crydom®

DP Series
Solid State Contactors

The Global Expert in Solid State Relay Technology

A brand of CST
CUSTOM SENSORS & TECHNOLOGIES

ABOUT US

Crydom, a brand of Custom Sensors & Technologies (CST) and **global expert in Solid State Relay Technology**, has a distinguished record of providing high quality, world class Solid State Relay and Control Products for a variety of heating, lighting and motion control applications. Crydom products, coupled with **unparalleled technical support, timely delivery and competitive pricing**, provide Crydom's clients with the innovative products and support necessary to succeed in today's competitive and fast paced global markets.

Crydom's extensive selection of standard off-the-shelf products is constantly being updated and expanded through its continuous improvement and aggressive new product development programs. Utilizing state of the art designs, materials and technology, Crydom offers a wide range of AC and DC output SSRs in industry standard Panel Mount, PCB Mount and DIN Rail packages, all **meeting global safety and standards agency requirements** such as CE, RoHS, UL, IEC, etc.

Bolstered by four decades of Solid State Relay operations experience, Crydom also specializes and encourages **adapted and fully custom-designed SSR products** for nearly any application where unique specifications and optimized performance are critical for success.

Crydom's modern purpose-built **100,000 square foot manufacturing facility** houses all aspects of its ISO certified operation including Design and Development Engineering, Manufacturing Operations and Quality Assurance, Customer Service, Finance, Marketing and General Management, permitting close coordination of all aspects of Crydom's activities. Applications Engineering and Sales support are both performed in the field to provide Crydom's Customers with the unparalleled technical and commercial support.

Following rigid design guidelines and standards, Crydom products have set the bench mark for SSR performance and reliability world wide. In addition to **award winning designs**, Crydom has acquired an impressive list of **patents** related to SSRs and Solid State Controls, while continuing to develop new circuit and technology-related inventions as part of **extensive R&D programs**.

To learn more about Crydom SSR technology and products, or how an alliance with Crydom can contribute to the success of your project, visit **www.crydom.com** or contact your authorized Crydom Distributor or Crydom Customer Service Representative today.

DP SERIES SOLID STATE CONTACTORS

Panel Mounted DC Load Reversing Solid State Contactors

The **DP Series** of DC Load Reversing Solid State Contactors (SSCs) include four optically isolated DC low dissipation FET outputs rated up to 60 amps at 48 VDC, wired in an H-Bridge configuration with a common input control to provide a convenient method to both power on and off and reverse the polarity to a variety of DC loads including motors, brakes, clutches, electro magnets, solenoids, plating baths and electrolytic cells. The **DP Series** is housed in a compact encapsulated industry standard 75 x 105 mm panel mount package featuring screw termination for power and load connections and a 4 conductor connector for control connections.

Flexible Control of DC Load

In addition to the on/off and reversing functions, **DP Series** Contactors include an internal interlock circuit to prevent damage due to overlapping forward/reverse control commands . The **DP Series** also offers options for a variety of combinations of Internal PWM Soft Start/Ramp Up, PWM Soft Stop/Ramp Down and Dynamic Brake functions. Available with a selection of set ramp times, the soft start and stop functions provide a convenient means to eliminate or reduce the mechanical shocks associated with starting and stopping DC electro-mechanical loads.

Ratings & Approvals

The **DP Series** of Solid State Contactors are available with either 20, 40 or 60 Amp general use ratings in a 40°C ambient temperature with appropriate heat sinking. The output will switch from 1 to 48 VDC. Available control inputs are conveniently matched to the input logic supply to accept either 4.5 to 15 VDC or 18 to 32 VDC from a common power supply. **DP Series** SSCs are CE Certified, RoHS Compliant, UL/cUL Recognized and carry Motor Control Ratings up to 15 FLA at 48 VDC.

For additional information about the **DP Series** DC Reversers, including available thermal management accessories, contact the nearest Crydom Distributor, Representative or local Crydom Sales Office, or visit our website at www.crydom.com.

DP Series

DC Load Reversing Solid State Contactors

- Convenient FET switches in H-Bridge configuration
- Control features to combine Soft Start/Ramp Up, Soft Stop/Ramp Down & Braking functions on each polarity
- Built-in protective Forward/Reverse interlock function
- 20 , 40 & 60 Amps Operational Current rating
- 48 VDC Rated Operating Voltage
- UL & IEC ratings for general use & Motor loads
- 4.5 to 15 VDC & 18 to 32 VDC Input Control Voltage options available
- LED Status indicators for Operating Modes
- Industry standard 75 x 105 mm Panel Mount package

Output Specifications (A)	DP4Rxx60x20xx	DP4Rxx60x40xx	DP4Rxx60x60xx
Operating Voltage Range [VDC]	1-60	1-60	1-60
Rated Operating Voltage [VDC]	48	48	48
Maximum Off-State Leakage Current @ Rated Voltage [µA]	20	20	20
Minimum Load Current [A]	0.10	0.10	0.10
Maximum Surge Current (10 ms) [ADC] (B)	80	140	240
Maximum On-State Resistance, per FET switch (RDS-ON) [Ohm]	0.014	0.007	0.005
Maximum On-State Voltage Drop @ Rated Current [VDC]	0.28	0.28	0.3
Total Power Dissipation per module, 2 FET switches conducting, Tj=100° C [Watts]	20	40	60
Combined Thermal Resistance Junction to Case (Rjc) [°C/W]	0.4	0.2	0.13
Internal PWM For Soft Start/Stop Versions (Duty Cycle 10-100%) [Hz]	200	200	200
UL 508 General Use Load Current @ Rated Voltage [A] (C)	20	40	60
UL 508 Motor Controller Load Current @ Rated Voltage [FLA] (C)	13	14	15
IEC 60947-4-1 DC-1 Load Current @ Rated Voltage [ADC] (C)	20	40	60
IEC 60947-4-1 DC-3 Load Current @ Rated Voltage [FLA] (C)	13	14	15

Input Specifications (A)	DP4Rxx60D40xx	DP4Rxx60E40xx
Logic Supply Voltage Range (pin 5) [VDC]	4.5 - 15	18 - 32
Min/Max Logic Supply Current (pin 5) [mA] (D)	16/20	20/25
Control Voltage Range (pin 7, pin 8) [VDC]	4.5 - 15	18 - 32
Minimum Control Input Current @ Min voltage (pin 7, pin 8) [mA]	0.20	1
Maximum Control Input Current @ Max voltage (pin 7, pin 8) [mA]	1	2
Typical Interlocking Time [msec]	200	200

General Specifications (A)	DP4Rxx60x20xx	DP4Rxx60x40xx	DP4Rxx60x60xx
Dielectric Strength, Input-Output to Baseplate (50/60Hz) [Vrms]	2500		
Minimum Insulation Resistance @ 500 VDC [Ohm]	10^9		
Maximum Capacitance, Input to Output [pF]	28		
Ambient Operating Temperature Range [°C]	-30 to 80		
Ambient Storage Temperature Range[°C]	-40 to 125		
Housing Material (Shell)	Black, UL 94 V-0		
Encapsulation	Thermally conductive Epoxy		
Weight (typical) [oz] (gr)	10.93 (310)	12.16 (345)	
Input Locking Connector	Rectangular Header, Male Pin 4 Positions, 0.100 in [2.54] Pitch (E)		
Output Terminals	Screw / Clamp Combo Type 10-32	Hex Screw Type 1/4-20 with lock washers	
Maximum Torque [in-lbs] (Nm)	20 (2.2597)	25 (2.8246)	
Input Connector Wire Capacity	AWG #24 (0.2 mm^2)		
Wire Size for Maximum Ratings (with terminals)	AWG #12 (IEC 3.3 mm^2)	AWG #8 (8.4 mm^2)	AWG #6 (IEC 13.3 mm^2)
IP rating	IP00		
LED Status Indicator	Green LED (Forward), Yellow LED (Reverse). See TABLE 2		
IEC 60068-2-6 : Vibration	Compliant (1.5 mm / 10-55 Hz)		
IEC 60068-2-27 : Shock	Compliant (15 G / 11 ms)		
IEC 61000-4-2 : Electrostatic Discharge	Level 2		
IEC 61000-4-4 : Electrically Fast Transients	Level 2 - Criteria A		
IEC 61000-4-5 : Electrical Surges	Level 2 - Criteria B		

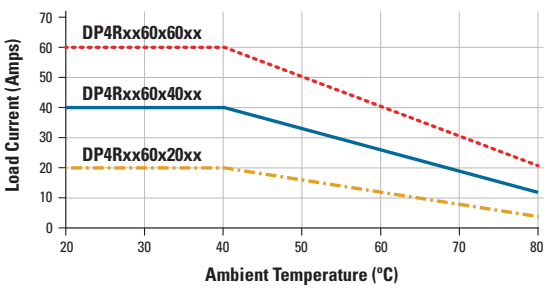
General Notes

(A) All parameters at 25°C unless otherwise specified.
(B) Maximum Surge Current rating not to be exceeded during motor Starting or Dynamic Braking.
(C) For maximum ratings use heat sink ratings in TABLE 1.
(D) Input circuit incorporates active current limitation.
(E) Suggested mating connector/plug : Crimp Housing, Positive Latch (Molex 050579404).

TABLE 1

DP Series Part No.	Required Heat Sink [°C/W]	Crydom Heat Sink Part No.
DP4Rxx60x20xx	1.5	HS103 / HS103DR
DP4Rxx60x40xx	1.0	HS103 / HS103DR
DP4Rxx60x60xx	0.5	HS053

Derating Curves (C)



Complete specifications of these & other Crydom products available at: **www.crydom.com**

Part Number Nomenclature (F)

Series

DP **4R** **SB** **60** **D** **40** **B** **H**

Start Mode
Blank: Start
SA: Soft Start/Ramp Up, 0.2 sec
SB: Soft Start/Ramp Up, 0.5 sec
SC: Soft Start/Ramp Up, 1 sec

Function
4R: 4 Channel DC Reversing

Rated Operating Voltage
60: 48 VDC

Control Voltage
D: 4.5-15 VDC
E: 18-32 VDC

Operational Current
20: 20 Amps
40: 40 Amps
60: 60 Amps

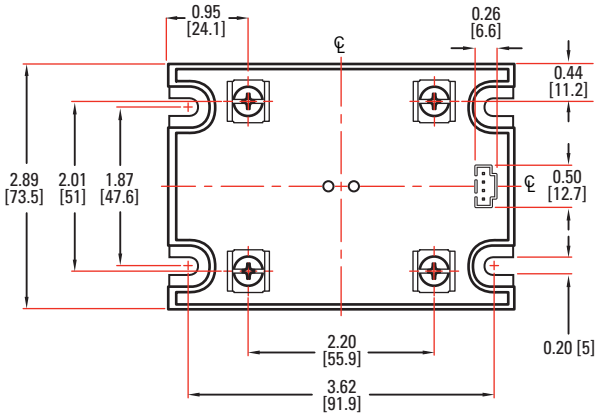
Stop Mode
Blank: Stop Mode matches Start Mode
B2: Dynamic Brake, 0.2 sec
B5: Dynamic Brake, 0.5 sec
B8: Dynamic Brake, 0.8 sec
B: Dynamic Brake, Continuous

Thermal Pad
Blank: Not Included
H: Included

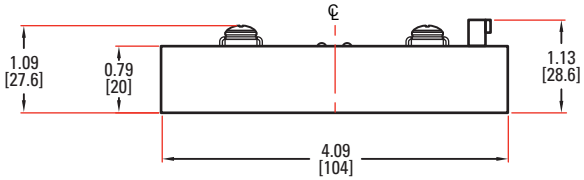
Required for valid part number
For options only and not required for valid part number

Mechanical Dimensions (G)

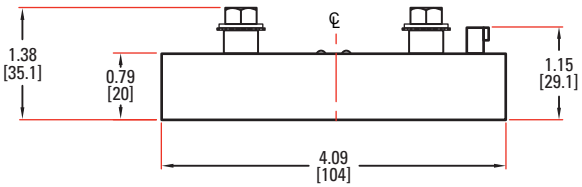
Tolerances: ±0.02 in / 0.5 mm
All dimensions are in: inches [millimeters]



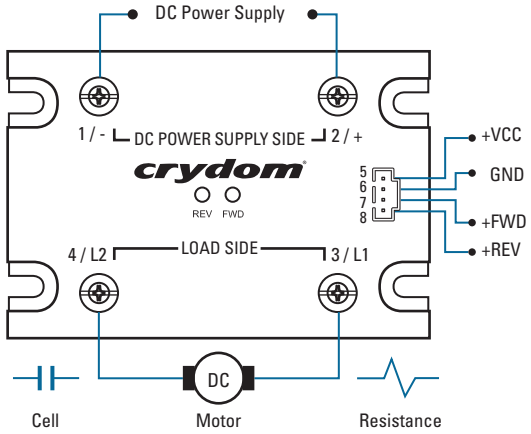
DP4Rxxxxx20



DP4Rxxxxx40 & DP4Rxxxxx60



Wiring Diagram



Block Diagram

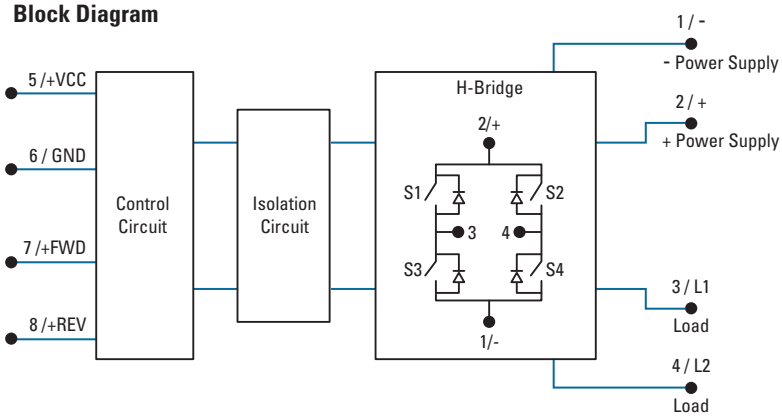


TABLE 2

Status Functions	Green LED (Forward)	Yellow LED (Reverse)
Initial Logic Supply Voltage On	Flash Twice	Flash Twice
Forward ON	ON	OFF
Reverse ON	OFF	ON
Dynamic Brake	Flash Once	Flash Once
Interlocking	Flash 3x Intermittently	Flash 3x Intermittently

TABLE 3

DP Series Part No.	Accessories					
	HK1	HS053	HS103 HS103DR	HSP-3 HSP-5	TRM1	TRM6
DP4Rxx60x20xx	◆		◆	◆		◆
DP4Rxx60x40xx	◆		◆	◆	◆	
DP4Rxx60x60xx	◆	◆		◆	◆	

(F) For a complete description of available Operating Modes, see definitions on page 5.
(G) Baseplate Thickness 0.125 [3.2]

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Operating Modes

Start: When either FWD or REV Control signal is applied, and after Control Signal Validation Delay, DC power supply on terminals 1/- and 2/+ is directly connected to Load at terminals 3/L1 and 4/L2 with a polarity according to the control signal. The start option can be combined with Stop and/or Dynamic Brake options.

Stop: Load is disconnected from DC power supply. All FET switches (S1, S2, S3 & S4) inside the DP Series SSC are turned off. This simple Stop option is available only in combination with the simple Start option (suffix Blank).

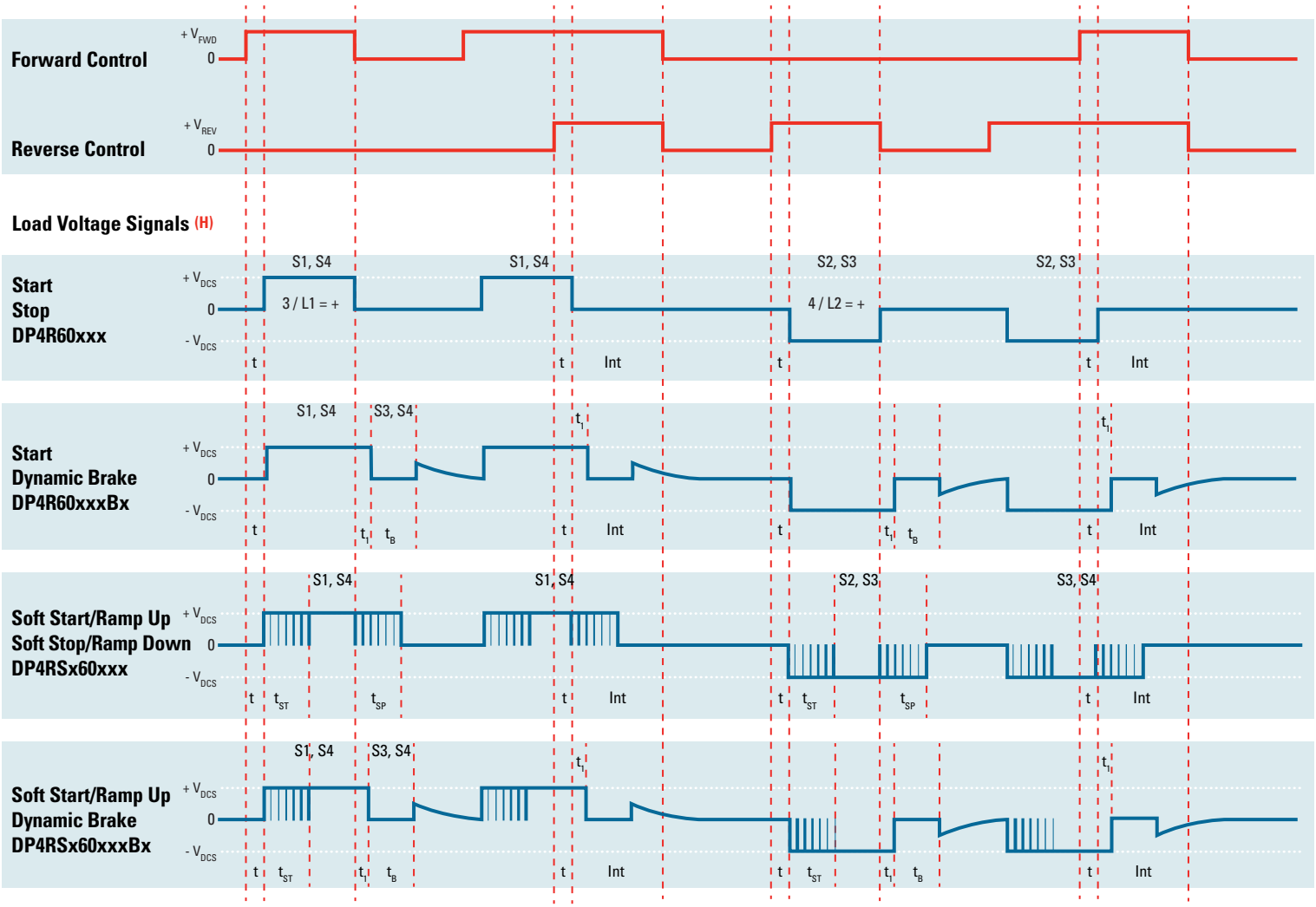
Soft Start/Ramp Up: It is a modified Start where the DC power supply is connected to the load using a 200 Hz pulse width modulation with a duty cycle going from 10% to 100%. Soft Start/Ramp Up time is defined by SA, SB and SC suffixes. After Soft Start/Ramp Up time is elapsed, the Load will remain continuously energized for as long as FWD or REV Control signal is applied. This option can be combined with Soft Stop/Ramp Down and Dynamic Braking modes, but not with simple Stop.

Soft Stop/Ramp Down: It is a modified Stop where the DC power supply is disconnected from the Load using a 200 Hz pulse width modulation with a duty cycle going from 100% to 0%. After Soft Stop/Ramp Down time is elapsed, the Load will remain continuously de-energized waiting for a new FWD or REV Control signal. Soft Stop/Ramp Down time is tied to Soft Start/Ramp Up time selected by SA, SB and SC suffixes and can be combined with Soft Start/Ramp Up only.

Dynamic Brake: It could be used as a modified Stop where the FET switches inside the DP Series SSC are arranged in such a way that they provide a path for the Load Current to keep flowing after the DC power supply has been disconnected. This mode allows for energy stored in some type of loads to be discharged. i.e. back EMF on DC motors. Timing for Dynamic Brake is selected by suffixes B2, B5, B8 and B where the latest will keep the braking or discharging path enabled for as long as FWD and REV Control signals are removed.

Interlock: It will shut down all FET switches inside the DP Series SSC within 0.2 sec after both control signals FWD and REV are applied at the same time. An Interlock condition will trigger a modified Stop such as Soft Stop/Ramp Down or Dynamic Brake whenever an option has been selected.

Control Signals



Int : Interlock
t : Control Signal Validation Delay = 0.2 sec, except for Start / Stop (0.025 sec)
t_I : 0.15 sec Break-before-make delay
t_B : Dynamic Brake time
- B2: 0.2 sec
- B5: 0.5 sec
- B8: 0.8 sec
- B: Continuous

t_{SP} : Soft Stop/Ramp Down time = t_{ST}
t_{ST} : Soft Start/Ramp Up time
- SA: 0.2 sec
- SB: 0.5 sec
- SC: 1 sec

V_{DCS}: VDC power supply
V_{FWD}: Forward Control Signal
V_{REV}: Reverse Control Signal

(H) Load voltage signals shown are typical of a DC motor, behavior may change for other load types.

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