



DART CONTROLS

Full Line Catalog

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Dart Delivers What You Want... When You Need It!



Since 1963, Dart Controls has been designing and manufacturing variable speed drives, controls, and accessories for electric motors in our Zionsville, Indiana facility.

Our Mission is to lead the market in development of technologically advanced variable speed motor controls and accessory products while maintaining our commitment to customers, employees and owners.

Our Passion is to develop or make available for sale the broadest range of products possible to meet customer's variable speed drive and motor requirements. We listen to customers and when needed, we will

modify existing or add a new design to our product offering. We also leverage our industry relationships to make available for sale related products (AC drives, motors and gear reducers for example) from manufacturers who share our passion for excellence and value.

This Total Solutions Provider approach allows us to deliver Total Value to our customers.

**DART DELIVERS!
PUT US TO THE TEST.**



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ISO 9001:2008 REGISTERED RoHS Compliant

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530 Series Variable Speed Control

NEMA 4/12



"RC" Chassis



Washdown Duty



Speed Potentiometer
Kit Included

Dart's most fully featured analog DC speed control is reliable, versatile, and economical. Rated to 3 horsepower, it provides many standard features typically offered as options.

The Dart 530 Series control combines advanced engineering design, quality component selection and rigorous quality control to deliver an excellent off-the-shelf SCR control.

Dependable, time-proven circuitry offers performance characteristics previously available only in more costly controls.

While providing a wide range of standard features, many options quickly and easily extend the 530 Series' capabilities to meet specific application requirements.

An integral part of a distinguished line of quality products, the 530 Series is representative of Dart's continuing effort to provide reliable, versatile controls to the OEM, distributor, and the industrial markets.

530 SERIES STANDARD FEATURES

- Dual 120/240 VAC, 50/60Hz via slide selector switch
- Adjustable horsepower settings
- Barrier terminal strip
- Packaged bridge supply (fullwave)
- 1% speed regulation with armature voltage feedback; $\pm 1/2\%$ with tach feedback
- Adjustable Minimum speed (0-30% of max)
- Adjustable Maximum speed (60-120% of base)
- Adjustable IR Compensation
- Adjustable Linear Acceleration (0.3–12 sec.)
- Adjustable Linear Deceleration (0.6–12 sec.)
- Adjustable Current Limit
- Line voltage compensation
- 5K ohm speed potentiometer with leads, dial and knob included
- Power on/off switch and indicator lamp (RE version)
- Power interrupt relays (RC & RE versions). Permits local and/or remote switching of AC power with low current momentary contacts. Prevents automatic restart after interruption of AC power.
- 50:1 speed range
- Overload capacity: 200% for one minute
- Transient voltage protection
- Voltage following mode or DC tachometer follower by supplying ungrounded analog input signal (0-12 VDC)
- DC tachometer feedback (jumper selectable 3V or 7V per 1000 RPM)
- Inhibit circuit - permits start and stop without breaking AC lines
- Shunt field supply provided (1 Amp max; 100V for 120 VAC; 200V for 240 VAC input)
- 2 AC line fuses
- +12 VDC, 12mA power supply, user accessible
- Enclosed models rated NEMA 4/12

530 SERIES SELECTION GUIDE

H.P. RANGE	CHASSIS "C"	ENCLOSED "RE"	CHASSIS WITH RELAY "RC"
<i>115 VAC Single Phase Input, 0-90 VDC Output¹</i>			
1/8 - 1.0	530BC	530BRE	530BRC
1.5	533BC	Available in chassis only, limited options available.	
<i>230 VAC Single Phase Input, 0-180 VDC Output</i>			
1/4 - 2.0	530BC	530BRE	530BRC
3.0	533BC	Available in chassis only, limited options available.	

Horsepower settings are adjustable, see installation manual. Control is tested and calibrated for maximum horsepower in its category.

1 - Regulated output voltage adjustable to 130 VDC, dependent upon motor horsepower rating.

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	LENGTH	DEPTH	WEIGHT
<i>English (inches)</i>				
Chassis	6.70	9.00	2.00	40 oz.
Enclosed	6.70	10.00	4.75	56 oz.
<i>Metric (centimeters)</i>				
Chassis	17.02	22.86	5.08	1134 gm.
Enclosed	17.02	25.40	12.07	1422 gm.

OPERATING CONDITIONS

Temperature -10° to +45° C.
 AC Input Voltage $\pm 10\%$ Rated Line Voltage
 Input Frequency 50/60 Hz.

ELECTRICAL SPECIFICATIONS AC INPUT 50/60 HZ

115 VAC Single Phase Input, 0-90 VDC Output

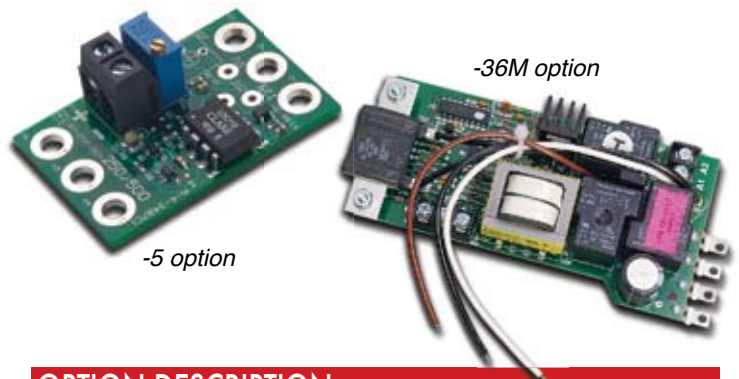
H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/8	1.8	0.22	1.4
1/6	2.6	0.31	2.1
1/4	3.5	0.42	2.7
1/3	4.4	0.53	3.4
1/2	6.5	0.78	5.0
3/4	9.3	1.12	7.2
1.0	13.2	1.58	10.2
1.5	21.5	2.57	14.7

230 VAC Single Phase Input, 0-180 VDC Output

H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/4	1.8	0.42	1.4
1/3	2.2	0.53	1.7
1/2	3.3	0.78	2.5
3/4	4.8	1.15	3.7
1.0	6.5	1.56	5.0
1.5	9.7	2.33	7.5
2.0	12.9	3.10	9.9
3.0	22.0	5.30	15.0

* Minimum Armature Amps: 150mA D.C.

POPULAR OPTIONS



OPTION DESCRIPTION

OPTION	SUFFIX
Jog (enclosed only)	-4
4-20mA isolated signal follower (chassis only).....	-5*
-5 option with Auto/Manual function.....	-7*
Extended linear Accel/Decel range (to 30 sec.)	-15A
NEMA 4/12 Enclosure	Standard
Forward/Reverse with Dynamic brake and zero speed detect. Direction controlled with SPDT switch, relay contact (dry contact switching), or NPN open collector. Once direction change is initiated, cannot be aborted until motor stops; prevents relay contact welding (available through 2 H.P.)	
120 VAC (factory installed only).....	-36M/MA ¹
240 VAC (factory installed only)	-38M/MA ¹

Other options are available, please consult factory for your requirement.

* Field installable on chassis version only.

1—"A" version dynamic brake resistor rating - 50W.

253 Series Variable Speed Control

Chassis

NEMA 4/12



Washdown Duty

Speed Potentiometer
Kit Included



The **253 Series** offers superb flexibility, reliability, and value. A general purpose, economical control rated to 2 horsepower, it provides the ultimate in standard features and versatility including: **dual voltage (120/240 VAC), adjustable H.P. settings, packaged power bridge, barrier terminal strip, fully rated-no auxiliary heatsink required, and chassis or NEMA 4/12 enclosure.** Many options further extend the 253's capabilities.

A logical, easily accessible layout simplifies installation and adjustment. Clean design, quality components and careful assembly are trademarks of Dart Controls.



253 SERIES STANDARD FEATURES

- Dual voltage - 120/240 VAC, 50/60Hz
- Adjustable horsepower settings
- Barrier terminal strip
- Packaged bridge supply (fullwave)
- 1% speed regulation with armature voltage feedback; $\pm 1/2\%$ with tach feedback
- Adjustable Minimum speed (0–30% of max)
- Adjustable Maximum speed (66–110% of base)
- Adjustable IR Compensation
- Adjustable Linear Acceleration (0.5-8 sec.)
- Adjustable Current Limit to 15 Amps
- Line voltage compensation
- 5K ohm speed potentiometer with leads, knob and dial included
- Power on/off switch (enclosed models)
- 50:1 speed range
- Overload capacity: 150% for one minute
- Transient voltage protection
- Voltage following mode or DC tachometer follower by supplying ungrounded analog input signal (0–12 VDC)
- DC tachometer feedback (6V at base speed)
- Inhibit circuit - permits start & stop without breaking AC lines
- Remote start/stop via pot circuit or inhibit circuit
- Shunt field supply provided (1 Amp max; 100V for 120 VAC; 200V for 240 VAC input)
- AC line fuse
- Enclosed models rated NEMA 4/12 w/threaded conduit holes

253 SERIES SELECTION GUIDE

H.P. RANGE CHASSIS "C" ENCLOSED "E"

120 VAC Single Phase Input, 0-90 VDC Output

1/50 - 1/8 251G-12C 251G-12E

1/8 - 1.0 253G-200C 253G-200E

240 VAC Single Phase Input, 0-180 VDC Output

1/25 - 1/4 251G-12C 251G-12E

1/4 - 2.0 253G-200C 253G-200E

Horsepower settings are adjustable, 1/50 thru 1/8 and 1/8 thru 2 - see installation manual. Control is tested and calibrated for maximum horsepower in its category.

DIMENSIONAL SPECIFICATIONS

MODEL WIDTH LENGTH DEPTH WEIGHT

English (inches)

Chassis 5.53 7.00 1.63 14.25 oz.

Enclosed 5.53 7.25 2.75 17.50 oz.

Metric (centimeters)

Chassis 14.1 17.78 4.14 404 gm.

Enclosed 14.1 18.42 6.98 486 gm.

OPERATING CONDITIONS

Temperature -10° to +45° C.

AC Input Voltage $\pm 10\%$ Rated Line Voltage

Input Frequency 50/60 Hz.

ELECTRICAL SPECIFICATIONS AC INPUT 50/60 HZ

120 VAC Single Phase Input, 0-90 VDC Output

H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/50	0.5	0.06	0.4
1/20	1.0	0.12	0.8
1/8	2.0	0.24	1.6
1/4	3.5	0.42	2.7
1/3	4.4	0.53	3.4
1/2	6.5	0.78	5.0
3/4	9.3	1.12	7.2
1	13.2	1.58	10.2

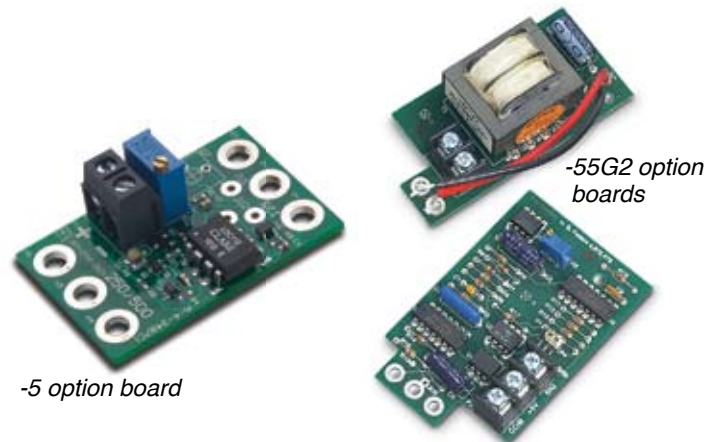
240 VAC Single Phase Input, 0-180 VDC Output

H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/4	1.8	0.42	1.4
1/3	2.2	0.53	1.7
1/2	3.3	0.78	2.5
3/4	4.8	1.15	3.7
1	6.5	1.56	5.0
1 1/2	9.7	2.33	7.5
2	12.9	3.10	9.9

For dual voltage 250 series, use table for the input voltage you are using.

* Minimum Armature Amps: 150mA D.C.

POPULAR OPTIONS



OPTION DESCRIPTION

OPTION	SUFFIX
NEMA 4X Enclosure	-4X
4-20mA isolated signal follower (chassis only).....	-5*
-5 option with Auto/Manual function.....	-7 ¹
Decel equals Accel time	-17B
Forward-Off-Reverse manual switch (center blocked, no Dynamic Brake—enclosed only)	-29
Forward-Off-Reverse manual switch (center blocked, no Dynamic Brake - chassis only).....	-29B
Torque control (enclosed only)	-34A
Isolated voltage follower (120/240 VAC input) – controls speed from any external grounded or ungrounded signal: 0-5 VDC thru 0-250 VDC adjustable (chassis only).....	-55H2*
-55H2 option with Auto/Manual function	-56H2 ¹

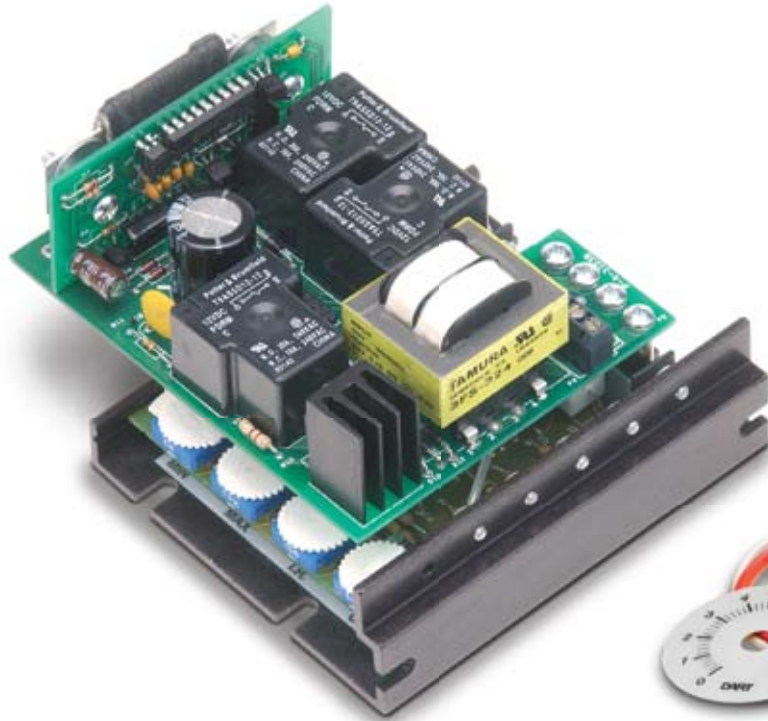
Other options are available, please consult factory for your requirement.

* Field installable

1—Enclosed version is factory installed only. Chassis version is field installed.

130 Series Reversing Control

For PM and Shunt Wound DC Motors through 2 HP



Speed Potentiometer
Kit Included



Instant reversing, quick stopping, rapid cycling... The 130 Series reversing control outperforms other dynamic braking and reversing controls by utilizing Dart's unique zero-speed detect and dynamic braking circuits. These circuits eliminate the contact arcing and failed braking problems associated with other reversing and dynamic braking controls. Dart's zero speed detect circuit also eliminates motor plug reversing problems.

In the event of a power loss or emergency stop condition, the 130 Series control will drop into a dynamic brake condition to safely and quickly bring the motor to a stop and remain there until power is reapplied and a run condition is recognized.



130 SERIES STANDARD FEATURES

- Adjustable horsepower settings
- Barrier terminal blocks
- Full wave bridge supply
- Adjustable Min speed (0-30% of max)
- Adjustable Max speed (66-100% of base)
- Adjustable IR compensation
- Adjustable current limit
- Fixed accel (0.5 sec)
- Line voltage compensation
- 5K speed pot with leads, dial and knob included
- 50:1 speed range
- Overload capacity: 200% for one minute
- Transient voltage protection
- Shunt field supply provided (1 Amp max; 100V for 120 VAC input or 200V for 240 VAC input)
- Onboard dynamic brake resistor
- Automatic dynamic braking on power loss
- 1% speed regulation with armature voltage feedback

130 SERIES OPERATING CONDITIONS

Temperature..... -10° to +45° C
 AC Input Voltage ±10% Rated Line Voltage
 Input Frequency 50/60 Hz

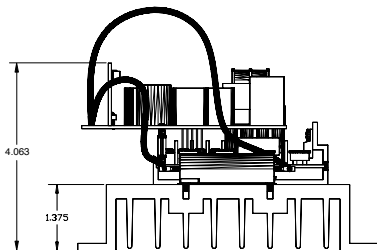
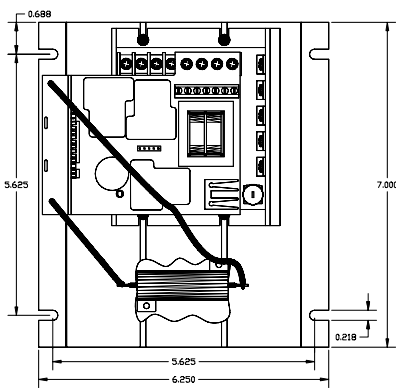
TYPICAL APPLICATIONS

- Door Openers
- Feeders
- Tapping Machines
- Pumps
- Screen Presses
- Conveyors

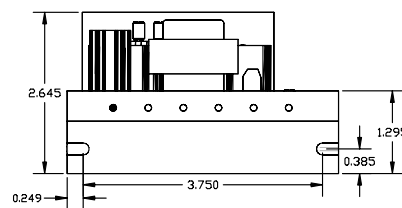
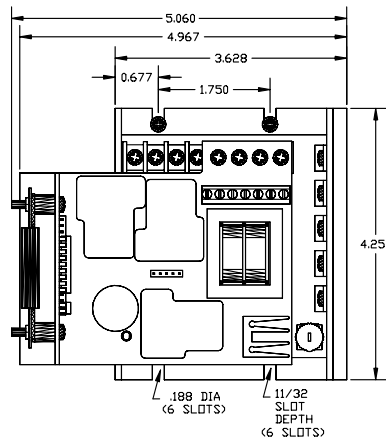
130 SERIES MODEL NUMBERS AND RATINGS

MODEL	INPUT VOLTAGE	OUTPUT HP RANGE	CYCLE AMPS DC	RATE
130LC12	120 VAC	1/15-1/8	1.2	3 C/MIN
130LC100	120 VAC	1/8-1/2	5.5	3 C/MIN
130HC12	120 VAC	1/15-1/8	1.2	UP TO 30 C/MIN
130HC100	120 VAC	1/8-1.0	10.0	UP TO 30 C/MIN
132LC25	240 VAC	1/25-1/4	1.2	3 C/MIN
132LC200	240 VAC	1/8-1.0	5.5	3 C/MIN
132HC25	240 VAC	1/25-1/4	1.2	UP TO 30 C/MIN
132HC200	240 VAC	1/4-2.0	10.0	UP TO 30 C/MIN

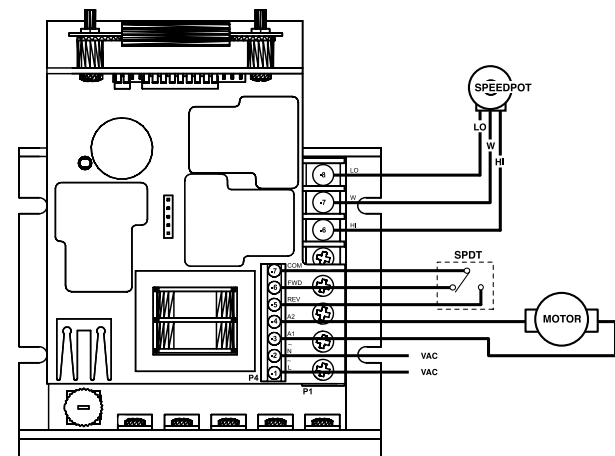
130 SERIES MECHANICAL SPECIFICATIONS, ADJUSTMENTS AND HOOK-UPS



130 Series HC Models



130 Series LC Models



130 Series Hook-up

All dimensions in inches

125 Series Variable Speed DC Control



125DV200EW-29

125DV200EB-29-4

125DV-C



Speed Potentiometer
Kit Included

The 125 Series is a compact, cost efficient, reliable control for PM, shunt wound, and universal motors that incorporates up-to-date design and engineering into a compact package.

Installation and field adjustments are facilitated using a barrier type terminal strip and large, easily adjusted trimpots. Adjustable horsepower range.

The 123D-C model operates on a low input voltage of 24/36 VAC with an output of 150mA–5.5 ADC

Standard features include an inhibit circuit for start-stop operation and 1% speed regulation over a 50:1 speed range. **Dual voltage 120/240VAC or 24/36VAC models are available.**

Long life and quality are assured by 100% full load testing. The 125 Series is ideal for applications such as: office machinery, conveyors, office packaging equipment, printers, process equipment, centrifuges, and exercise equipment.

History Note-1973
OPEC oil embargo causes 200% spike in gas prices; long lines at the pump
Dart introduces first SCR control for industrial use

125 SERIES STANDARD FEATURES

- Dual Voltage 120/240 VAC or 24/36 VAC, 50/60Hz
- Adjustable horsepower settings
- Barrier terminal strip
- Full wave bridge supply
- 1% speed regulation with armature voltage feedback; $\pm 1/2\%$ with tach feedback
- Adjustable Minimum speed (0–30% of max)
- Adjustable Maximum speed (66–100% of base)
- Adjustable IR Compensation
- Adjustable Current Limit
- Adjustable Acceleration & Deceleration (enclosed models)
- Line voltage compensation
- 5K ohm speed potentiometer with leads, dial & knob included
- 50:1 speed range
- Overload capacity: 200% for one minute
- Transient voltage protection
- Voltage following mode or DC tachometer follower by supplying ungrounded analog input signal (0–12 VDC)
- DC tachometer feedback (6V at base speed)
- Inhibit circuit—permits start & stop without breaking AC lines
- Shunt field supply provided (1 Amp max; 100V for 120 VAC; 200V for 240 VAC input)

125 SERIES SELECTION GUIDE

H.P. RANGE	MODEL	INPUT	OUTPUT
<i>Chassis Models</i>			
150mA - 5.5ADC	123D-C	24/36 VAC	0-20/30 VDC
1/50 - 1/8 } 1/25 - 1/4 }	125D-12C	120 VAC	0-90 VDC
		240 VAC	0-180 VDC
1/8 - 1/2* } 1/4 - 1.0* }	125DV-C	120 VAC	0-90 VDC
		240 VAC	0-180 VDC
<i>Enclosed Models</i>			
1/8 - 1 } 1/4 - 2 }	125DV200E	120 VAC	0-90 VDC
		240 VAC	0-180 VDC

* With suitable external heatsink. UL rating for output amps can be increased from 5.5 amps DC to 10.0 amps DC.

Horsepower settings are adjustable - see installation manual. Control is tested and calibrated for maximum horsepower in its category.

ENCLOSED MODEL - STANDARD OPTIONS

125DV200EB.....	Black Body, On/Off Switch, Speed Pot
125DV200EW.....	White Body, On/Off Switch, Speed Pot
125DV200EB-29	Black Body, On/Off and FWD/REV Switch, Speed Pot
125DV200EW-29	White Body, On/Off and FWD/REV Switch, Speed Pot
125DV200EB-29-4	Black Body, On/Off Switch, FWD/REV and JOG Switch, Speed Pot
125DV200EW-29-4	White Body, On/Off Switch, FWD/REV and JOG Switch, Speed Pot

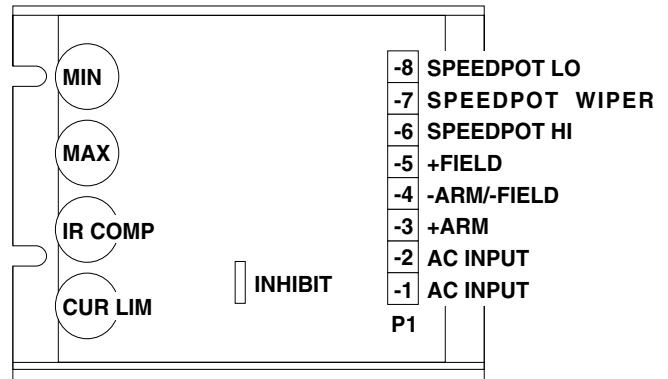
OPERATING CONDITIONS

Temperature.....	-10° to +45° C.
AC Input Voltage.....	$\pm 10\%$ Rated Line Voltage
Input Frequency.....	50/60 Hz.

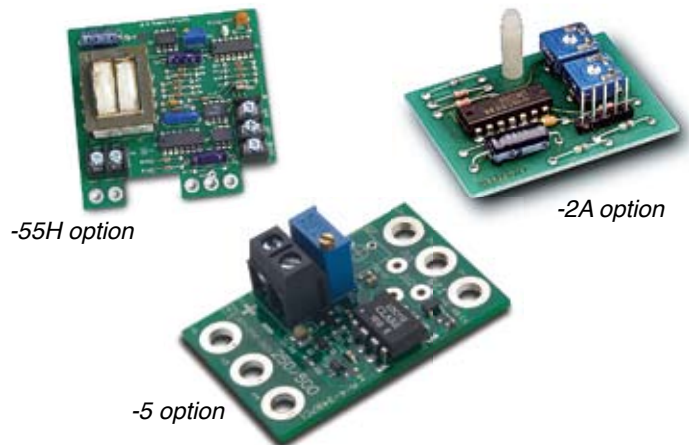
DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH	WEIGHT
English (cm)				
Chassis	3.63 (9.22)	4.25 (10.76)	1.30 (3.30)	12.5 oz. (354.4 gm)
Enclosed	5.00 (12.70)	9.50 (24.10)	5.50 (14.10)	64 oz. (1814 gm)

ADJUSTMENTS AND HOOK-UP



POPULAR OPTIONS (CHASSIS MODELS ONLY)



OPTION DESCRIPTION (CHASSIS MODELS ONLY)

OPTION	SUFFIX
Electronic speed control interlock – when AC power to control is applied, prevents motor from starting until speedpot is first rotated to the zero position, then CW. Also, should AC power be interrupted then restored, prevents automatic restart.....	-1*
Independently adjustable linear accel and decel (0.5 - 8.0 seconds)	-2A*
4-20mA isolated signal follower.....	-5*
-5 option with Auto/Manual switch	-7*
Acceleration time (approx. 4 seconds).....	-15B
Acceleration time (approx. 6 seconds).....	-K
Forward-Off-Reverse manual switch (center blocked, no Dynamic Brake)	-29B*
Isolated voltage follower (120/240 VAC input)– controls speed from any external grounded or ungrounded signal: 0-5 VDC thru 0-250 VDC adjustable.....	-55H*
-55H option with Auto-Manual function.....	-56H*
Auxiliary heatsink (7" long x 6.25" wide x 1.375" deep).....	-HS(125)*

Other options are available, please consult factory for your requirement.

* Field installable



15 SERIES SELECTION GUIDE

Suffix -1 and -2 refer to mounting configuration, see diagram below.

MODEL	DC OUTPUT CURRENT	INPUT	OUTPUT
13DV1A	2 Amps*	12/24 VAC	0-11/0-22 VDC
13DV2A	2 Amps*	12/24 VAC	0-11/0-22 VDC
13DVE	3 Amps	12/24 VAC	0-11/0-22 VDC
15DV1A	2 Amps*	120/240 VAC	0-90/0-180 VDC
15DV2A	2 Amps*	120/240 VAC	0-90/0-180 VDC
15DVP	2 Amps	120/240 VAC	0-90/0-180 VDC
15DVE	3 Amps	120/240 VAC	0-90/0-180 VDC

* Rating for D.C. Output Current can be increased from 2.0 to 4.0 amps w/suitable external heatsink (equiv. to 4" x 4" x .125" aluminum plate).

OPERATING CONDITIONS

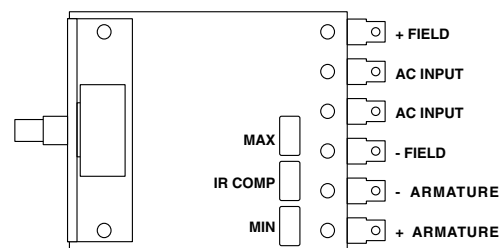
Temperature..... -10° to +45° C.
 AC Input Voltage ±10% Rated Line Voltage
 Input Frequency 50/60 Hz.

ELECTRICAL SPECIFICATIONS AC INPUT 50/60 HZ

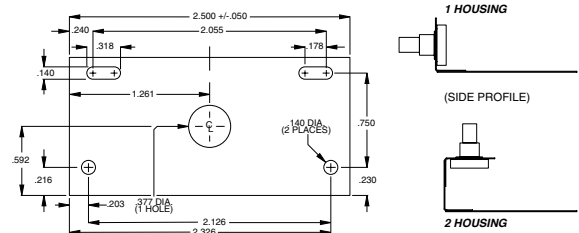
MAXIMUM MODEL	MAX. CONTINUOUS AC AMPS	CONTINUOUS ARM AMPS*	MAX HP
<i>12 VAC Single Phase Input, 0-11 VDC Output</i>			
13DVA	2.6	2.0	1/40
13DVE	3.9	3.0	1/25
<i>24 VAC Single Phase Input, 0-22 VDC Output</i>			
13DVA	2.6	2.0	1/20
13DVE	3.9	3.0	1/12
<i>120 VAC Single Phase Input, 0-90 VDC Output</i>			
15DVA/15DVP	2.6	2.0	1/6
15DVE	3.9	3.0	1/3
<i>240 VAC Single Phase Input, 0-180 VDC Output</i>			
15DVA/15DVP	2.6	2.0	1/3
15DVE	3.9	3.0	2/3

* Minimum Armature Amps: 150mA D.C.

HOOK-UP DIAGRAM



HEATSINK DIMENSIONS AND STYLES



OPTION DESCRIPTION

OPTION	SUFFIX
Single pole AC switch integral with speedpot for 120 VAC application of -1 mounting style only	-104
3-position terminal strip with speedpot, dial, & knob kit	-TS

15 Series Adjustable Speed DC Control

The 15 Series is a general purpose, economical variable speed control for small DC and universal motor applications featuring: **dual input voltages of 12/24 VAC or 120/240 VAC** with a DC output current rating of 2 Amps, adjustable trimpot settings, and quick connect terminal pins. **The 15 Series is available in two compact panel mount styles; a NEMA 1 (15DVP) and NEMA 4 (15DVE) enclosed model.**

15 SERIES STANDARD FEATURES

- Dual voltage models of 12/24 VAC or 120/240 VAC input
- Full wave bridge power supply
- Adjustable Minimum speed (0-30% of max)
- Adjustable Maximum speed (40-145% of base)
- Adjustable IR Compensation
- Fixed Acceleration (0.5 seconds)
- 5K ohm speed potentiometer with leads, knob & dial included
- 25:1 speed range • 1% speed regulation
- Shunt field supply provided (1 Amp max)
 - 10V for 12 VAC; 20V for 24 VAC input,
 - 100V for 120 VAC; 200V for 240 VAC input
- Overload capacity of 200% for 1 minute
- Transient voltage protection
- Power on/off switch (enclosed models)
- AC line fuse (15DVE only)

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH	WEIGHT
English (metric)				
13DV1A/15DV1A	2.80 (7.20)	1.30 (3.30)	3.30 (8.40)	2.64 oz. (75 gm)
13DV2A/15DV2A	2.80 (7.20)	1.50 (3.30)	3.30 (8.40)	2.94 oz. (83 gm)
13DVE/15DVE	3.81 (9.68)	5.50 (13.96)	3.50 (8.89)	20.30 oz. (576 gm)
15DVP	4.173 (10.60)	4.96 (12.60)	1.75 (4.45)	16.30 oz. (462 gm)



VSI2 Series Signal Isolator

The Dart VSI2 signal isolator permits the user to control the output of a variable speed drive from any external DC voltage or 4-20mA input signal. A single model accepts a wide range of inputs: (0-5 through 0-25VDC or 0-25 through 0-250VDC; 4-20mA

– jumper selectable). The VSI2 incorporates Dart's unique feedback circuit which virtually eliminates output changes due to the thermal drift of logic components. The VSI2 is packaged in an aluminum chassis mount housing and contains an on-board power supply for its logic circuit. An electrical isolation rating of 2500Vrms is achieved by the use of an optically isolated IC package. The Dart VSI2 can be used with virtually any motor speed control that has a speed reference circuit of +5 to +15VDC and an input impedance greater than 47K ohms. The output of the VSI2 is a filtered, pulse width modulated signal that is directly proportional to the input speed signal. The wide input range allows the VSI2 to follow signals as low as +0-5V logic levels and up to the levels present at the armature leads of a 180VDC motor. By simply connecting the input terminals across the armature leads of a "master motor", you can use the VSI2 for master/follower operation. The addition of a scaling pot will provide for proportional follower operation.

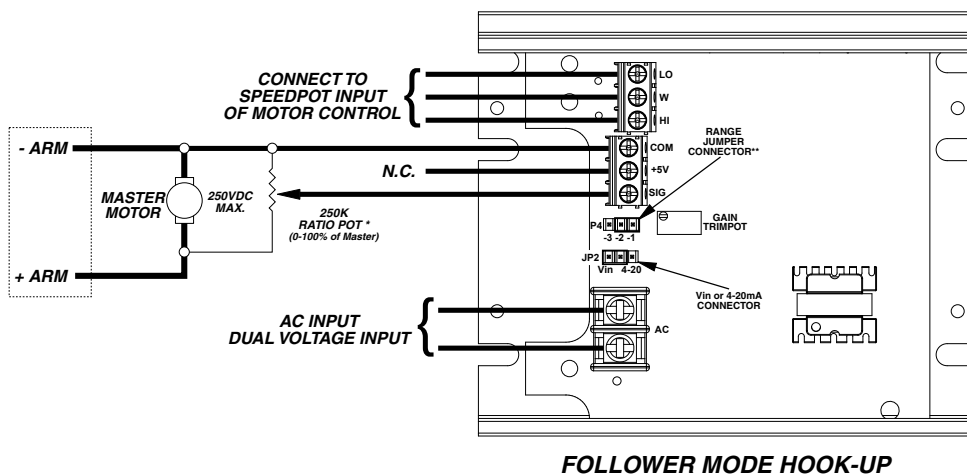
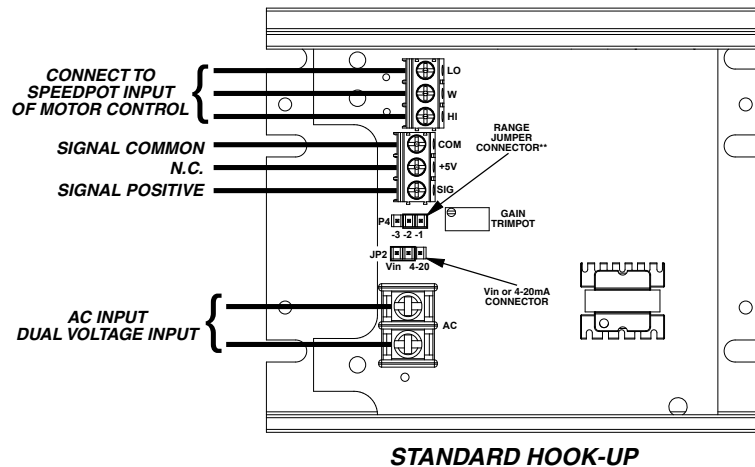
VSI2 SERIES SELECTION GUIDE

MODEL	SUPPLY VOLTAGE
VSI2	120/240VAC 50/60 Hz.

DIMENSIONAL SPECIFICATIONS

WIDTH	LENGTH	DEPTH	WEIGHT
<i>English</i>			
3.630 in	4.250 in	1.650 in	9.8 oz
<i>Metric</i>			
9.220 cm	10.795 cm	4.191 cm	277.3 gm

VSI2 HOOK-UP CONFIGURATIONS



MD3E



MD3P



MD Series Digital Closed Loop DC Speed Control

The MD Series is a compact, programmable DC speed control with digital closed loop feedback and LED display for DC motors rated to 2 horsepower. An on-board microprocessor with non-volatile memory, coupled with sophisticated internal software, makes Dart's Micro-Drive the ultimate value in accuracy and control.

Friendly front-panel field programming permits customizing the MD for specific applications. The MD can be set to display the target speed directly in RPM, FPM, GPM, process time, or any other engineering unit. Programmable parameters include maximum and minimum set speed, decimal points, and operating mode (master or follower).

The Micro-Drive is simple to operate: set the desired RPM, rate, or time in the large 1/2" LED display by depressing the "Up" and "Down" pushbuttons on the front panel. Settings can be one digit at a time or fast sweep. **The Micro-Drive settings are exact and repeatable.** It will precisely control speed to $\pm 1/2$ RPM of set speed, long term. **No calibrations of the control are necessary.**

The MD10P and MD3P have 1/8 DIN and 1/4 DIN industry standard cutout dimensions respectively, providing easy panel installations.

TYPICAL APPLICATIONS

The flexibility of Dart's Micro-Drive design makes it uniquely suited for many commercial and industrial applications, such as:

- Conveyor ovens used in food preparation, UV curing processes, and heat shrink packaging
- Electronic solder re-flow and drying processes
- Industrial auger and mixing equipment
- Medical lab mixing equipment
- Industrial and commercial spray equipment
- Printing process equipment

MD SERIES STANDARD FEATURES

- Adjustable min/max
- Adjustable accel/decel
- Adjustable equivalent to proportional and integral gains
- Pulse input capacity of 50,000 PPM, 833Hz
- Programmable power-on initial settings
- Inhibit mode is selectable from many input options
- Jog function selectable from many input options
- Non-volatile memory allows all custom settings to be stored for future use
- Factory default function—reset drive to factory setting
- User-default storage capability allows user to store/recall a known good set of parameters while experimenting with new settings
- User-friendly programming from the front panel with parameter lockout capability
- Programming buttons allow for adjustable display scroll rate in a linear or non-linear mode
- Display is programmable for any engineering unit of measure
- Adjustable display options include decimal point positions and intensity
- Custom front panel artwork available
- Easy panel mounting with 2 or 4 bolts (supplied)
- NEMA 4X Rating (faceplate with supplied gasket)
- Universal power supply supports any AC voltage input 85–250 VAC
- Compatible with Dart line of low-cost digital pick-ups or other suitable pick-ups
- Programmable user output supporting up to 230 VAC @5A form C relay
- Multiple operational modes: Rate, Time, Follower

OPTION DESCRIPTION

OPTION	SUFFIX
Provision for remote pushbutton switches	-1
Blank lexan	-9
Pluggable terminal strip.....	-P
Magnetic pick-up input board	-3

MD SERIES SELECTION GUIDE

MODEL NUMBER	MAX. ARM DC AMPS	MAX H.P.	INPUT	OUTPUT
MD10P	5	1/2	120 VAC	0-90 VDC
	5	1	240 VAC	0-180 VDC
MD3P	10	1	120 VAC	0-90 VDC
	10	2	240 VAC	0-180 VDC
MD3E	10	1	120 VAC	0-90 VDC
	10	2	240 VAC	0-180 VDC

- All models accept 85-250 VAC Single Phase Input.
- Peak motor output voltage is equal to peak AC input voltage.
- Requires Dart PU-E or other suitable pick-up.
 - Sensor must have minimum output current of 10 mA.
 - Drive includes supply for external sensor of 5VDC @50 mA max.
 - Shipped set for 0-2400 RPM with one pulse per revolution.

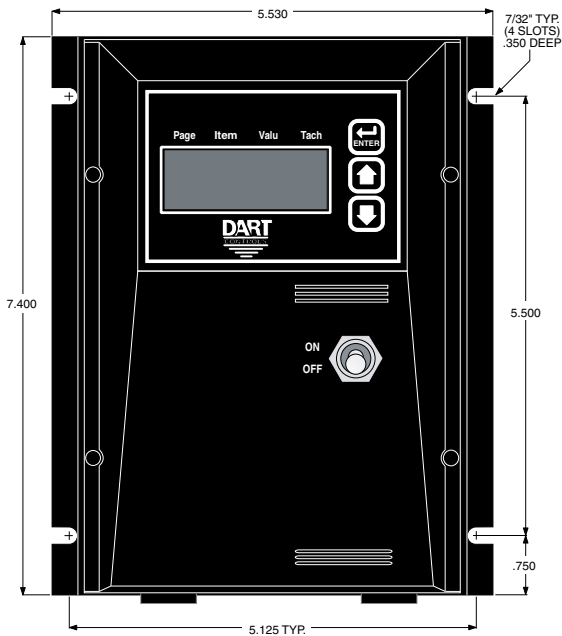
OPERATING SPECIFICATIONS

Temperature	-10° to +45° C
AC input voltage	85-250 VAC
Input frequency	50/60 Hz
Overload capacity	200% for 1 minute
Transducer signal input	0-5 to 0-24 VDC
On-board power supply	5 VDC, 50mA

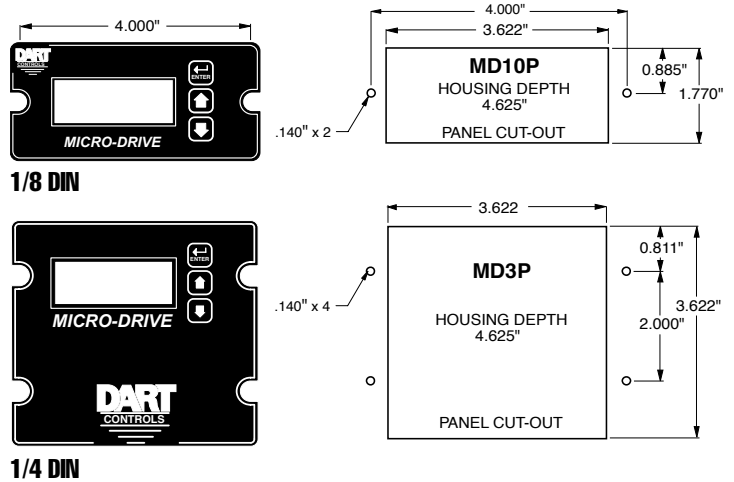
DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
MD10P	inches (millimeters)		
Housing	3.620 (91.95)	1.656 (42.06)	4.625 (117.47)
Lens	4.539 (115.29)	2.289 (58.13)	0.375 (9.52)
MD3P	inches (millimeters)		
Housing	3.620 (91.95)	3.497 (88.82)	4.625 (117.47)
Lens	4.539 (115.29)	4.179 (106.15)	0.375 (9.52)

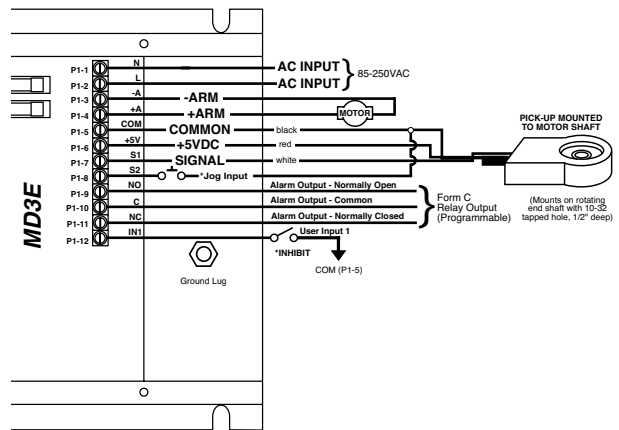
MOUNTING SPECIFICATIONS MD3E



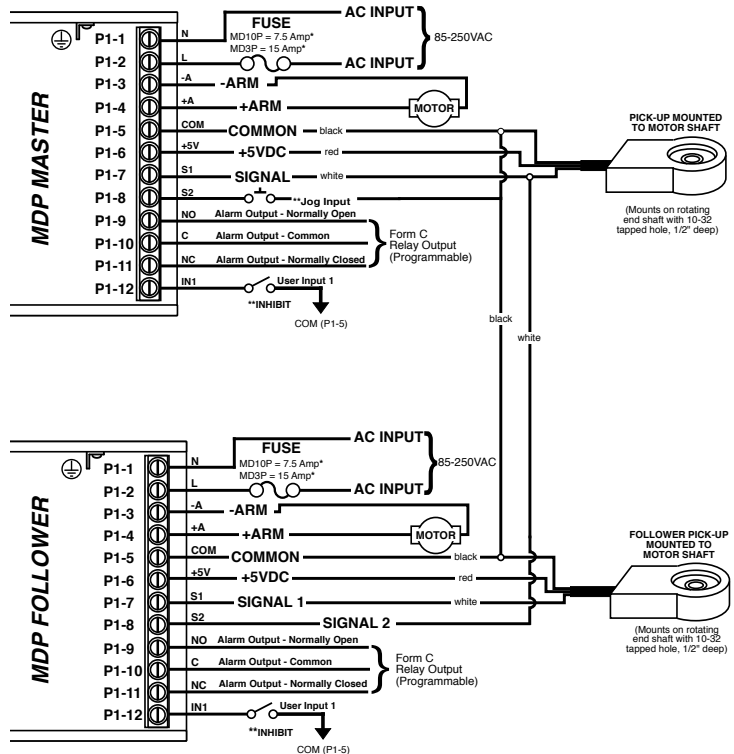
MOUNTING SPECIFICATIONS



WIRING DIAGRAMS



* P1-8 & P1-12 user input may be programmed for a number of functions. Including (jog, inhibit, etc.)



* For AC inputs utilizing two hot lines, both inputs should be protected with appropriately sized fuses or circuit breakers.

** P1-8 & P1-12 user input may be programmed for a number of functions. Including (jog, inhibit, etc.)



MD Plus Series Digital Closed Loop DC Drive

Ideal for Metering Pump and Other Applications
Requiring an Isolated 4-20mA Input/Output Signal

The MD *plus* is a field-programmable closed loop DC drive system employing an advanced velocity-form PID algorithm for accurate and responsive control. The MD *plus* system also features an **optional isolated 4-20mA input and output** for easy integration with existing Process Control systems.

The MD *plus* system is ideally suited for metering pump applications by efficiently combining all of the application requirements into a single compact package. **The MD *plus* system, when used with the OPT420 option, not only accepts a 4-20mA signal to control the pump speed, but it also provides a 4-20mA output signal back to the Process Control that is proportional to the actual running speed. Both the input and output signals are isolated from each other and from the control itself. The MD *plus* system also has two field-programmable Form C relay contacts that can be set to indicate a wide variety of conditions such as the pump is running, a “fault” condition exists, and many other events.**

The MD *plus* system is available in both enclosed and panel-mount versions. The MD50E version comes in a NEMA 4X enclosure complete with an auto/off/manual switch on the cover. The 1/8 DIN MD40P and 1/4 DIN MD50P panel-mount versions come complete with a NEMA 4X rated faceplate, gasket kit, stainless steel mounting hardware, and connections for an external auto/manual switch.

STANDARD FEATURES

- 1/50 to 2.0 HP range
- Universal power supply supports 85-250 VAC input
- 1/8 or 1/4 DIN panel mount with NEMA 4X faceplate, or NEMA 4 stand-alone enclosure
- Front panel field-programming (with lock-out jumper)
- Target and actual speed can be any engineering unit of measure
- Two alarm relay outputs (one standard; one with OPT420 option)
- Large 1/2" LED display
- Master/Follower modes
- Displays set point or actual running speed
- Adjustable PID settings

AVAILABLE OPTIONS

- Custom faceplates for your Brand Name
- Pluggable euro-style terminal strip
- Provision for Remote Up/Down pushbutton switches

OPERATING SPECIFICATIONS

Ambient Temp.....	-10° to +45° C
Line Input Frequency	50/60 Hz
Overload Capacity	200% for 1 minute
Transducer Input.....	0-5 to 0-24 VDC
On-board transducer	
Power Supply.....	5 VDC, 50mA
4-20mA input/output accuracy.....	±1%

MD PLUS SERIES SELECTION GUIDE

MODEL NUMBER	MAX. ARM DC AMPS	MAX H.P.	INPUT	OUTPUT
MD40P	5	1/2	120 VAC	0-90 VDC
	5	1.0	240 VAC	0-180 VDC
MD50P	10	1.0	120 VAC	0-90 VDC
	10	2.0	240 VAC	0-180 VDC
MD50E	10	1.0	120 VAC	0-90 VDC
	10	2.0	240 VAC	0-180VDC
MD40P-420	5	1/2	120 VAC	0-90 VDC
	5	1.0	240 VAC	0-180 VDC
MD50P-420	10	1.0	120 VAC	0-90 VDC
	10	2.0	240 VAC	0-180 VDC
MD50E-420	10	1.0	120 VAC	0-90 VDC
	10	2.0	240 VAC	0-180VDC

DIMENSIONS (INCHES)

MODEL	WIDTH	HEIGHT	DEPTH
<i>MD40P (1/8 DIN)</i>			
Housing	3.620	1.656	4.625
Lens	4.539	2.289	0.375
<i>MD50P (1/4 DIN)</i>			
Housing	3.620	3.497	4.625
Lens	4.539	4.179	0.375
<i>MD50E (NEMA 4 enclosed)</i>			
Housing	3.620	3.497	4.625
Lens	4.539	4.179	0.375

APPLICATIONS

The MD plus system is ideal in many process applications requiring a closed-loop DC variable speed drive with an optional isolated 4-20mA input and output.

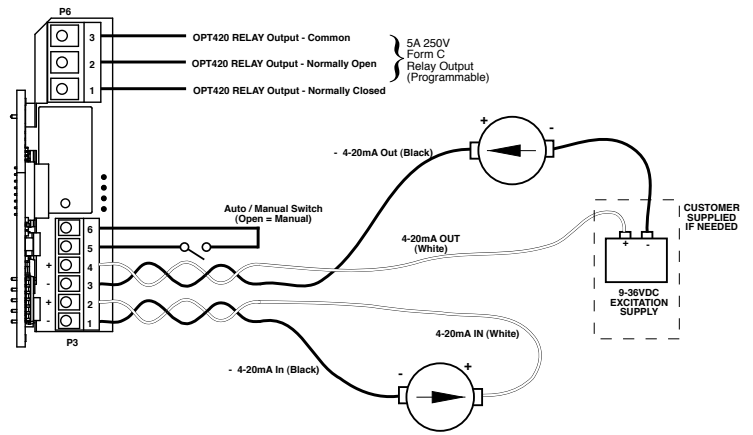
Typical applications include:

- Waste water treatment
- Chemical metering processes
- Laboratory mixing equipment
- Industrial auger/mixing equipment
- Polymer injection processes

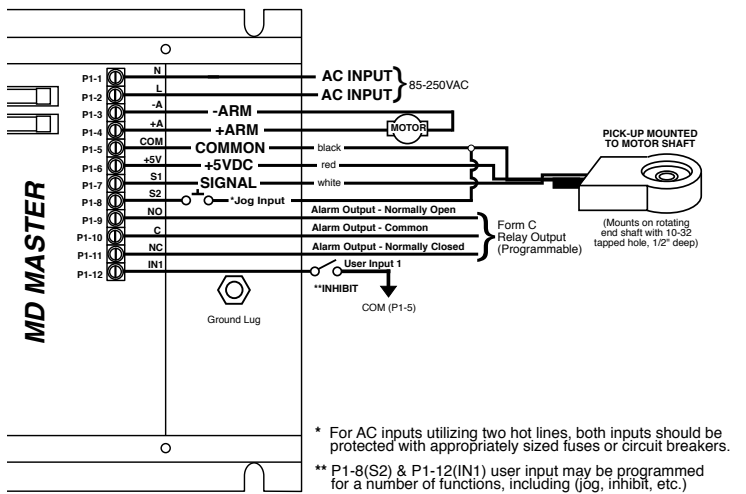
OPT420 OPTION

The OPT420 Option may be factory or field installed to any drive in the MD Plus Series. The 4-20mA output is Loop Powered, relying on another device in the loop for its power. Both the 4-20mA input and output are individually isolated. A second relay output is available when this option is used to indicate alarm and status information.

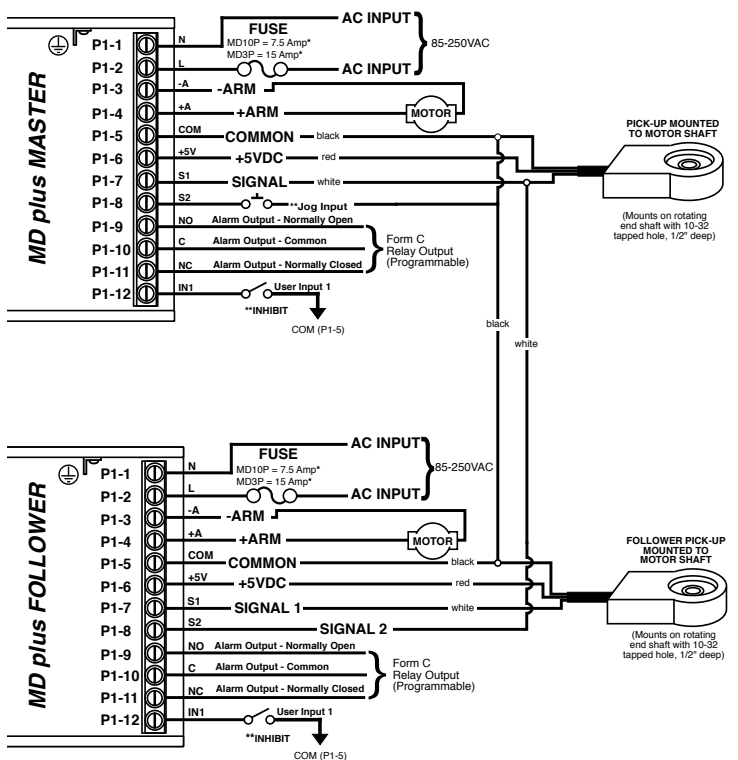
OPT420 OPTION WIRING DIAGRAM



MD50E DRIVE TYPICAL WIRING DIAGRAM



WIRING DIAGRAM - MASTER/FOLLOWER



Accu-Set Series Smart Speed Potentiometer

For Improved AC or DC Drive System Performance



*Performance matched with
Dart's PU Series Encoder*



The Accu-Set is a compact, economical control that can be used with conventional AC, DC, or Brushless DC adjustable speed drive systems to provide an LED display of set speeds and precise, digital closed loop motor speed control. An on-board microprocessor with non-volatile memory coupled with sophisticated internal software makes Dart's Accu-Set the ultimate in accuracy and control.

Target speeds are displayed directly in RPM, FPM, GPM, process time, or any other engineering unit of measure. Friendly front-panel field programming permits customizing the Accu-Set to the exact specifications for each application; maximum and minimum set speed, decimal points or colon, operating mode (master or follower), and the constant which takes into account motor gear ratios.

The Accu-Set is simple to operate... just set the desired RPM, rate, or time in the large 1/2" LED display by depressing the "up-down" pushbuttons, one digit at a time or fast sweep. The Accu-Set settings are exact and repeatable. It will precisely control speed to a remarkable $\pm 1/2$ RPM of set speed, long term.

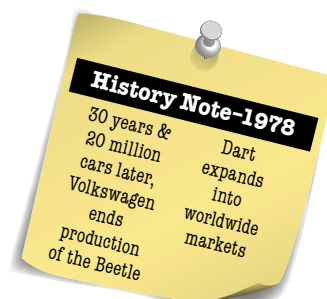
The panel mount unit is easy to install in the industry standard cutout dimensions of 1/8 DIN. All wiring connects directly to a European style terminal strip through the easy access rear panel.

TYPICAL APPLICATIONS

Dart's Accu-Set design is ideal for providing the same precise closed loop control and digital readout as the MD Series Micro-Drive in new or retro-fit applications that use an AC, DC, or Brushless DC motor drive system.

OPERATING SPECIFICATIONS

Temperature	-10° to +45° C
AC input voltage	85–250 VAC
Input frequency	50/60 Hz
Transducer signal input	0-5 to 0-24 VDC
On-board power supply	5 VDC, 50mA (for external sensors)



ACCU-SET SERIES STANDARD FEATURES

- Adjustable min/max
- Adjustable accel/decel
- Adjustable equivalent to Proportional & Integral gain setting
- Pulse input capacity of 50,000 PPM, 833Hz
- Programmable power-on initial settings
- Inhibit mode is selectable from many input options
- Jog function selectable from many input options
- User-friendly programming from the front panel with parameter lockout capability
- Configurable display rate of change when in Program Mode (linear or accelerating)
- Display is programmable for any engineering unit of measure
- Adjustable display options include decimal point positions and intensity
- Custom front panel artwork available
- Easy panel mounting with 2 bolts (supplied)
- NEMA 4X Rating (faceplate with supplied gasket)
- Universal power supply supports any AC voltage input from 85–250 VAC
- Compatible with Dart's line of low-cost digital pick-ups or other suitable pick-ups
- Programmable user output supporting up to 230 VAC @5A
- Multiple operational modes: Rate, Time, Follower
- Non-volatile memory allows all custom settings to be stored for future use
- Factory default function-reset drive to factory setting
- User-default storage capability allows user to store/recall a known good set of parameters while experimenting with settings

ASP SELECTION GUIDE

MODEL	INPUT	DISPLAY UNITS	STD. SPEED RANGE
ASP10	120/240 VAC	Rate or Time	Field Programmable*

Requires Dart PU-E or other pick-up.

* Shipped set for 0–2400 RPM with one pulse per revolution

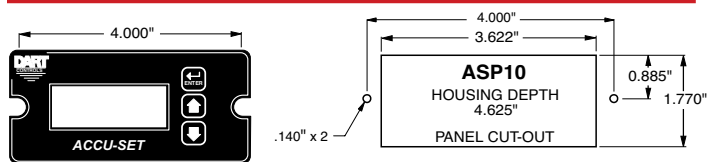
OPTION DESCRIPTION

OPTION	SUFFIX
Provisions for remote pushbutton switches.....	-1
Pluggable terminal strip	-P
Magnetic pick-up input board	-3

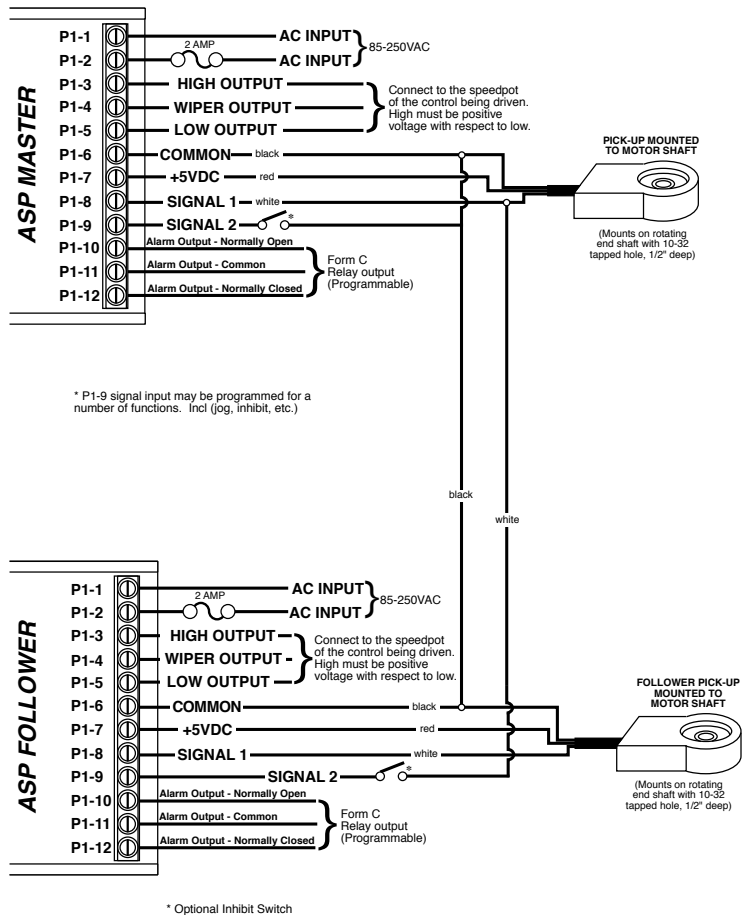
DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
ASP 10 inches (millimeters)			
Housing	3.620 (91.95)	1.656 (42.06)	4.625 (117.47)
Lens	4.539 (115.29)	2.289 (58.13)	0.375 (9.52)

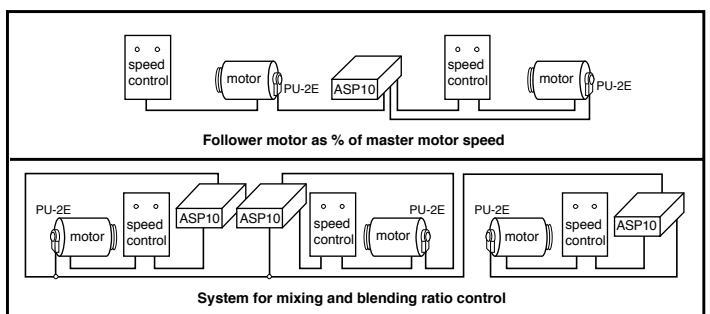
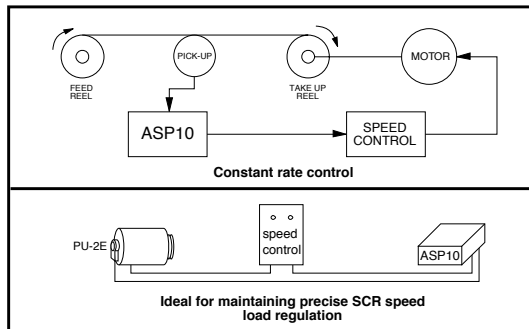
MOUNTING SPECIFICATIONS



ACCU-SET HOOK-UP- MASTER AND FOLLOWER



ASP CONFIGURATIONS



ASP Plus Series Smart Speed Pot for Any* Drive

*Must accept a 3-wire speed pot input



*Performance matched with
Dart's PU Series Encoder*



The **ASP PLUS Series** is the latest development from Dart in the area of SMART speed pots.

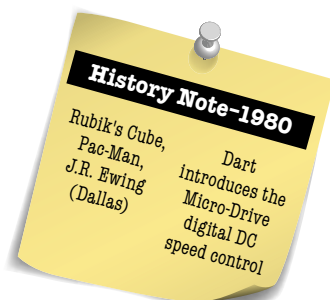
A SMART speed pot is:

- **Digital**
- **Programmable**
- **Closed-loop**
- **Multi-function**
- **Multi-mode**

The ASP PLUS is ideal for applications where a remote PLC/SCADA system sends the motor drive a set speed.

The ASP PLUS works in conjunction with any drive by providing an isolated input for the PLC/SCADA command, using encoder feedback closes the motor loop to maintain tight speed regulation, and sends analog or serial communication data back to the supervisory system to verify actual motor speed. Along with motor not running indication, remote stop and Auto/Manual control modes the ASP PLUS packs all these features in one small package eliminating installation space and labor costs.

The ASP PLUS is a real problem solver for plant maintenance, system integrator and OEM equipment designers.



ASP PLUS STANDARD FEATURES

- Microprocessor-based design allows for incredible flexibility to suit your process control needs
- ModularBus expansion makes it possible for the Accu-Set plus to accommodate a wide variety of I/O
- Digital closed-loop algorithm ensures accuracy of $\pm 1/2$ RPM of set speed or equivalent
- Digital open-loop operation available, where a speed pickup is impractical or undesired
- Non-volatile memory stores settings without batteries, even when power has been removed
- Factory or field programmable via front-panel keypad
- Many adjustable settings include min, max, accel, decel, display options, alarm options, and more
- Internal program-enable jumper selectively prevents tampering with unit's configuration
- Universal power supply accepts any line voltage inputs from 85-250VAC @ 50-60Hz without switches or jumpers. The unit automatically adjusts as needed.
- Transient voltage protection prolongs unit's life in harsh industrial environments
- Speed pickup input compatible with a variety of signal input types including: Hall-Effect Pickups, Photoelectric, TTL, etc.
Note: Open collector devices must be capable of sinking at least 3mA
- Self-contained power supply for external speed pickups, limited to 5V @ 50mA
- Programmable alarm outputs with Form C contacts
- Flexible user inputs support Inhibit, Emergency-Stop, and Jog functionality
- Large 4 digit, 1/2" LED display, with user-settable decimal point (colon displayed in Time mode)
- Durable aluminum housing with Polycarbonate membrane and gasket included meet NEMA 4X standards when used with NEMA 4X enclosures
- European-style 5mm terminal block or pluggable terminal block available
- cULus approval pending
- Wide operating ambient temperature range of -10°C to 45°C (14°F to 113°F)
- Multiple operating modes are available in closed-loop operation, including:
 - Master, Rate Mode – Controls in rate unit such as RPM, Gallons per Second, etc.
 - Master, Time Mode – Controls in time units such as HH:MM, MM:SS, SS:TT
 - Follower Mode – Controls in percentage of master rate

ASP PLUS SELECTION GUIDE

MODEL	INPUT @ 50-60HZ	PICKUP REQUIRED?	4-20mA OUTPUT?
ASP40	85-250VAC	No	No
ASP40-420	85-250VAC	Yes	Yes

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
<i>ASP40/ASP40-420 English (inches)</i>			
Housing	3.620	1.656	4.625
Lens	4.539	2.289	0.375
<i>ASP40/ASP40-420 Metric (millimeters)</i>			
Housing	91.95	42.06	117.47
Lens	115.29	58.14	9.52

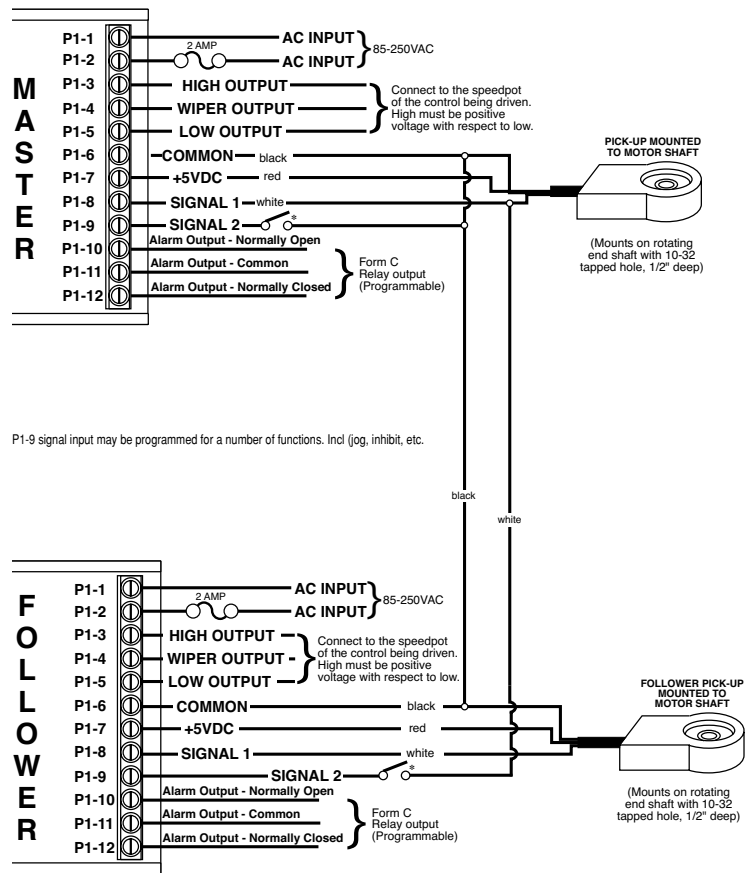
SPECIFICATIONS

Signal Input Voltage Range	5VDC to 24VDC (square wave, referenced to P1-6 COMMON)
Speed Pickup	
Input Frequency (S1 and S2 Inputs)	0 – 600,000 Pulses per Minute @ 5V square wave
Display Range	0.001 – 9,999
"Engineering Units"	User Programmable, any Units
Sensor / Pickup Power Supply	5V @ 50mA
ASP40 Isolated Alarm Relay Output Rating	250VAC @ 5A
OPT420 Isolated Alarm Relay Output Rating	50VAC @ 1A
Voltage Difference between PotLo and PotHi Inputs	2VDC to 24VDC
Pot Wiper Output voltage range	PotLo +50mVDC to PotHi – 50mVDC

OPERATING CONDITIONS

Temperature	-10° to +45° C.
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ASP PLUS HOOK-UP - MASTER AND FOLLOWER



700/Commutrol™ Series DC Brushless Motor Control



703BDC



Speed Potentiometer
Kit Included

Dart's 700/Commutrol™ Series is a family of brushless DC motor controls designed to provide commutated power and variable speed control for standard 3 phase brushless (BLDC) motors. The controls operate in a basic open loop or closed loop configuration with either 60" or 120" brushless D.C. motors. Compact, economical, and efficient, the 700/Commutrol™ Series is ideal where high torque, high speed and quiet operation are needed.

The latest addition to the 700 Series, the 703BDC, has the same compact surface mount layout as the 701BDC with the following added features: Adjustable Accel/Decel plus a bi-directional speedpot control capability (wig-wag).

The 700/Commutrol™ Series controls can also be provided with a pluggable connector and fixed settings for OEM applications.

700/COMMUTROL™ STANDARD FEATURES

- Open loop or integrated closed loop models
- Quiet 15KHz. PWM switching frequency
- MOSFET power devices
- Directional control - forward/reverse
- Internal supply for motor Hall-Effect sensors
- 5K ohm speedpot w/leads, knob and dial for remote mounting
- Anodized chassis mount heatsink

OPERATING CONDITIONS

Temperature -10° to +45° C.

700/COMMUTROL™ SELECTION GUIDE

For 700B Series	For 710A Series	For 730 Series	
Model 700BDC	Model 710ADC	Model 730	Open Loop
Model 701BDC	Model 711ADC	Model 731	Closed Loop
Model 703BDC		Model 733	Closed Loop

700/COMMUTROL™ OPTION DESCRIPTION

OPTION	SUFFIX
Pluggable terminal strip (700/730 Series only).....	-PA
Current limit shutdown (Model 733BDC only)	-CL

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	LENGTH	DEPTH	WEIGHT
<i>English (inches) Metric (centimeters)</i>				
700BDC/730	3.63 9.21	4.25 10.80	1.30 3.30	6 oz. 170 gm.
701BDC/731	3.63 9.21	4.25 10.80	1.30 3.30	6 oz. 170 gm.
703BDC/733	3.63 9.21	4.25 10.80	1.30 3.30	6 oz. 170 gm.
710ADC	3.62 9.20	7.00 17.78	2.00 5.08	16 oz. 453 gm.
711ADC	3.62 9.20	7.00 17.78	2.00 5.08	16 oz. 453 gm.

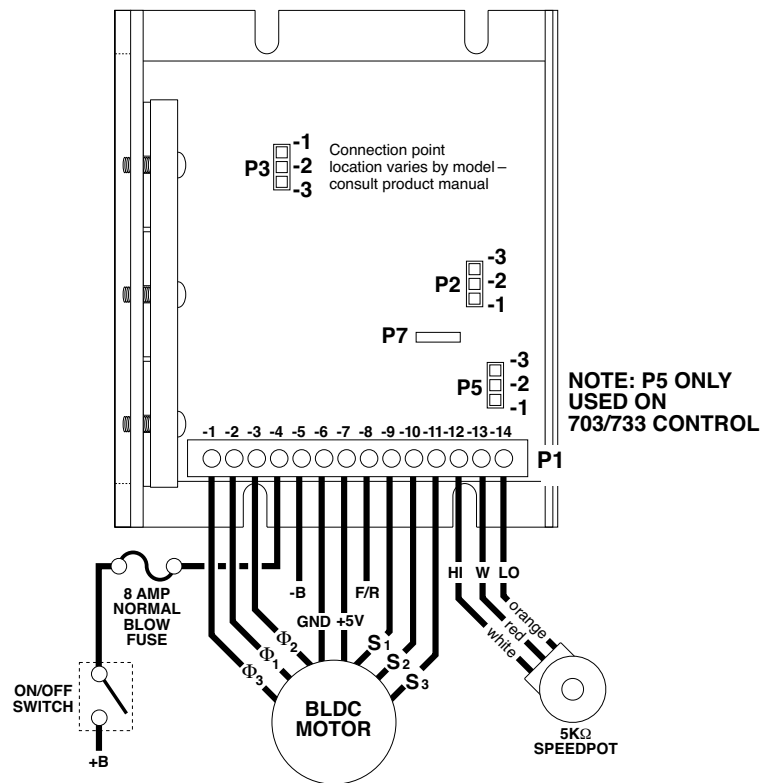
700/COMMUTROL™ SPECIFICATIONS

	700B SERIES	730 SERIES	710A SERIES
Input Voltage	11–40 VDC ¹	10.5–54 VDC ^{2,3}	10–54 VDC ²
Output Voltage	0–Input Voltage	0–Input Voltage	0–Input Voltage
Load Current	5 Amps continuous	8 Amps continuous ⁴	20 Amps continuous
Overload Current	150% for 30 seconds	150% for 30 seconds	200% for 30 seconds
Speed Adjustment	Potentiometer or 0–5 VDC Analog Input Signal	Potentiometer or 0–5 VDC Analog Input Signal	Potentiometer or 0–6.2 VDC Analog Input Signal
Speed Range	50:1	50:1	50:1
Current Limit	Adjustable Trimpot	Adjustable Trimpot	Adjustable Trimpot
Motor Hall Spacing (electrical degrees)	60 or 120 degrees (field selectable)	60 or 120 degrees (field selectable)	60 or 120 degrees (field selectable)
Acceleration	Fixed, fast start Adjustable 0–10 Sec (703 only)	Fixed, fast start Adjustable 0–10 Sec (733 only)	Fixed, fast start
Deceleration	Fixed Adjustable 0–10 Sec (703 only)	Fixed, fast start Adjustable 0–10 Sec (733 only)	Fixed: fast stop
Min Speed	Adjustable; 0–30% of max.	Adjustable; 0–30% of max.	Adjustable; 0–30% of max.
Max Speed	Adjustable; 60–100% of max.	Adjustable; 60–100% of max.	Adjustable; 60–100% of max.
Input/Output Connections	Terminal Strip; optional pluggable	Terminal Strip; optional pluggable	Terminal block
Speed Regulation	Open loop (700BDC) Closed loop (701BDC, 703BDC) ±1/2% of base speed	Open loop (730) Closed loop (731, 733) ±1/2% of base speed	Open loop (710ADC) Closed loop (711ADC) ±1/2% of base speed

1 - Field selectable voltage range 11-14 VDC input or 18-40 VDC input.
2 - Field selectable voltage range 10-13.5 VDC input or 18-54 VDC input.

3 - Load Current is 5 Amps continuous above 40VDC supply.
4 - 9.5A with use of Auxillary Heat Sink HS2

700/730 SERIES HOOK-UP



720 Series Line Voltage Brushless DC Control



721AC-E



720AC-IC



Speed Potentiometer
Kit Included

The **720 Series** is the result of Dart's continued leadership and investment in brushless DC technology. It is a family of feature-rich drives designed for incorporation into many types of OEM equipment: medical, door actuators, printers, scanners, air handling, parts placement, packaging / labeling and many more. **As designers consider the long term cost of ownership, maintenance and service, brushless DC drive systems offer an opportunity to gain a competitive market edge.**

The **720 Series** is available in a **variety of styles and capabilities.** Both the chassis and NEMA 4/12 enclosed versions come in open or closed loop, isolated or non-isolated versions. All include the standard features designers need to address their motion control requirements: 120 *VAC source power, quiet 17 KHz switching, FWD/REV control, dynamic brake and Inhibit, LED indication of drive status and fault conditions, and remote signal follower capability.

Contact Dart today to discuss the 720 Series for your application



* Consult factory for 240 VAC applications

720 SERIES STANDARD FEATURES

- Line voltage source power
- Open and closed loop models
- Quiet 17 khz PWM switching
- IGBT power devices
- Forward/reverse control
- Brake control
- Inhibit control
- Run/stop output indicator
- Internal source power LED (green)
- Internal fault LED (red)
- Voltage follower input
- 5k Ω speedpot kit
- +5 volt dc supply for motor halls

SPECIFICATIONS*

Input voltage 120 VAC \pm 10%
 Load current 3.1 A continuous
 Speed regulation \pm 1/2% base speed

* Call factory for complete specifications

OPERATING CONDITIONS

Temperature -10° to +45° C.

720 SERIES SELECTION GUIDE

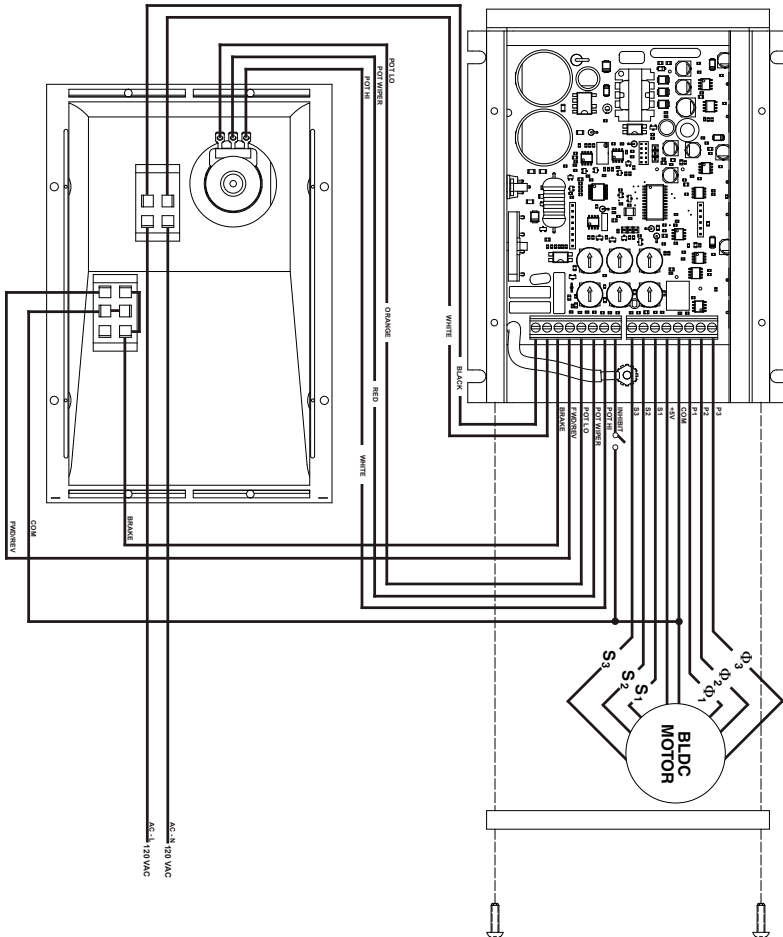
CONTROL TYPE	CHASSIS MODEL	ENCLOSED MODEL	ISOLATED CHASSIS MODEL	ISOLATED ENCLOSED MODEL
Open Loop	720AC-C	720AC-E	720AC-IC	720AC-IE
Closed Loop	721AC-C	721AC-E	721AC-IC	721AC-IE

DIMENSIONAL SPECIFICATIONS

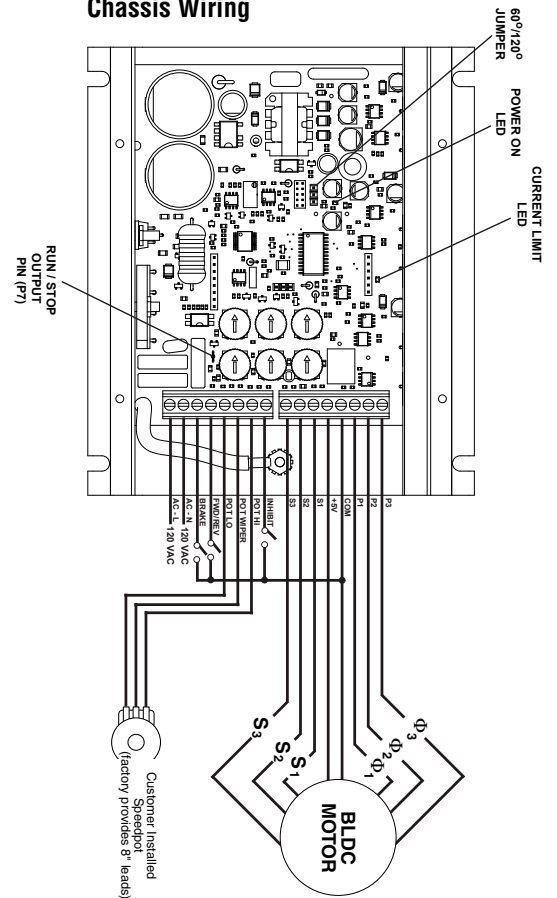
MODEL	WIDTH	LENGTH	HEIGHT	WEIGHT
CHASSIS	5.53 in.	6.41 in.	2.60 in.	27 oz.
ENCLOSED	5.53 in.	7.15 in.	4.33 in.	38 oz.

CONNECTION DIAGRAMS

Enclosed Wiring



Chassis Wiring



BLM 700 Series MicroDrive Brushless DC Control



The BLM700 Series from Dart is the brushless DC version of the very popular Dart Micro-Drive Series of closed loop controls. The BLM700 Series continues this success by providing the OEM designer an integrated, fully programmable digital display with the latest technology brushless DC motor speed control. Even better, the BLM700 does not require a separate motor speed pickup, instead utilizing the existing motor hall-effect transistors to provide actual speed information to close the loop.

The BLM Series is available in a NEMA 4X 1/8 DIN panel mount. This microprocessor-based closed loop BLDC control maintains $\pm 1/2$ RPM of set speed by using a full velocity form PID algorithm. The BLM700 allows for user configuration of MIN, MAX, ACCEL, DECEL and display units that are all maintained in non-volatile on-board memory. The unit has a program lockout capability to prevent changes being made to the configuration except under managed conditions.

History Note-2000

Gladiator
wins Oscar
for
Best Movie

Dart
implements
Lean
Manufacturing
& ISO 9001

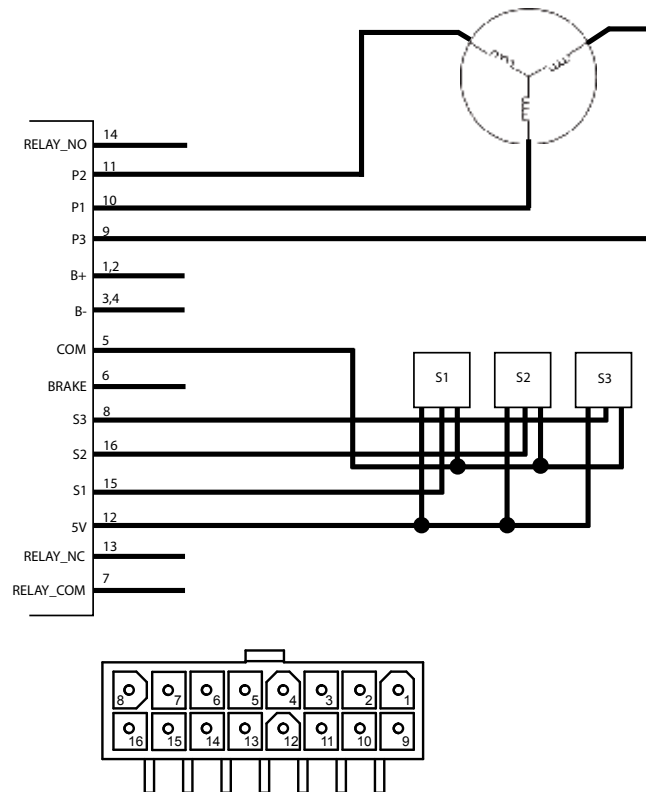
BLM700 SERIES STANDARD FEATURES

- Microprocessor-based design
- Digital closed-loop accuracy to $\pm 1/2$ RPM
- Non-volatile memory stores configuration
- Factory or field programmable via front-panel
- Configurable MIN, MAX, ACCEL, DECEL
- Configurable alarms / status and alarm indicators
- Program-enable jumper prevents tampering
- Source power 12 or 24-48 VDC (jumper selectable)
- Transient voltage protection
- Self-contained power supply for motor halls
- Large 4 digit, 1/2" LED display
- Durable NEMA 4X rated aluminum housing
- Forward or Reverse motor (jumper selectable)

SPECIFICATIONS

- Input voltage 12-48 VDC (jumper selectable)
- Continuous load current 8 Amps
- Overload current 150% for 30 seconds
- Adjustable Current Limit
- Jumper selectable motor hall spacing (60° or 120°)
- Motor hall sensor power supply provided (5V @ 50mA)
- Display type – 4 digit 1/2" LED
- Display range – 0 to 9999
- Programmable display – rate or time in process
- NEMA 4X panel mount enclosure
- Pluggable connector for external wiring

CONNECTION DIAGRAMS



OPERATING CONDITIONS

Temperature..... -10° to +45° C.

BLM700 SERIES SELECTION GUIDE

BLM701P

** More versions coming soon! Check with Dart to discuss your application and for availability.

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
<i>BLM700 English (inches)</i>			
Housing	3.620	1.656	4.625
Lens	4.539	2.289	0.375
<i>BLM700 Metric (millimeters)</i>			
Housing	91.95	42.06	117.47
Lens	115.29	58.14	9.52

OPTIONS

Isolated 4-20mA input/output for desired/actual speed.
Factory or field installed..... OPT 420

65 Series Battery Operated DC Motor Speed Control

65E10E

65E60



65E10

65E40/65E20



Speed Potentiometer
Kit Included

The 65 Series controls are high performance PWM controls for 12 to 48 volt battery/solar powered equipment providing smooth control with high efficiency operation. The advanced design permits a substantial increase in the equipment running time between charges over conventional techniques. Features include adjustable maximum speed, minimum speed, current limit, I.R. compensation, and acceleration. The adjustable current limit feature protects the control, battery, and motor from sustained overloads. The higher capacity models also provide thermal protection.

Dart's 65 Series controls are designed for heavy duty low voltage PM motor applications, such as: floor scrubbers, small personnel carriers, AGV's, agricultural sprayers and a vast variety of portable equipment.

The newest addition to the 65 Series is the 65E10E: a NEMA 4X enclosed model rated 10 amps continuous for 12 to 36 volt applications.

Watch for news on our website for a 20A model now under development.

All the 65 Series controls come standard with a speed pot, knob, and dial plate.

65 SERIES STANDARD FEATURES

- Provides smooth variable speed capability for mobile equipment
- Increases range or running time of battery operated equipment through high efficiency
- Allows reduction in battery size w/out loss of operating range
- Automatic compensation to allow for declining battery voltage
- Speed regulation is $\pm 1\%$ of base speed
- Adjustable maximum speed
- Adjustable minimum speed
- Adjustable I.R. compensation
- Adjustable current limit
- Adjustable acceleration speed
- Maintains variable speed control as batteries discharge
- 5K ohm speedpot with leads, knob and dial included
- Speed adjustment using 5K ohm speedpot or 0-10 VDC analog input signal
- Inhibit terminal permits optional start-stop without breaking battery line

65 SERIES SELECTION GUIDE

MODEL NUMBER	CONTINUOUS CURRENT
<i>12 VDC Input, 0-12 VDC Output</i>	
65E10-12	10 Amps
65E20-12	20 Amps
65E40-12	40 Amps
65E60-12	60 Amps
<i>24/36 VDC Input, 0-24/0-36 VDC Output</i>	
65E10	10 Amps
65E20	20 Amps
65E40	40 Amps
65E60	60 Amps
<i>Enclosed Models</i>	
65E10E12 12VDC Input, 0-12VDC output	10 Amps
65E10E36 24-36VDC Input, 0-(source) Output	10 Amps

65 SERIES SPECIFICATIONS

	65E10E	65E10	65E20	65E40	65E60
Load Current (continuous)	10 Amps	10 Amps	20 Amps	40 Amps	60 Amps
Speed Adjustment	5K ohm potentiometer or 0 to +10V DC input signal				
Overload Capacity	200% for 10 seconds; 150% for 1 minute				
Speed Range	30:1				
Current Limit	Adjustable to 200% motor full-load Amps (up to continuous drive rating above)				
Acceleration	Adjustable - 0 to 10 sec.				
Deceleration	Non-adjustable - 0.5 sec.				
Maximum Speed	Adjustable - 50 to 100% of base speed				
Minimum Speed	Adjustable - 30% of max speed				
Input/Output Connections	Barrier terminal block / Accepts 12 to 6 AWG				
Speed Regulation	1% of base speed				
Package Configuration	NEMA 4X	Black anodized aluminum extrusion			
Internal Operating Frequency	18K Hz.	Approximately 800 Hz.			
Thermal Protection	Not Available	Current foldback at 80°C. heatsink temp			

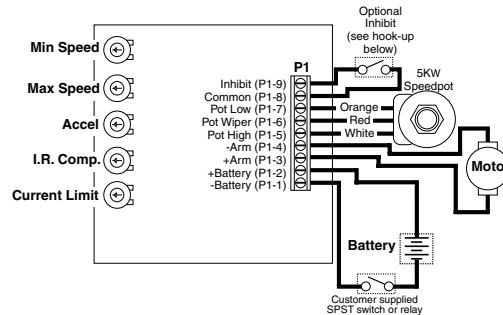
OPERATING CONDITIONS

Operating Temperature..... -10° C to +45° C (14°F to 113°F)

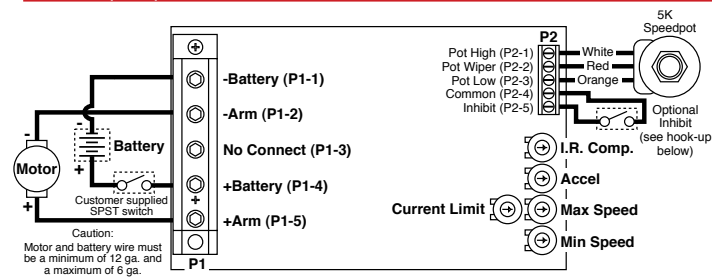
DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	LENGTH	DEPTH	WEIGHT
English (inches) Metric (centimeters)				
65E10	3.625 (9.21)	4.25 (10.76)	1.30 (3.30)	6.0 oz. (170 gm.)
65E20	3.70 (9.40)	7.00 (17.78)	1.70 (4.32)	10.5 oz. (297 gm.)
65E40	3.70 (9.40)	7.00 (17.78)	1.70 (4.32)	13.4 oz. (297 gm.)
65E60	6.70 (17.02)	9.00 (22.86)	2.27 (5.77)	34.0 oz. (962 gm.)
65E10E	5.53 (14.05)	7.30 (18.54)	4.78 (12.14)	37 oz. (1049 gm.)

65E10 HOOK-UP DIAGRAM



65E20/40/60 HOOK-UP DIAGRAM



DM8000 Series Microprocessor Based Digital Tachometer and Process Meter



The DM8000 is an economical microprocessor-based digital tachometer system capable of measuring shaft speeds lower than 1 RPM.

With an on-board microcomputer coupled with sophisticated internal software and a quartz crystal controlled reference frequency, the DM8000 is able to maintain accuracy of $\pm 0.04\%$, even if the shaft is uneven.

The DM8000 is field programmable through the easy-to-use front panel interface and can be configured to display any desired unit of measure. Large 1/2 inch

4-digit LED display numbers allow viewing under the most adverse conditions.

The DM8000 is actually **four devices in one:**

- Tachometer
- Counter
- Totalizer
- Zero Speed Switch

In addition, the DM8000 will accept a second sensor input and toggle the display between the two sensors by depressing a front panel key. This allows one display to do the work of two, saving cost and space.

The isolated 5 Amp form C relay output can be configured for many different alarming conditions. Designed to use a variety of inputs, including the Dart Hall-Effect solid state PU Series pick-up, the system delivers trouble free operation at an economical cost.

History Note-Future

Exciting new products are under development. Watch for news at: www.dartcontrols.com

DM8000 STANDARD FEATURES

- Selectable alarm relay output: low, high, window or not window (a second alarm option is available)
- User inputs allow for special functions: counter reset, counter gate, and alarm display
- Control modes are selectable between rate, time, and counter
- Factory default function—reset to factory setting
- User-default storage capability allows user to store/recall a known good set of parameters while experimenting with new settings
- Non-volatile memory allows all custom settings to be stored for future use
- NEMA 4X Rating (faceplate with supplied gasket)
- Accepts second sensor for one display/two speeds operation

TYPICAL APPLICATIONS

The DM8000 can be used in process applications for monitoring speeds and rates, or counting discrete input signals. Process applications using counting may be batching, filling, mixing, punching, cutting, drilling, diverting, or alarming. Process applications using speed or rate monitoring may be conveyors, conveyor ovens, material flow, rotational rpm, and testing.

DM8000 SELECTION GUIDE

MODEL	INPUT	DISPLAY UNITS	STD. SPEED RANGE
DM8000	120/240 VAC	Rate or Time	Field Programmable*

Requires Dart PU-E or other pick-up.

* Shipped set for 0 - 2400 RPM with one pulse per revolution.

DM8000 OPTION DESCRIPTION

OPTION	SUFFIX
Second alarm output relay (form C).....	-R
Provision for remote pushbutton switches	-1
Pluggable terminal strip	-P
Magnetic pick-up input board	-3

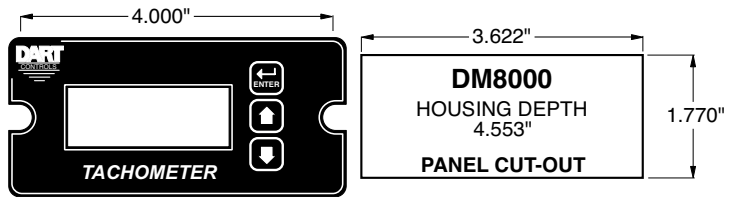
DM8000 OPERATING SPECIFICATIONS

AC input voltage.....	85–250 VAC
Input frequency.....	50/60 Hz
Input pulse rate.....	1 to 125,000 input pulses per minute
Resolution.....	from 0.01 RPM
Accuracy.....	±0.04% display up-date every pulse or 0.5 seconds, whichever is longer
Isolated high/low alarm output	5 Amp 230 VAC
Display range.....	0 to 9999
Transducer signal input.....	0-5 to 0-24 VDC square wave

4-IN-1 METER DOES IT ALL

- Programmable Rate (RPM, GPM, FPM)
- Programmable Time / Time in Process
- Counter/Totalizer w/ Contact Outputs
- Zero Speed Switch

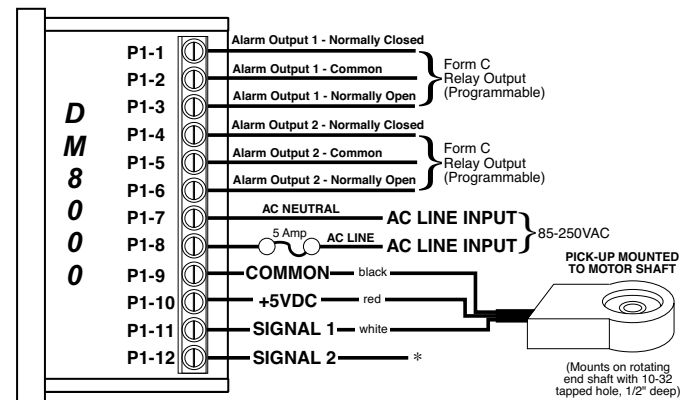
DM8000 MOUNTING SPECIFICATIONS



DM8000 DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
DM8000 inches (millimeters)			
Housing	3.620 (91.95)	1.656 (42.06)	4.428 (112.47)
Lens	4.539 (115.29)	2.289 (58.13)	0.375 (9.52)

DM8000 HOOK-UP



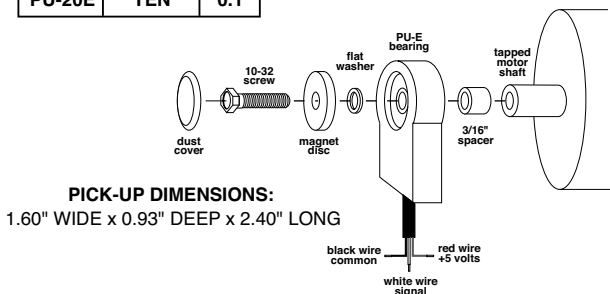
* Used for various functions, including quadrature counter mode.

DART PU-E SELECTION AND MOUNTING

MODEL	PULSES PER REV	MIN. RPM
PU-2E	ONE	1.0
PU-20E	TEN	0.1

MOUNTING PROCEDURE

1. Tap motor shaft 10-32 x 1/2" deep.
2. Remove red cap on pick-up screw.
3. Remove black dust cover from PU.
4. See illustration below.





DP4 Series Digital Potentiometer

With Scalable Display & User I/O

The DP4 is a microprocessor based digital speed potentiometer that can directly replace a conventional 3-wire analog speedpot or motorized speedpot for most AC and DC drives. The desired set speed is entered into the large 1/2 inch LED display through the convenient front-panel interface, and display units are now programmable for virtually any unit of measure.

The attractive panel mount unit is easy to install in industry standard 1/8 DIN cut-out dimensions. The electrically isolated common signal permits direct wiring from the unit terminal block to the drive's potentiometer terminal points.

The DP4 offers the same enhanced display options and capabilities featured in our other digital control products, as well as the Universal Power Supply and rugged screw type terminal strip.

TYPICAL APPLICATIONS

The DP4 is ideal for new equipment as well as for retrofitting most AC or DC drive systems where precise, repeatable speed setting and digital readout are desired. The DP4 is also ideal in applications where high vibration and other environmental factors can cause normal speedpot settings to drift.

STANDARD FEATURES

- Inhibit function selectable from a number of modes
- Control mode selectable between rate and time
- Jog function selectable from several modes
- Factory default function – reset drive to factory setting
- User-default storage capability allows user to store/recall a known good set of parameters while experimenting with new settings
- NEMA 4X Rating (faceplate with supplied gasket)
- Supports bipolar connections for regenerative drives

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
<i>DP4 inches (millimeters)</i>			
Housing	3.620 (91.95)	1.656 (42.06)	4.625 (117.47)
Lens	4.539 (115.29)	2.289 (58.13)	0.375 (9.52)

DP4 SELECTION GUIDE

MODEL	INPUT	STD. SPEED RANGE
DP4	120/240 VAC	0–100% (0.1% Increments)

OPTION DESCRIPTION

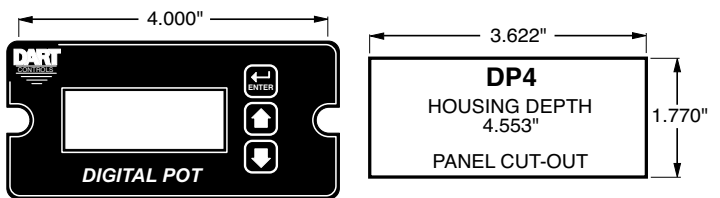
OPTION	SUFFIX
Provisions for remote pushbutton switches.....	-1
Blank Lexan.....	-9
Pluggable terminal strip.....	-P*

*Check factory for availability.

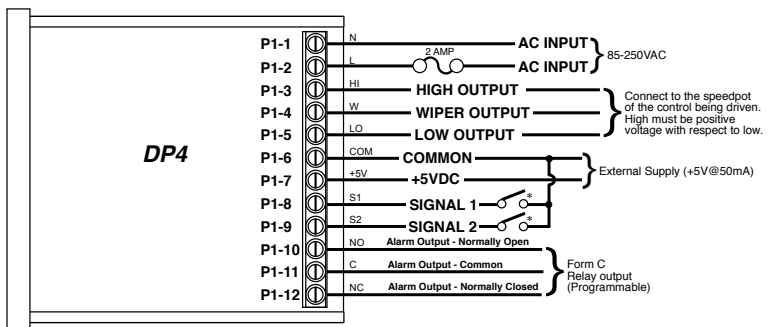
OPERATING SPECIFICATIONS

Temperature.....	-10° to +45° C
AC input voltage.....	85–250 VAC
Input frequency.....	50/60 Hz
Output compatible.....	any drive input impedance of 1000 ohms to 10,000,000 ohms.
Output support.....	±12 VDC or 0–+24 VDC

MOUNTING SPECIFICATIONS



DP4 HOOK-UP



* P1-8 & P1-9 signal inputs may be programmed for a number of functions.



PU-E Series
industrial/indoor applications

PU-E Series Hall-Effect Pick-up

The PU Series pick-up is an economical and reliable way to **monitor motor speed**. Its unique design provides ease of installation in otherwise difficult to reach areas. The PU pick-up operates at a 5 to 24 volt level producing a sharp square wave output, which may be fed into Dart's field programmable tachometer, closed-loop control, counter, or any other digital device.

The PU pick-up series also includes a quadrature model to monitor both motor speed and direction by providing two square wave output signals 81° out-of-phase.

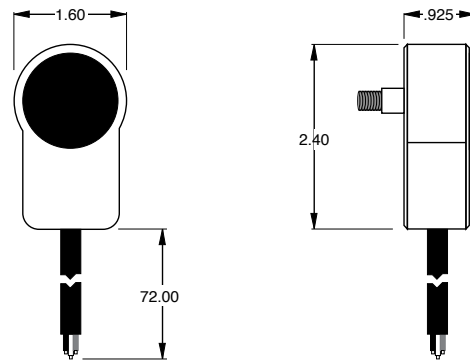
STANDARD FEATURES

- PU Series pick-up mounts directly on shaft being monitored using a single 10-32 screw.
- Maximum speed: 5,000 RPM or 50,000 pulses per minute.
- Supply voltage +4.5 VDC to +24 VDC.
- NPN open collector output signal with built-in pull-up resistor. Square wave output, signal voltage equals supply voltage. +5 VDC to 24 VDC supply voltage. Current sink: 50mA absolute maximum.
- Operating temperature: -40° C. to +100° C.
- Stainless steel ball bearing.
- Compact housing of molded "Santoprene" plastic rubber.
- Output cable-6' rubber jacketed, 3-wire 18AWG conductors;
 - red wire: +VDC supply input
 - black wire: Common
 - white wire: Signal A
 - brown wire: Signal B (model PU-20EQUAD only)

PU SERIES SELECTION GUIDE

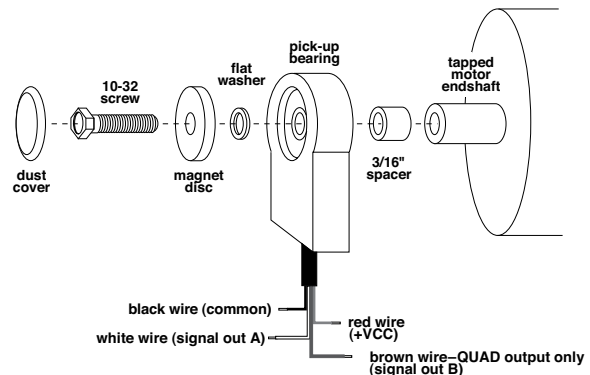
MODEL	PULSES/REVOLUTION
PU-2E industrial/indoor app. PU-2R industrial/outdoor app.	1
PU-4E PU-4R	2
PU-20E PU-20R	10
PU-40E PU-40R	20
PU-20EQUAD PU-20RQUAD	10 (and direction)

DIMENSIONAL SPECIFICATIONS



No other mounting brackets or screws are necessary, as the cord will keep the unit from rotating. The PU gives a high signal when the south pole of the magnetic disc crosses the Hall-Effect transistor. The signal is switched low when the north pole crosses this same transistor.

INSTALLATION AND WIRING



CAUTION: DO NOT OVER TIGHTEN MOUNTING SCREW !!!

CAUTION: The PU cord should not be grouped with any other wires or cords. For applications with PU wires over 6 feet long, or particularly noisy environments, a **SHIELDED CABLE** is recommended. Connect the shield to the **COMMON** terminal of the control device, leaving the shield at the pick-up end floating.



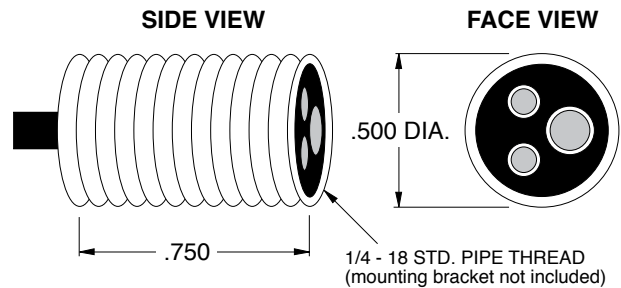
STANDARD FEATURES

- Detects shaft rotation or any other moving targets without physical contact
- Maximum speed: 600,000 pulses per minute
- Output rise and fall time: 500ns maximum
- Supply voltage +5 VDC (+6 VDC max.)
- Output is a square wave +5 VDC - 0 VDC; open collector NPN transistor capable of sinking 50mA DC maximum
- Compatible with all Dart digital speed controls and tachometers
- Shielded output cable

OPU SERIES SELECTION GUIDE

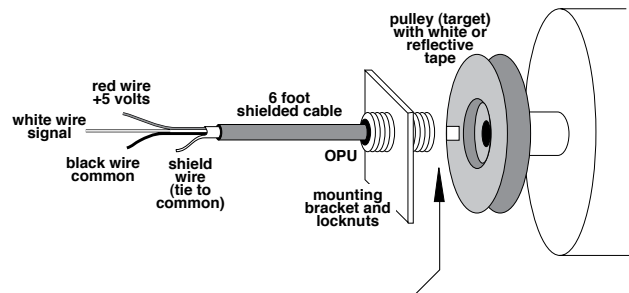
MODEL	PULSES PER REVOLUTION
OPU	Based on the number of reflective bands on target

DIMENSIONAL SPECIFICATIONS



CAUTION: The OPU cord should not be grouped with any other wires or cords. For applications with OPU wires over 6 feet long, or particularly noisy environments, may become sensitive to electrical noise.

INSTALLATION AND WIRING



IMPORTANT!

Optical pick-up face must be 1/8" to 1" from white marked surface or 3/8" to 4" from reflective marked surface!

OPU Series Photoelectric Optical Pick-up

The OPU Series pick-up is another motor speed pick-up available from Dart. It can be used in place of the PU-E pick-up, when limited space prevents physical contact with the motor shaft. The OPU is designed for use in applications which are shielded from ambient light, especially sunlight.

The OPU is an infrared LED transceiver which produces a high (+5 Volt max) signal from the reflective (light) target, and a low (0 Volt) signal from a non-reflective (dark) target surface. The result is a square wave with the frequency (number of pulses) dependent on the number of alternating light and dark surfaces on the target. The OPU can monitor not only rotating shafts but belts or virtually any moving surface.



STANDARD FEATURES

- Complete kit consists of motor face ring, sensor, mounting bolts and sensing disk.
- Molded sensing disk, impervious to dust, oil and water.
- Output connections: 3 wires.
- Supply voltage: +4.5 to 24 VDC.
- Output: NPN open collector capable of sinking 20mA D.C.
- Operating temperature: -40°C to 125°C.

CF SERIES SELECTION GUIDE

MODEL#	DISK ONLY	FRAME SIZE	PULSES PER REVOLUTION
CF-H1	-H1	56C	1
CF-H2	-H2	56C	2
CF-H15	-H15	56C	15
CF-H60	-H60	56C	60
CF-J1	-J1	*	1
CF-J2	-J2	*	2
CF-J15	-J15	*	15
CF-J60	-J60	*	60

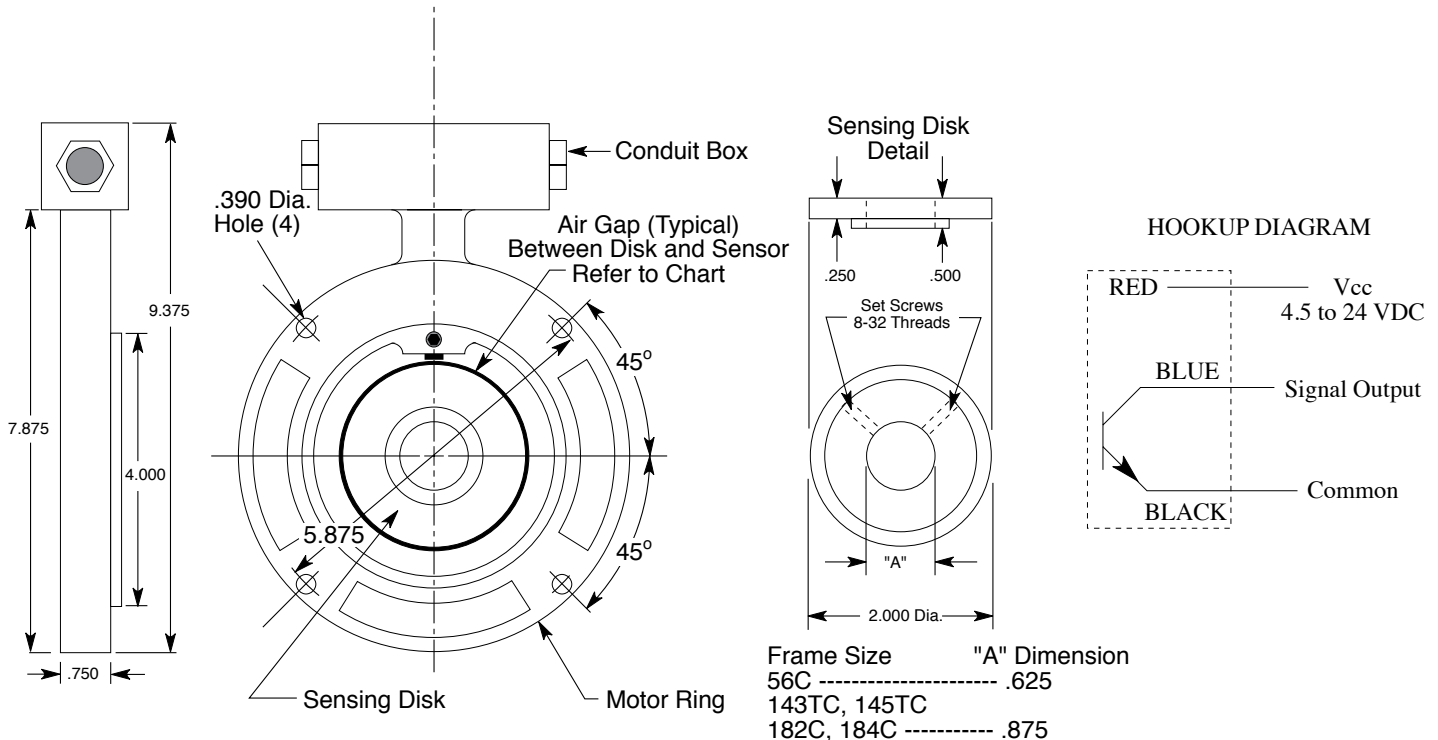
* Frame sizes 143TC, 145TC, 182C, 184C

CF Series Hall-Effect Pick-up Kit

The CF SERIES pick-up kit can be used in place of the PU-E or OPU series to monitor motor speeds when access to the motor shaft is otherwise impossible.

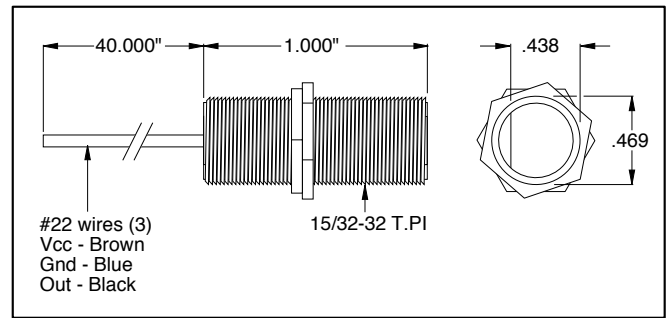
The CF series mounts directly to a motor's, NEMA "C" face. It operates at a 4.5 to 24 volt level producing a square wave output which may be used with Dart's tachometers, closed loop controls, or other digital devices.

DIMENSIONAL SPECIFICATIONS AND SCHEMATIC (DIMENSIONS IN INCHES)





DIMENSIONAL SPECIFICATIONS



Caution: The MPU-A cord should not be grouped with any other wires or cords. For applications with MPU-A wires over 6 feet long, or for particularly noisy environments, a SHIELDED CABLE is recommended. Connect the shield to the COMMON terminal on the wire end opposite the MPU-A housing.

INSTALLATION AND WIRING

The MPU-A Series must be installed so that the mounting axis is perpendicular to the direction of rotation. The flat side of the sensor housing must be parallel to the direction of the gear rotation.

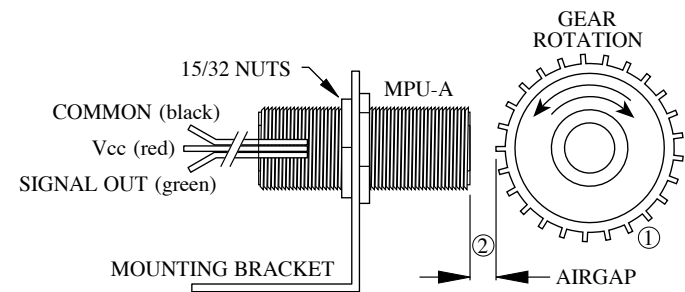


FIGURE 1

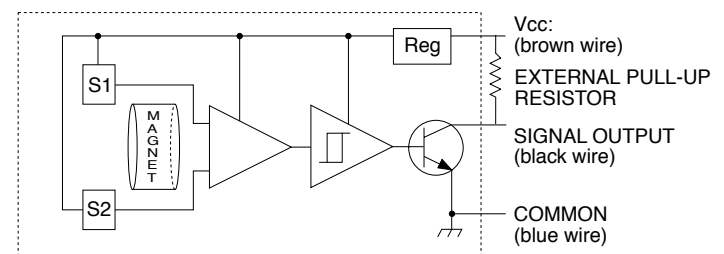
- 1) The practical **minimum** target dimensions are: 0.10" top of tooth, 0.15" tooth depth, and 0.10" spacing between teeth.
- 2) The working airgap for target dimensions approaching the minimum is approximately .005", and up to .100" for larger targets. Optimum airgap performance is achieved using target materials with a high magnetic permeability such as low carbon steels.

All Dart products requiring digital pulse feedback are designed with internal pullup resistors. However, if the MPU-A is being used with a peripheral that does not have a pullup resistor, then the resistor value can be determined below:

$$R = (V_{cc} - 0.2) \div I_{\text{sink}}$$

where I_{sink} is the desired sink current (typically 5 mA, max. 20 mA). For 5 volt V_{cc} and a desired 5 mA sink current, a resistor value of 960 ohm is calculated (1K ohm may be used).

MPU-A SERIES SCHEMATIC



MPU-A Series Hall-Effect Geartooth Pick-up

The MPU-A Series geartooth speed pick-up provides speed sensing capabilities using an integrated Hall-Effect sensor in conjunction with a permanent magnet which supplies a bias field. This ready-to-use pick-up directly senses rotating ferrous gear and other similar gear-type targets.

The MPU-A Series is capable of sensing various target tooth sizes over wide ranges of airgap. The operational airgap achieved is independent of gear rotation speed. The small module size makes it ideal in applications where space considerations are of concern. The rugged design allows the operation of these sensor assemblies in hostile environments where dirt and oil are major problems.

The MPU-A Series pick-up can be used in place of a PU-E, OPU or CF Series to monitor motor speeds when access to the motor shaft or restraints limit their use.

STANDARD FEATURES

- Senses motion of ferrous gear type targets.
- Digital output signal (square wave).
- NPN Open collector output, capable of sinking up to 20mA.
- Zero speed sensing capabilities.
- Larger operational airgap than magnetic pick-ups.
- No additional conditioning electronics needed.
- Immune to hostile environments.
- Operates from +4.5 to +24 volts DC supply.
- Operating temperature range of -40° to +125° C.
- Rugged cylindrical threaded aluminum housing.
- Compatible with all Dart digital speed controls and tachometers.

MPU-A SELECTION GUIDE

MODEL	PULSES PER REVOLUTION
MPU-A	Based on number of teeth on target

55AC10E/15E

Min speed trim pot



55AC10C/15C



55AC and AC03 Series Variable AC Voltage Supplies

A dependable, economical and compact variable AC voltage supply manufactured especially for the vibratory feeder, fan, pump, heating, and lighting industries. All models feature single-phase AC input and fully variable AC output. The enclosed version comes with a rugged housing, power on/off switch, power on indicator lamp, front access fuse, as well as convenient input and output cords and plugs.

The heart of the control is a triac fired in a manner to adjust phase and thereby vary speed. The 55 Series is designed to work with shaded pole, permanent split capacitor, universal motors or any resistive load. It is not designed for capacitor start motors.

55 SERIES SELECTION GUIDE

C = Chassis; E = Enclosed

120 VAC Single Phase Input 50/60 Hz., 0-120 VAC Output

AC INPUT MODEL	AC OUTPUT AMPS	WATTS
55AC10C/E	10	1150
55AC15C/E	15	1725

240 VAC Single Phase Input 50/60 Hz., 0-240 VAC Output

AC INPUT MODEL	AC OUTPUT AMPS	WATTS
57AC10C/E	10	2300
57AC15C/E	15	3450

OPTION DESCRIPTION

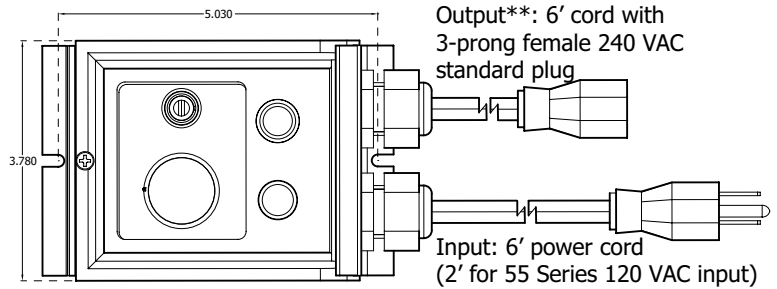
OPTION	SUFFIX
Half-wave DC output available for all chassis versions. Usually utilized in vibratory feeder applications.....	-D*

* Option compatible with DC PM or universal motors and resistive load.

55 SERIES DIMENSIONAL SPECIFICATIONS

MODEL/OPTION	WIDTH	LENGTH	DEPTH
<i>English (inches)</i>			
55AC10/15C	2.90	1.80	2.20
57AC10/15C	2.90	3.50	2.20
55AC10/15E	4.00	5.53	3.80
57AC10/15E	4.00	5.53	3.80
<i>Metric (centimeters)</i>			
55AC10/15C	7.37	4.57	5.59
57AC10/15C	7.37	8.89	5.59
55AC10/15E	10.16	14.07	9.65
57AC10/15E	10.16	14.07	9.65

57 SERIES ENCLOSURE DIAGRAM

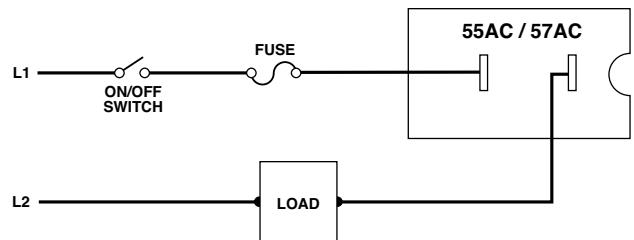


**55AC10/15E has female 3-prong receptacle in cover for output

55 SERIES OPERATING CONDITIONS

Temperature	-10° to +45° C.
AC Input Voltage	±10% Rated Line Voltage
Input Frequency	50/60 Hz.

55 SERIES HOOK-UP DIAGRAM

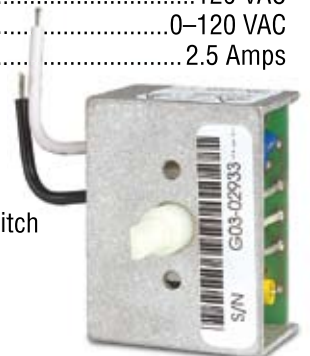


NOTE: Second switch and fuse required in L2 leg for 240 VAC chassis model applications

AC03-05S SERIES SPECIFICATIONS (LOWER CURRENT APPLICATIONS)

Input Voltage.....	120 VAC
Output Voltage	0-120 VAC
Maximum AC Output Current.....	2.5 Amps

- Features
- Controls most single phase AC motors and restrictive loads, not equipped to handle capacitor start motors
 - Speed pot with on/off switch



AC03-05S



AC03 cULus Recognized



MSC38A Series Eight Channel Master Speed Control

A reliable, economical master speed control unit for operating multiple variable speed drives from a single 5K master potentiometer or field selectable DC voltage range of 0-5 through 0-25 VDC OR 0-25 through 0-200 VDC input (grounded or ungrounded).

Drives may be controlled to maintain identical speeds or individually pre-set proportional speeds with respect to the MSC speed setting.

STANDARD FEATURES

- 120 VAC $\pm 10\%$, 50/60 Hz. line source
- Eight (3-wire) output channels - each optically isolated
- MSC38A may be cascaded to operate more than 8 drives
- Master command input circuit electrically isolated from AC
- Rapid response time
- European style terminal block connectors
- Supply voltage of driven unit is 5-25 VDC maximum
- 5K ohm speedpot with leads, dial, and knob for remote mounting included
- Interfaces with Dart 125, 250, or 500 series controls or most other manufacturer's drives
- Outputs are controlled via a 5K ohm master speedpot or a field selectable DC voltage signal (0-5 through 0-25 VDC OR 0-25 through 0-200 VDC)
- Each output is capable of driving input impedances as low as 500 ohm

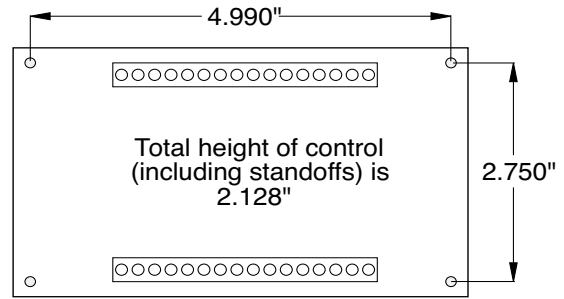
DIMENSIONAL SPECIFICATIONS

WIDTH	HEIGHT	LENGTH	WEIGHT
<i>English (inches)</i>			
3.13	2.13	5.40	7.4 oz
<i>Metric (centimeters)</i>			
7.95	5.41	13.73	208.3 gm

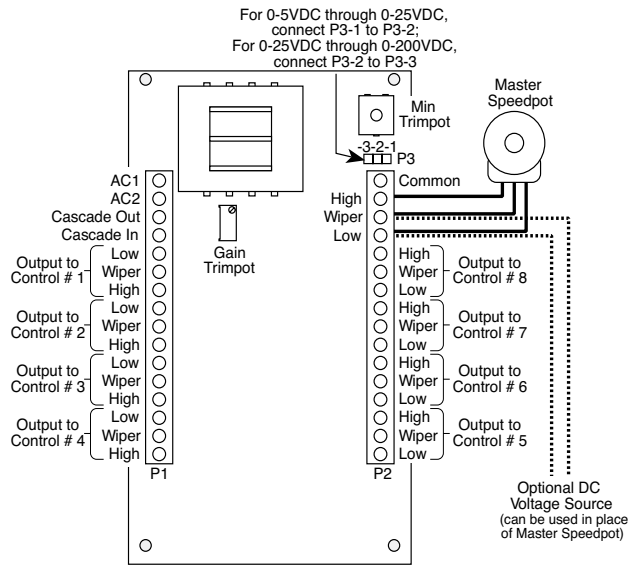
OPERATING CONDITIONS

Temperature.....-10° to +45° C. (15° to 113° F.)
 AC Input Voltage..... $\pm 10\%$ Rated Line Voltage
 Input Frequency.....50/60 Hertz
 Output Voltage..... 0-5 through 0-25 VDC each channel
 Output Current..... 10 mA per channel

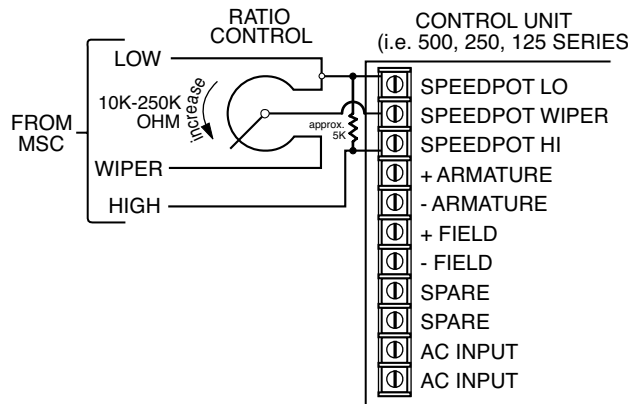
MSC38A MOUNTING DIMENSIONS



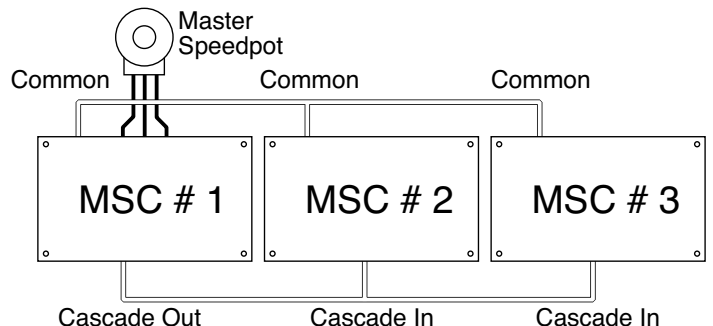
MSC38A HOOK-UP FOR DIRECT OPERATION



INPUT HOOK-UP FOR RATIO OPERATION



CASCADE HOOK-UP FOR BASIC CONTROLS



For more than 8 outputs using a single Master speedpot, controls can be cascaded together via the cascade and common terminals shown above.

Standard DC Motors



Dart has partnered with Leeson Electric to sell their motors, gearmotors and reducers. **Our philosophy is to make these items available to our customers with quick delivery at a competitive price, regardless of order size.**

Leeson has provided Dart with access to any item in their catalog. For items we do not stock ourselves, we are able to drop ship directly to customers from any one of 25 domestic Leeson warehouse locations.

Our application engineers are ready to help you select the right

motor / gearmotor / reducer for your application. If we cannot answer your questions directly, we will get those answers for you. You owe it to yourself to check our service and price against your current solution – you may be pleasantly surprised.

Stock Motors

Dart maintains stock of NEMA frame DCPM motors through 2HP. These motors from Leeson have their shafts drilled and tapped to accommodate the very popular PU Series encoders.

STOCK MOTORS

MODEL	HP	VOLTAGE
LM90T025	1/4	90
LM90T033	1/3	90
LM90T050	1/2	90
LM90T075	3/4	90
LM90T100	1	90
LM180T050	1/2	180
LM180T075	3/4	180
LM180T100	1	180
LM180T150	1½	180
LM180T200	2	180

Get your copy of the latest Leeson Stock Catalog:

http://www.leeson.com/Literature/brochures_1050.html

For outline drawings and complete specifications, go to:

<http://www.dartcontrols.com/product-guide/motors-and-gear-reducers/standard-stock-dc-motors/>

Three Set Speeds of Operation

Dart Controls DC motor speed controls may be configured for three set speeds of operation by connecting a switch in the potentiometer circuit.

The 3 set speeds are as follows:

- 1) High Speed – Maximum speed set by the board mounted max speed pot
- 2) Mid Speed – Adjustable speed set by the main speed pot
- 3) Low Speed – Minimum speed set by the board mounted min speed pot

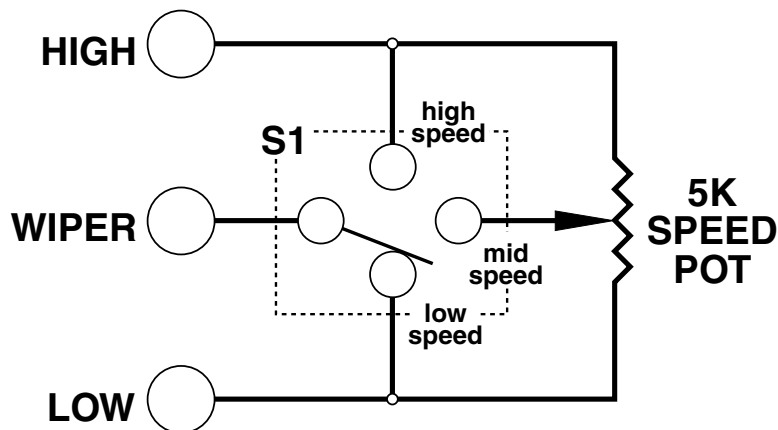
Valid For Models: Any Dart Controls motor control with an adjustable speed potentiometer.

SCR Controls:500, 250, 130, 125, 15

Brushless Controls:700

Battery Operated Controls: ...65

Dart Controls offers both AC and DC motors and controls. Feel free to contact us for assistance in selecting the right AC or DC motor and control for your application.



Drive On/Off Strategies

Requirement: Identify the different ways drives can be turned on/off, and advantages of each

Solution:

1. Cycle source power – this is the safest and most complete method. ACCEL settings functional but DECEL is bypassed. Not recommended for rapid drive cycling applications as power off/on creates delay during power up waiting for internal power supply to become active. Note: -29 Option 4PDT switch breaks source power to drive when in center position

2. Inhibit – this method leaves source power connected to the drive but inhibits motor armature output by collapsing the internal power supply, disabling driver circuit logic. ACCEL and DECEL settings are bypassed. There are advantages to this method – this method is recommended for on/off cycling applications as internal power supply is maintained throughout and delay is avoided. In addition switch or relay contact used are switching very low power.

3. Break POT HI / WIPER – another low-power method of switching the drive on and off, simply break either the POT HI or WIPER lead. This method leaves both ACCEL and DECEL settings functional

Valid for Dart Models:

13/15 Series; 65 Series; 125 Series; 130/132 Series; 253 Series; 530 Series

Control Chassis Grounding

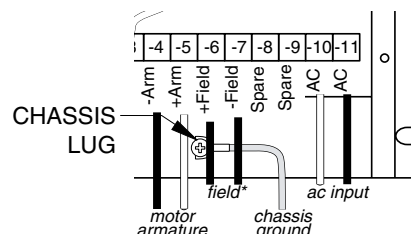
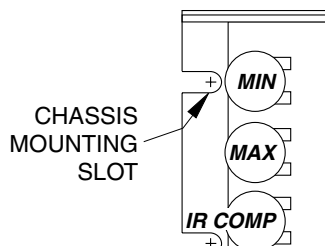
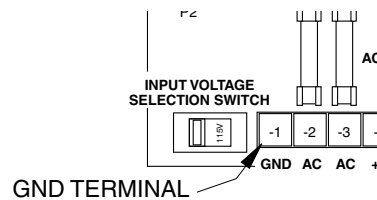
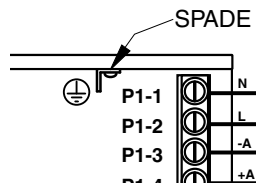
It is important to understand and implement proper grounding of your motor control to ensure safety of personnel and protect your product investment.

Circuit common (sometimes called 'ground') and earth ground are NOT synonymous.

The motor control circuitry should remain isolated from earth ground at all times. Earth ground conductors should not terminate at any screw terminal unless specifically labeled GND, as in the 500 series. The 500 series is the only Dart product line that provides a screw terminal connection for earth ground wiring.

Dart motor controls are mounted to various types of metal chassis which act as heat-sinks for the motor current carrying components of the control circuitry. These chassis are electrically isolated from the circuitry and should be grounded. If present, the GND screw terminal will safely ground the chassis. If a GND screw terminal is not provided (the case for ALL Dart products except the 500 Series), ground termination points may be provided in the form of a ground lug or spade. Consult the product Instruction manual to verify whether a screw terminal or spade pin is provided to accommodate earth ground wiring.

If a termination point is not provided on the terminal strip or chassis directly, a ground conductor may be terminated under a mounting screw or bolt at one of the mounting slots of the chassis.



Adding Length to Standard PU Series Cord

Requirement: Some applications require more than the standard cord length provided
Solution: Add SHIELDED CABLE Valid for Models: All PU-E and PU-R Series

Instructions:

1. **Cut cable** provided near the sensor end, leaving room for wire strip & splice
2. **Splice SHIELDED CABLE** (see table). Soldered splice connections recommended
3. **Terminate shield at ONE END ONLY** to earth ground (equipment frame, grounding lug or post)

Distance	Wire AWG
5 – 100'	16
100' – 300'	14
300' +	(Not Recommended)

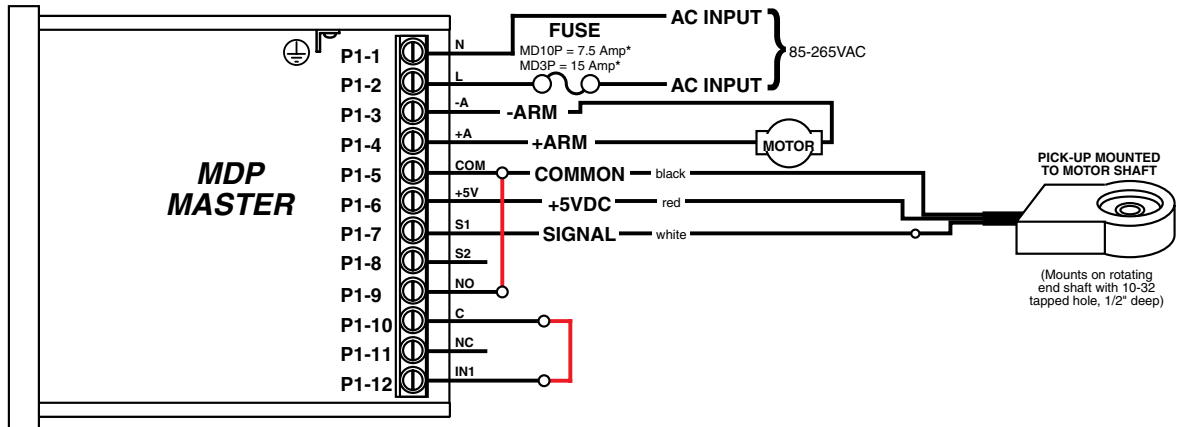
MD Series Loss of Pick-up Signal Shutdown

Requirement: Detect when feedback pulses from the required speed sensor are lost (sensor is defective / motor stalled) and/or when the drive output has gone to 100% (sensor feedback lost)

Solution: User configurable alarm output tied back into the MD Series Inhibit circuit

Valid for Models: All MD and MD Plus Series of the chassis.

Programming: MD10 / MD3: Parameter 50; 57 or 58
MD40 / MD50: Parameter 34 & 50



Drive Synchronization Using Dart ASP Series

Requirement: Operate multiple motors in proportion to each other (ex: batching, blending or synchronized parts feed)

Solution: Use Dart ASP Series SMART (closed loop) Speed Pots in Master / Follower Mode

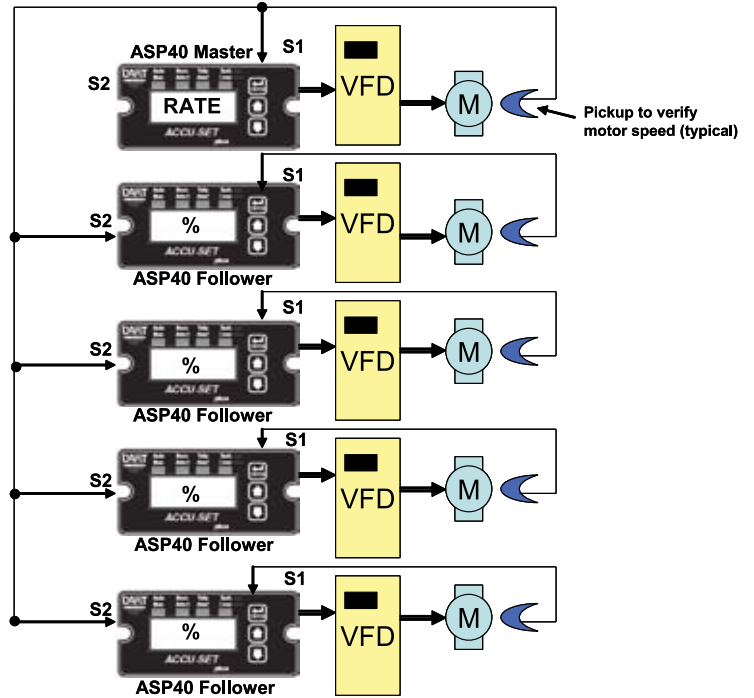
Valid for Models: ASP10 or ASP40 used with ANY drive that accepts 3 wire speed pot input

ASP40 MASTER Configuration (changed from Default)

Parameter	Value
P30*	Desired Display Value (ex: units/min)
P31*	Motor RPM at Desired Display Value
P32	S1 pulses/rev
*If RPM of motor is the desired display value, only P32 is changed	

ASP40 FOLLOWER Configuration (changed from Default)

Parameter	Value
P10	Set to 3 (Follower Mode)
P13*	Set to 3 for decimal point (XXX.X)
P32	S1 pulses/rev
P37	S2 pulses/rev
*optional	



DEFINITION OF TERMS

1. ADJUSTABLE CURRENT LIMITING (TORQUE LIMITING)

This feature permits the operator to adjust the maximum current the motor will draw. This in effect limits the maximum torque the motor will produce.

2. ADJUSTABLE LINEAR ACCELERATION

Allows the operator to adjust the amount of time it takes the motor to come up from stop to the maximum speed setting. This is available in time spans up to 12 seconds (model dependent), with longer times available as special items.

3. ADJUSTABLE MINIMUM AND MAXIMUM SPEED

This feature allows the operator to set the minimum and maximum speeds that the motor is to operate. The main speed dial then adjusts the speed between this range.

4. BASIC TYPE OF LOAD

The three basic types of loads, (constant torque, variable torque, and constant horsepower) can be accommodated with Dart controllers when properly selected.

5. CHASSIS MOUNT (LESS ENCLOSURE)

Open construction for mounting in the customers existing enclosures or control consoles.

6. COGGING

Speed change as a result of armature coils entering and leaving magnetic fields.

7. CONSTANT HORSEPOWER

This type of load requires constant horsepower throughout the speed range and the torque increases as the speed decreases. For all constant horsepower loads the horsepower required at the driven equipment's lowest operating speed determines the horsepower of the drive.

8. CONSTANT TORQUE

By far the most common of loads. Torque remains constant throughout the speed range while the horsepower required decreases in direct proportion from maximum to minimum speed. In all constant torque applications, the drive is selected based on the maximum horsepower required by the driven equipment at its maximum speed.

9. CONTROL BY REMOTE SIGNAL

Remote signal controls take the form of voltage or current signals in the following ranges; 4-20mA, and 0-5 thru 0-250 VDC. Remote signal controls are available both electrically isolated and non-isolated. It is important therefore to indicate if the remote signal is not electrically isolated from the power source (grounded).

10. CONTROLLED (TIMED) ACCELERATION

This feature will accelerate the motor to the set speed in a given length of time.

11. DUTY-CYCLE

The relation between the operating time and the rest time of a motor. A motor which continues to operate after it has reached its normal operating (steady) temperature is operating under continuous duty conditions. One which never reaches a steady temperature but is permitted to cool between operations is operating under intermittent duty conditions.

12. DYNAMIC BRAKING

A way of stopping a brush-type motor by first disconnecting the power source. The rotating motor then becomes a generator which is connected to a resistor. The energy of rotation is then dissipated as heat in the resistors.

13. HORSEPOWER OR TORQUE REQUIRED

If the horsepower or torque for a given application is not known, it can usually be calculated using of the following methods:

$$\text{HORSEPOWER} = \frac{\text{Force (lbs)} \times \text{Feet per minute}}{33,000}$$

$$\text{HORSEPOWER} = \frac{\text{Torque (in-lbs)} \times \text{RPM}}{63,025}$$

$$\text{HORSEPOWER} = \frac{\text{Torque (ft-lbs)} \times \text{RPM}}{5,252}$$

$$\text{TORQUE (in-lbs)} = \frac{63,025 \times \text{HP}}{\text{RPM}}$$

$$\text{TORQUE (ft-lbs)} = \frac{5,252 \times \text{HP}}{\text{RPM}}$$

$$\text{FEET/MINUTE} = 262 \times \text{Dia. of wheel (inches)} \times \text{RPM}$$

14. IR COMPENSATION

This function compensates for the resistance change in the armature due to load changes and also increases the speed regulation range.

15. JOGGING

This feature provides a means of inching the motor using a single button. The jog feature is available only when a separate remote station is used (i.e. Start-Stop). A run jog selector is provided along with the jog button itself.

16. LINE VOLTAGE COMPENSATION

Holds the motor speed constant when the line voltage fluctuates over a range of $\pm 10\%$.

17. MULTI-MOTOR CONTROL OR MASTER OVERRIDE

This is accomplished by one of two ways, namely:

A) A master control which controls each individual control and its associated motor. Using this method the master control sets the maximum speed that can be set on the individual unit, maintaining the ratio.

B) Connecting more than one motor to an individual control. Satisfactory results are limited to specific applications using this arrangement. Consult the applications department before specifying this system.

18. PLUG REVERSAL

A method of changing the rotation of a motor by reversing connection polarity as the motor runs. This is not recommended for DC motors – it can damage the control and motor and reduce their life.

19. POTENTIOMETER SPEED INDICATOR

This feature provides a means of speed indication by monitoring the voltage on the speed set control. This meter is accurate to the degree the control will provide. Generally the control is accurate to 2% and the metering circuit is accurate to 3% to give an overall accuracy of 5%. This is used where a meter is desired.

20. PRE-SET SPEED

A selected speed may be set when the control is not in operation. The motor will then accelerate to the pre-set speed when the switch is turned on.

21. PUSHBUTTON SPEED CONTROL

Permits the selection of speed settings via pushbuttons.

22. REVERSING, ELECTRICAL (AUTOMATIC)

Utilizes relays and/or solid state circuitry to automatically provide dynamic braking for a quick stop; and reversal of the armature leads at zero motor speed. Direction is controlled with a SPDT switch, relay contacts (dry contact switching), or NPN open collector.

23. REVERSING, MANUAL

The manual reverse incorporates a switch to reverse the polarity of the armature leads. The switch is constructed so that the leads cannot be reversed without going through a neutral or brake position.

24. SPEED ADJUSTMENT POTENTIOMETER

The standard speed potentiometer when provided is a 3-wire single turn $5K\Omega$ $\frac{1}{2}$ Watt.

25. SPEED RANGE

The speed range is defined as the ratio of minimum to maximum speed where the speed regulation published is obtained. The motor speed is always adjustable to zero.

26. SPEED REGULATION

Defined as the change in motor RPM from NO LOAD TO FULL LOAD, and expressed as a percentage of base speed. For close regulation a tachometer generator feedback system or digital closed loop control is suggested.

27. TACHOMETER FEEDBACK

This feature includes the tachometer mounted on the opposite end of the motor. Extremely close regulation is available with tachometer feedback. Practical systems have regulation as close as $\frac{1}{2}\%$.

28. TACHOMETER FOLLOWER

Permits the speed control to be controlled by a remote tachometer. The speed control maximum trim pot then adjusts the maximum speed at which the motor will run. Note: The tachometer (customer mounted) must run at the speed the motor to be controlled runs.

29. TACHOMETER SPEED REGULATION

This feature normally used in conjunction with Tachometer Feedback (item 27) includes the tachometer mounted on the end shaft of the motor and a meter calibrated to read from 0-100%. Other markings are available. The standard meter scale is 3.5 inches.

30. VARIABLE TORQUE AND HORSEPOWER

Although encountered considerably less often than constant torque, this type load should be recognized as having an increase in horsepower that varies as the square or cube of the increase in speed. With this type of load the horsepower and torque required increases at a greater rate than the increases in driver speed. As with the constant torque load drive the variable torque and the horsepower load drive should be reflected for the maximum horsepower required by the driven equipment at its maximum speed.

Accent on Product

Dart is the most responsive manufacturer of controls anywhere. We listen to our customers' needs and respond with the control product that best fits their special requirements.

For product and application assistance, please contact us.

- **SCR and Digital DC speed controls for AC line voltage to three horsepower**
- **DC reversing controls**
- **AC VFD and vector drives**
- **Brushless DC speed controls**
- **Battery/low voltage DC speed controls**
- **Open and closed loop control systems**
- **Digital tachometer for rate and time**
- **Speed sensors**
- **Variable AC voltage supply**
- **Standard stock DC motors**
- **RoHS Compliant Products**

Available From:

Accent on Service

Dart has refined its lean manufacturing process to be able to schedule production runs in multiple quantities and models.

We can promise shipment the same day on standard products and within five days for specials.

- Local stocking distributors in most major cities, U.S.A., Canada, and selected overseas countries.
- Sales representatives covering 48 states and Canada.

Dart Controls Headquarters Contacts:

Customer Service

(317) 733-2133 ext. 350
customerservice@dartcontrols.com
Price and shipment information, order placement, and warranty.

Sales Department

(317) 873-5211
sales@dartcontrols.com

Application Support

(317) 733-2133 ext. 350
<http://www.dartcontrols.com/support/>
Product information and application assistance.

Technical Support

(317) 733-2133 ext. 350
<http://www.dartcontrols.com/support/>

Customer Feedback

(317) 873-5211
sales@dartcontrols.com



Manufacturer of High Quality Motor Speed Controls and Accessories Since 1963.

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For the most recent updates on Dart product innovations, see our website at:
www.dartcontrols.com

