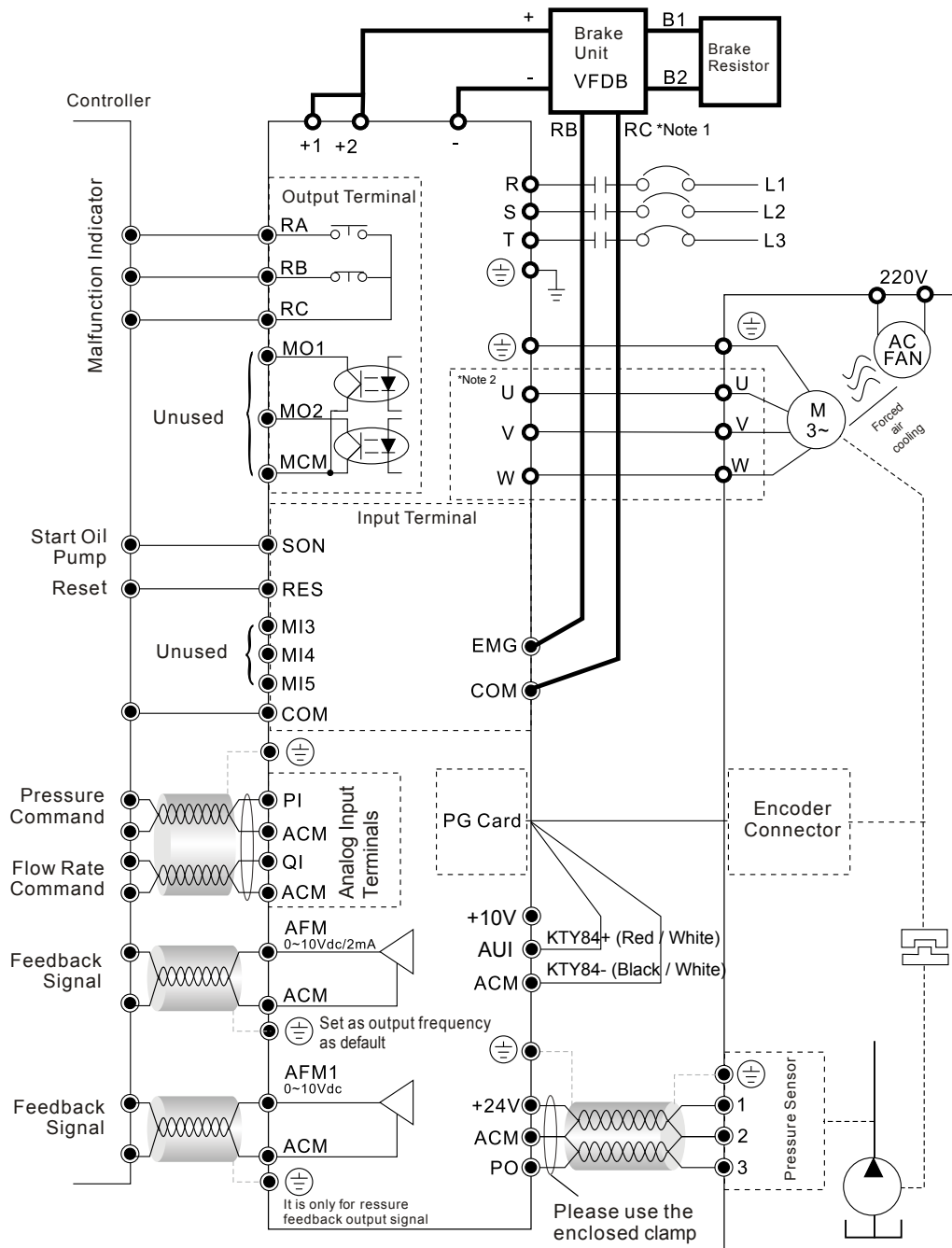
Wiring

HES063H23C ~ HES125H23C

HES063H43C ~ HES200H43C



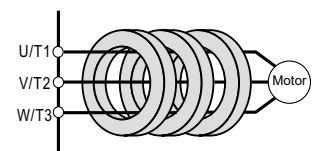
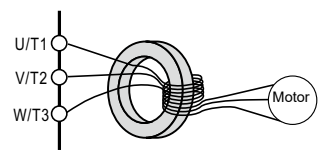
HES160H23C ~ HES250G23C
HES250M43C ~ HES320M43C



***Note 1:** The RB, RC connectors of the brake Unit is for overheating protection.

***Note 2:** For HES063H43C ~ HES100H43C (Please winding the wire through the zero phase reactor at least 3 turns before connecting to the motor)

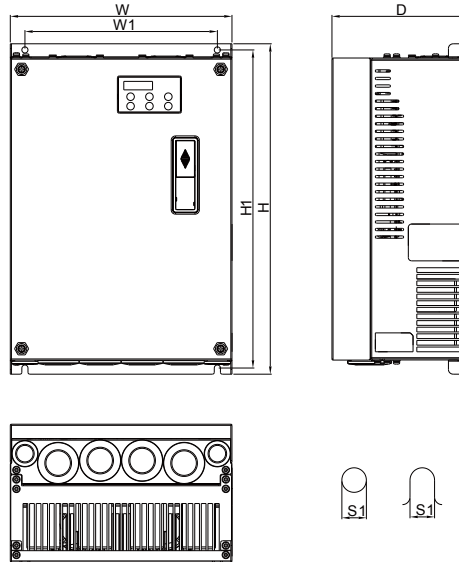
For HES063H23C ~ HES250G23C
 HES125H43C ~ HES320M43C



Dimensions

Hybrid Servo Controller

Frame C



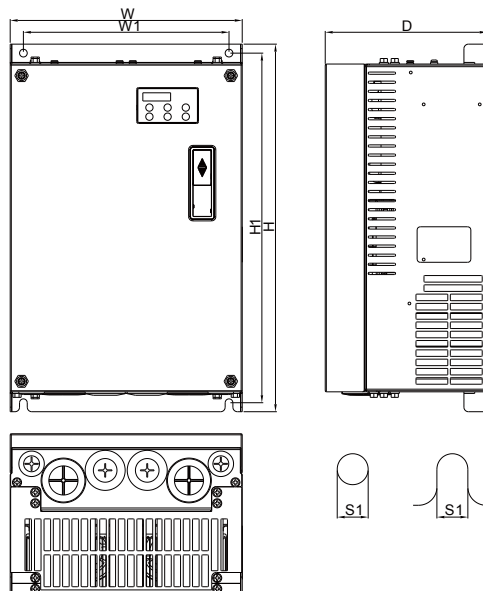
MODEL

VFD110 VL23Axxxx
 VFD110 VL43Axxxx
 VFD150 VL43Bxxxx
 VFD185 VL43Bxxxx

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

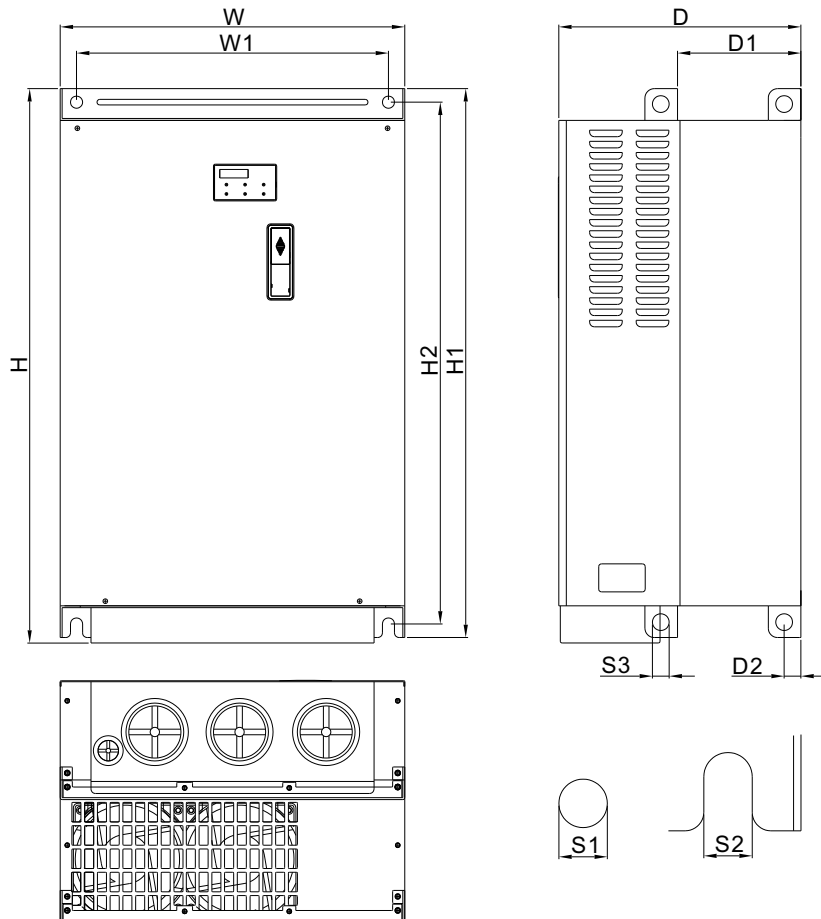
VFD150 VL23Axxxx
 VFD220 VL23Axxxx
 VFD220 VL43Axxxx
 VFD300 VL43Bxxxx

Unit: mm [inch]

Frame		W	H	D	W1	H1	S1
D	mm	255	403.8	168.0	226.0	384	8.5
	inch	10.04	15.90	6.61	8.90	15.12	0.33

Hybrid Servo Controller

Frame E2



MODEL

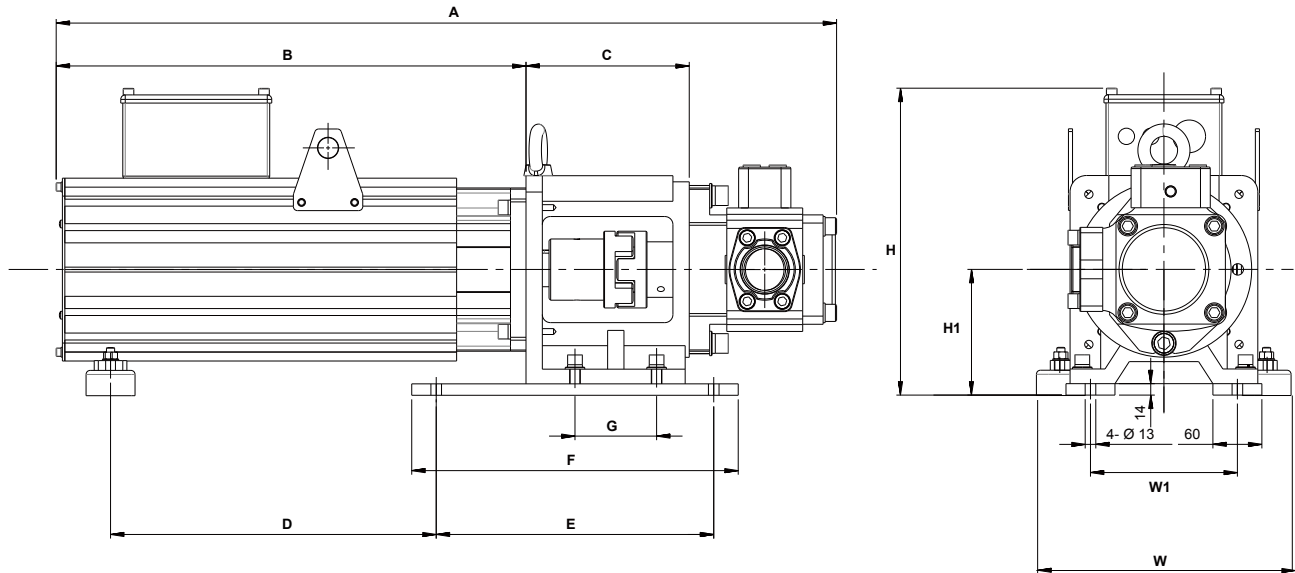
VFD300VL23Axxxx
 VFD370VL23Axxxx
 VFD550VL43Axxxx

Unit : mm [inch]

Frame		W	H	D	W1	H1	H2	D1	D2	S1	S2	S3
E2	mm	370.0	595.0	260	335.0	589.0	560.0	132.5	18.0	13.0	13.0	18.0
	inch	14.57	23.43	10.24	13.19	23.1	22.05	5.22	0.71	0.51	0.51	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	2" PT	1" PT
HES200H23C	956	575	200	399	340	400	100	376	154	314	180	2-1/2" 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

Accessories

Accessory Pack

A. Brake Resistor	B. Brake Unit	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	VFD300VL23A16HC	HSP-064-230-23C	HESP-160-H-BC23 Item: A, B, C, Dx3, E
HES200H23C	VFD300VL23A20HC	HSP-080-270-23C	HESP-200-H-BC23 Item: A, B, C, Dx3, E
HES250G23C	VFD370VL23A25GC	HSP-100-270-23C	HESP-250-G-BC23 Item: A, B, C, Dx3, E
HES063H43C	VFD110VL43A06HC	HSP-025-100-43C	HESP-063-H-NC43 Item: A, C, D, E
HES080H43C	VFD150VL43B08HC	HSP-032-100-43C	HESP-080-H-NC43 Item: A, C, D, E
HES100H43C	VFD185VL43B10HC	HSP-040-140-43C	HESP-100-H-NC43 Item: A, C, D, E
HES125H43C	VFD220VL43A12HC	HSP-050-180-43C	HESP-125-H-NC43 Item: A, C, Dx3, E
HES160H43C	VFD300VL43B16HC	HSP-064-230-43C	HESP-160-H-NC43 Item: A, C, Dx3, E
HES200H43C	VFD300VL43B20HC	HSP-080-250-43C	HESP-200-H-NC43 Item: A, C, Dx3, E
HES250M43C	VFD550VL43A25MC	HSP-125-450-43C	HESP-250-M-BC43 Item: A, B, C, Dx3, E
HES320M43C	VFD550VL43A32MC	HSP-160-520-43C	HESP-320-M-BC43 Item: A, B, C, Dx3, E

** Encoder cable is provided inside the Servo Pump (HSP) package for model CBHE-E5M, P/N: 3865345000.



Smarter. Greener. Together.

Industrial Automation Headquarters

Delta Electronics, Inc.

Taoyuan Technology Center
No.18, Xinglong Rd., Taoyuan District,
Taoyuan City 33068, Taiwan
TEL: 886-3-362-6301 / FAX: 886-3-371-6301

Asia

Delta Electronics (Shanghai) Co., Ltd.

No.182 Minyu Rd., Pudong Shanghai, P.R.C.
Post code : 201209
TEL: 86-21-6872-3988 / FAX: 86-21-6872-3996
Customer Service: 400-820-9595

Delta Electronics (Japan), Inc.

Tokyo Office
Industrial Automation Sales Department
2-1-14 Shibadaimon, Minato-ku
Tokyo, Japan 105-0012
TEL: 81-3-5733-1155 / FAX: 81-3-5733-1255

Delta Electronics (Korea), Inc.

Seoul Office
1511, 219, Gasan Digital 1-Ro., Geumcheon-gu,
Seoul, 08501 South Korea
TEL: 82-2-515-5305 / FAX: 82-2-515-5302

Delta Energy Systems (Singapore) Pte Ltd.

4 Kaki Bukit Avenue 1, #05-04, Singapore 417939
TEL: 65-6747-5155 / FAX: 65-6744-9228

Delta Electronics (India) Pvt. Ltd.

Plot No.43, Sector 35, HSIIDC Gurgaon,
PIN 122001, Haryana, India
TEL: 91-124-4874900 / FAX : 91-124-4874945

Delta Electronics (Thailand) PCL.

909 Soi 9, Moo 4, Bangpoo Industrial Estate (E.P.Z),
Pattana 1 Rd., T.Phraksa, A.Muang,
Samutprakarn 10280, Thailand
TEL: 66-2709-2800 / FAX : 662-709-2827

Delta Energy Systems (Australia) Pty Ltd.

Unit 20-21/45 Normanby Rd., Notting Hill Vic 3168, Australia
TEL: 61-3-9543-3720

Americas

Delta Electronics (Americas) Ltd.

Raleigh Office
P.O. Box 12173, 5101 Davis Drive,
Research Triangle Park, NC 27709, U.S.A.
TEL: 1-919-767-3813 / FAX: 1-919-767-3969

Delta Greentech (Brasil) S/A

São Paulo Office
Rua Itapeva, 26 – 3° Andar - Bela Vista
CEP: 01332-000 – São Paulo – SP - Brasil
TEL: 55-11-3530-8642 / 55-11-3530-8640

Delta Electronics International Mexico S.A. de C.V.

Mexico Office
Vía Dr. Gustavo Baz No. 2160, Colonia La Loma,
54060 Tlalnepantla Estado de Mexico
TEL: 52-55-2628-3015 #3050/3052

EMEA

Delta Electronics (Netherlands) BV

Eindhoven Office
De Witbogt 20, 5652 AG Eindhoven, The Netherlands
MAIL: Sales.IA.EMEA@deltaww.com
MAIL: Sales.IA.Benelux@deltaww.com

Delta Electronics (France) S.A.

ZI du bois Chaland 2 15 rue des Pyrénées,
Lisses 91056 Evry Cedex, France
MAIL: Sales.IA.FR@deltaww.com

Delta Electronics Solutions (Spain) S.L.U

Ctra. De Villaverde a Vallecas, 265 1° Dcha Ed.
Hormigueras – P.I. de Vallecas 28031 Madrid
C/Llull, 321-329 (Edificio CINC) | 22@Barcelona, 08019 Barcelona
MAIL: Sales.IA.Iberia@deltaww.com

Delta Electronics (Italy) Srl

Ufficio di Milano Via Senigallia 18/2 20161 Milano (MI)
Piazza Grazioli 18 00186 Roma, Italy
MAIL: Sales.IA.Italy@deltaww.com

Delta Electronics (Germany) GmbH

Coesterweg 45, D-59494 Soest, Germany
MAIL: Sales.IA.DACH@deltaww.com

Delta Energy Systems LLC (CIS)

Vereyskaya Plaza II, office 112 Vereyskaya str.
17 121357 Moscow, Russia
MAIL: Sales.IA.RU@deltaww.com

Delta Greentech Ltd. (Turkiye)

Serifali Mevkii Barbaros Bulvari Soylesi Sok
No 19 34775, Y.Dudullu-Umraniye/Istanbul
MAIL: Sales.IA.Turkey@delta-emea.com

Delta Energy Systems AG (Dubai BR)

P.O. Box 185668, Gate 7, 3rd Floor, Hamarain Centre,
Dubai, United Arab Emirates
MAIL: Sales.IA.MEA@deltaww.com