

YOUR MOTION SYSTEMS SOLUTIONS PROVIDER



DART
CONTROLS

www.dartcontrols.com

Since 1963, Dart Controls has been designing and manufacturing some of the world's most reliable variable speed motor drives and accessories. Through continuous innovation, a relentless dedication to the industry, and a commitment to high quality products and dependable delivery, Dart Controls has retained the leadership position it established over 35 years ago.

Our mission is to continue to be the leader in variable speed controls and accessory products by constantly seeking to improve the quality of products, procedures and service, while maintaining our commitment to our customers, employees, shareholders and suppliers.

Some of the ways that Dart Controls fulfills this mission is as follows...

Dedicated Employees and Manufacturing Operations

Dart Controls is proud to have one of the most loyal and dedicated workforces available anywhere in the world. With an extremely low turnover rate, you can rest assured that your drive is being assembled by a team of associates that understands their job very well and knows the importance of doing it right. From our headquarters and manufacturing facility in Zionsville (Indianapolis), Indiana, we have produced and shipped more than 2,000,000 variable speed drives.

Total Solutions Provider

In addition to the many standard, off-the-shelf, products offered, Dart Controls is also a 'Total Solutions Provider'. We will develop 'packages' of sensors and drives to meet your specific needs, and custom-engineer products for your unique application. Dart Controls is a 'Customer-Driven' company, so we listen to your needs. If those needs require new or customized products, we will work with you and your engineering team to provide a total solution.

Broad Range of Products

Dart Controls offers the broadest range of electronic motor speed controls (rated to 5 Hp), as well as speed control accessories, available in the industry.

Superior Service and Support

With Dart Controls, you can rely on an immediate response for product or service information, as well as rapid order processing, prompt shipments, and a knowledgeable service staff. We also provide comprehensive instruction manuals for each of our products and these manuals, as well as other valuable, time-saving information, can be found and downloaded from our website.

In addition, our network of sales representatives covers the U.S., Canada, and Mexico, and our products are stocked by local distributors in most major cities in the U.S., Canada and certain overseas locations.



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NEMA 4/12



"RC" CHASSIS

WASHDOWN DUTY

500 Series Variable Speed DC Control

Dart's top of the line DC speed control is reliable, versatile, and economical. Rated to 3 horsepower, it provides many standard features typically offered as options.

The Dart 500 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 500 Series' capabilities to meet specific application requirements.

An integral part of a distinguished line of quality products, the 500 Series is representative of Dart's continuing effort to provide reliable, versatile controls to the OEM, distributor, and the industrial market.

You can close the system loop with Dart's economical pick-ups and digital products. See pages 16-19 and pages 35-38.

500 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)
- Power interrupt relays (RC and 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, 120mA power supply, user accessible
- Enclosed models rated NEMA 4/12
- c.U.L. Recognized - file # E78180 (N)

500 SERIES SELECTION GUIDE

H.P. RANGE	CHASSIS "C"	ENCLOSED "RE"	CHASSIS WITH RELAY "RC"
<i>115 VAC Single Phase Input, 0-90 VDC Output ¹</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

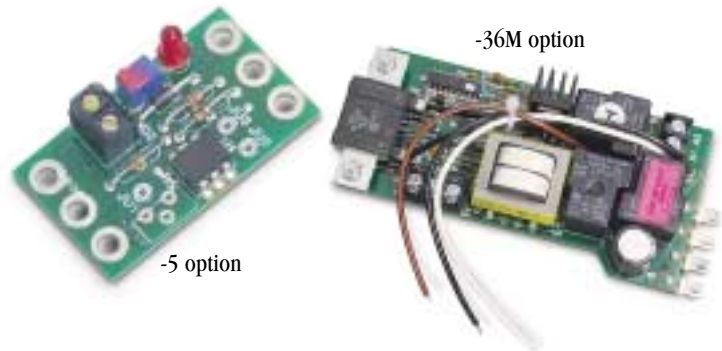
H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/8	1.8	0.22	1.4
1/6	2.6	0.31	2.1
1/4	3.5	0.42	2.7
1/3	4.4	0.53	3.4
1/2	6.5	0.78	5.0
3/4	9.3	1.12	7.2
1.0	13.2	1.58	10.2
1.5	21.5	2.57	14.7

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*
Ten turn speed potentiometer (chassis only)	-11*
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	-36M*/MA ¹
240 VAC	-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 (factory installable only).	

CHASSIS

NEMA 4/12



250 Series Variable Speed DC Control

The 250 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 (120/240VAC), 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 250's capabilities.

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

You can close the system loop with Dart's economical pick-ups and digital products. See pages 16-19 and pages 35-38.

250 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 and 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
- U.L. 508 Recognized - file # E78180 (N)
- C.S.A. Certified - file # LR 85877

250 SERIES SELECTION GUIDE

H.P. RANGE	CHASSIS "C"	ENCLOSED "E"
<i>120 VAC Single Phase Input, 0-90 VDC Output</i>		
1/50 - 1/8	251G-12C	251G-12E
1/8 - 1.0	253G-200C	253G-200E
<i>240 VAC Single Phase Input, 0-180 VDC Output</i>		
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
<i>English (inches)</i>				
Chassis	5.53	7.00	1.63	14.25 oz.
Enclosed	5.53	7.25	2.75	17.50 oz.
<i>Metric (centimeters)</i>				
Chassis	14.1	17.78	4.14	404 gm.
Enclosed	14.1	18.42	6.98	486 gm.

OPERATING CONDITIONS

Temperature -10° to $+45^{\circ}$ 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

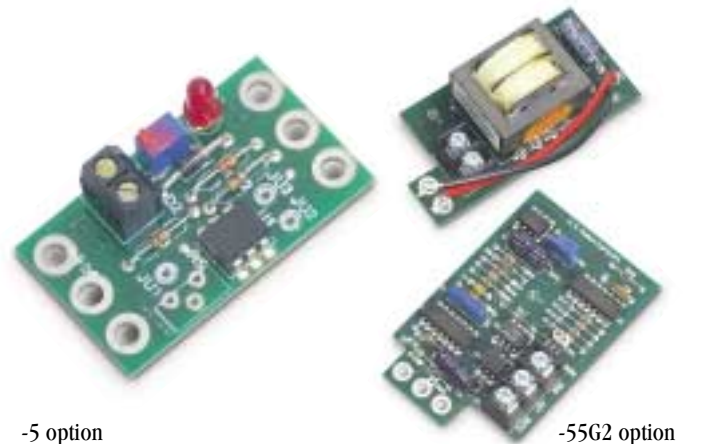
H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/50	0.5	0.06	0.4
1/20	1.0	0.12	0.8
1/8	2.0	0.24	1.6
1/4	3.5	0.42	2.7
1/3	4.4	0.53	3.4
1/2	6.5	0.78	5.0
3/4	9.3	1.12	7.2
1	13.2	1.58	10.2

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 253 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)	-55G2*
-55G2 option with Auto/Manual function	-56G2 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.



125 Series Variable Speed DC Control

A compact, cost-efficient, reliable control for PM, Shunt Wound DC motors and Universal motors. The 125 Series variable speed control incorporates up-to-date design and engineering into an amazingly small package.

Installation and field adjustment are facilitated using a barrier type terminal strip and large, easily adjusted trimpots. Adjustable horsepower range - 120VAC, 1/50 through 1/8 and 1/4 through 1/2; 240VAC, 1/25 - 1/4 and 1/8 through 1.

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.

You can close the system loop with Dart's economical pick-ups and digital products. See pages 16-19 and pages 35-38.

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 (60-110% of base)
- Adjustable IR Compensation
- Adjustable Current Limit
- Fixed Acceleration (0.5 sec.)
- Line voltage compensation
- 5K ohm speed potentiometer with leads, dial and 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 and stop without breaking AC lines
- Shunt field supply provided (1 Amp max; 100V for 120 VAC; 200V for 240 VAC input)
- U.L. 508 Recognized - file # E78180 (N)
- C.S.A. Certified - file # LR 85877
- European Compliance - C.E. mark

125 SERIES SELECTION GUIDE

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

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

240 VAC Single Phase Input, 0-180 VDC Output

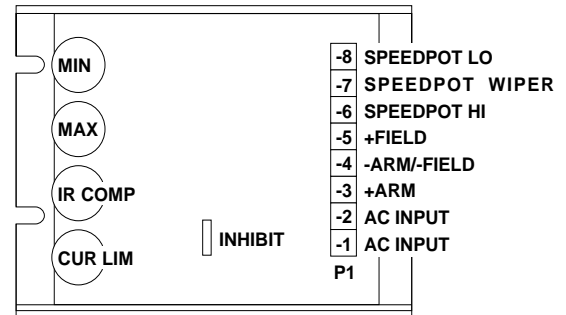
H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/4	1.8	0.42	1.4
1/3	2.2	0.53	1.7
1/2	3.3	0.78	2.5
3/4	4.8	1.15	3.7
1	6.5	1.56	5.0

* Minimum Armature Amps: 150mA DC

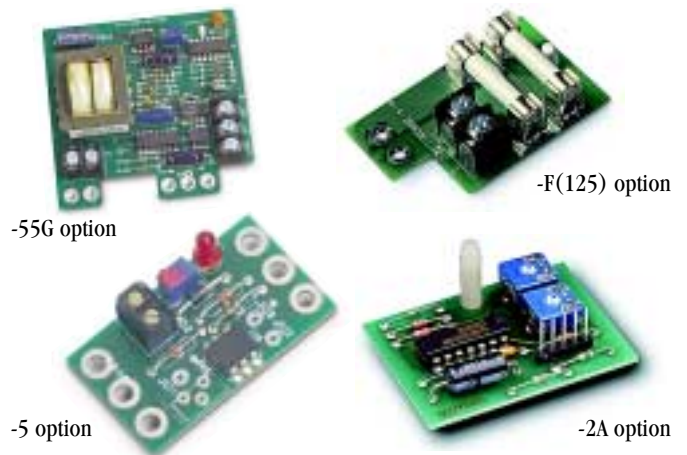
DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH	WEIGHT
<i>English (inches)</i>				
Chassis	3.63	4.25	1.30	8 oz.
<i>Metric (centimeters)</i>				
Chassis	9.20	10.80	3.30	227 gm.

ADJUSTMENTS AND HOOK-UP



POPULAR OPTIONS



OPTION DESCRIPTION

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. (Patent # 4,888,813)	-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	-55G*
-55G option with Auto-Manual function	-56G*
Auxiliary heatsink (7" long x 6.25" wide x 1.375" deep)	-HS(125)*
Fuse board with (2) 15 Amp 3AG fuses	F(125)*

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

DART CONTROLS

15 SERIES



15 Series Adjustable Speed DC Control

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 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 and a NEMA 4/12 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 and 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
- AC line fuse
- Power on/off switch } Enclosed Model
- UL/cUL Recognized File # E78180
- European compliance – CE mark

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
13DV-E	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
15DV-E	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).

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH	WEIGHT
<i>English (inches)</i>				
13DV1A/15DV1A	2.80	1.30	3.30	2.64 oz.
13DV2A/15DV2A	2.80	1.50	3.30	2.94 oz.
13DV-E/15DV-E	3.81	5.50	3.50	10.00 oz.
<i>Metric (centimeters)</i>				
13DV1A/15DV1A	7.20	3.30	8.40	75 gm.
13DV2A/15DV2A	7.20	3.90	8.40	83 gm.
13DV-E/15DV-E	9.68	13.96	8.89	284 gm

OPERATING CONDITIONS

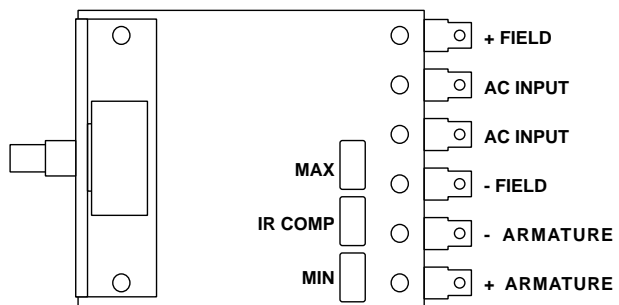
Temperature -10° to +45° C.
 AC Input Voltage ±10% Rated Line Voltage
 Input Frequency 50/60 Hz.

ELECTRICAL SPECIFICATIONS AC INPUT 50/60 Hz

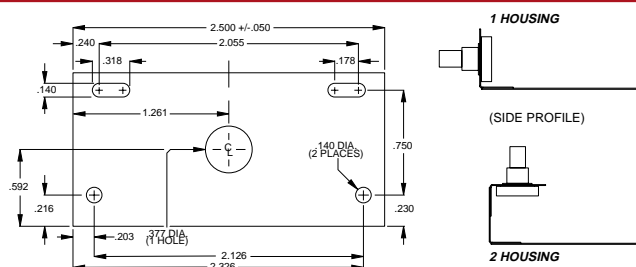
MODEL	MAXIMUM CONTINUOUS AC AMPS	MAX. CONTINUOUS ARM AMPS*	MAX HP
<i>12 VAC Single Phase Input, 0-11 VDC Output</i>			
13DVA	2.6	2.0	1/40
13DV-E	3.9	3.0	1/25
<i>24 VAC Single Phase Input, 0-22 VDC Output</i>			
13DVA	2.6	2.0	1/20
13DV-E	3.9	3.0	1/12
<i>120 VAC Single Phase Input, 0-90 VDC Output</i>			
15DVA	2.6	2.0	1/6
15DV-E	3.9	3.0	1/3
<i>240 VAC Single Phase Input, 0-180 VDC Output</i>			
15DVA	2.6	2.0	1/6
15DV-E	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 only	-104
3-position terminal strip with speedpot, dial, and knob kit	-TS



VSI Series Voltage Signal Isolator*

The Dart VSI (voltage signal isolator) permits the user to control the output of a variable speed motor drive from any external grounded or ungrounded DC input signal. A single model accepts a wide range of input voltages (0-5 through 0-25VDC or 0-25 through 0-250VDC). The GAIN trimpot is used to adjust the output of the VSI to full on when a full speed signal is applied to its input terminals. The VSI

incorporates Dart's patented feedback circuit, which virtually eliminates output changes due to the thermal drift of logic components. The VSI 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 VSI 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 VSI is a filtered, pulse width modulated signal that is directly proportional to the input speed signal. The wide input range allows the VSI to follow signals as low as +0-5V logic levels and up to the 180VDC 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 VSI for master/follower operation. The addition of a scaling pot will provide for proportional follower operation.

* By adding a resistor across signal input, VSI can function as Current Signal Isolator.

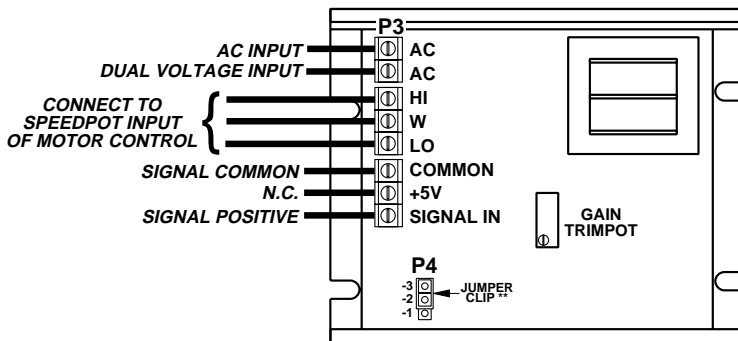
VSI SERIES SELECTION GUIDE

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

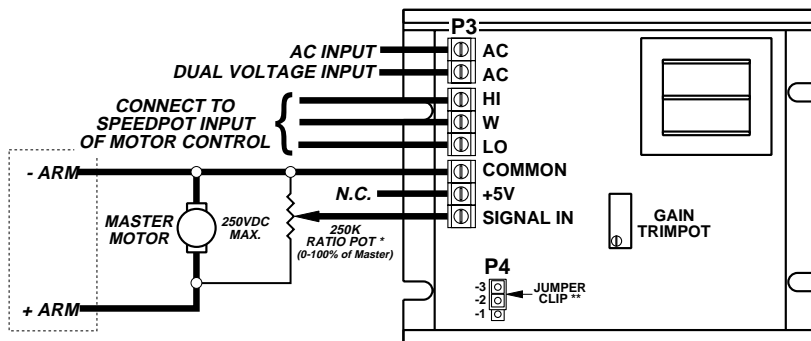
DIMENSIONAL SPECIFICATIONS

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

VSI HOOK-UP CONFIGURATIONS



STANDARD HOOK-UP



FOLLOWER MODE HOOK-UP

NOTES:

* If ratio of Master is NOT needed, delete the 250K pot and connect +Armature directly to Signal Input.

** Jumper clip is used to select input voltage range. When installed from P4-1 to P4-2, the range is 0-25VDC thru 0-250VDC; when installed from P4-2 to P4-3, range is 0-5VDC thru 0-25VDC.

MD Series Digital Closed Loop DC Speed Control

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, operating mode (master or follower), and the constant which takes into account motor gear ratios.

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.

Industry standard cutout dimensions of 1/8 DIN and 1/4 DIN provide easy panel installation. All wiring connects directly to a rugged screw type terminal strip through the rear panel.

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

TYPICAL APPLICATIONS

- 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
- Pump and chemical metering systems

OPERATING SPECIFICATIONS

Temperature	-10° to +45° C
AC input voltage	85–265 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

(For external sensors)

New universal power supply will support any AC input voltage from 85 to 265 VAC



Display adjustable for intensity, decimal point positions, and zero blanking

User can program all configurations through easy-to-use front panel push button switches

Easy access to all rear panel connector terminals



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 have adjustable rate and mode; linear or non-linear
- Display is programmable for any engineering unit of measure
- Display options include zero-blanking, 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 from 85 – 265 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
- Multiple operational modes: Rate, Time, Follower

MD SERIES SELECTION GUIDE

MODEL NUMBER	SIZE	H.P. RANGE	INPUT	OUTPUT
MD10P	1/8 DIN	.15A-1/2 HP	120 VAC	0-90 VDC
		1/8-1 HP	240 VAC	0-180 VDC
MD3P	1/4 DIN	1/4-1 HP	120 VAC	0-90 VDC
		1/4-2 HP	240 VAC	0-180 VDC

- All models accept 85-265 VAC Single Phase Input.
- NOTE: The new design features of the MD3P described in this catalog will be available the week of August 26, 2002. Until then, continue to order the model MD3P for 120 VAC input and the MD3P-5 for 240 VAC input. The MD10P is currently available as described in this catalog.
- 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.

OPTION DESCRIPTION

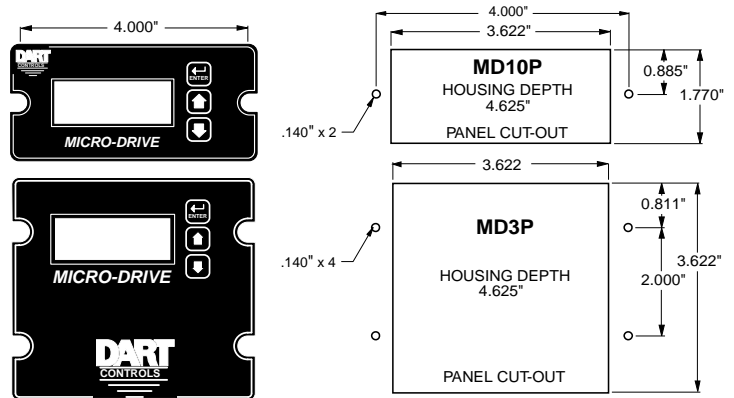
OPTION	SUFFIX
Provision for remote pushbutton switches	-1
Blank lexan	-9
Pluggable terminal strip	-P*

* Check factory for availability

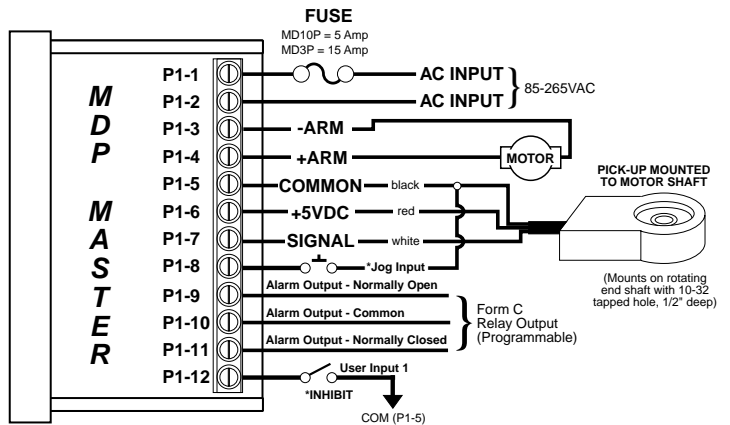
DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
<i>MD10P 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)
<i>MD3P Inches (millimeters)</i>			
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

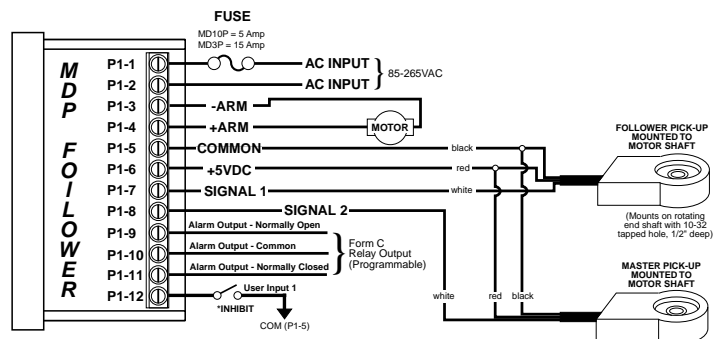


WIRING DIAGRAM - MASTER



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

WIRING DIAGRAM - FOLLOWER



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



MDII Series Programmable Digital Closed Loop DC Speed Control with P-I-D and RS Communication

The MDII Series digital motor speed controls, employing an advanced 16-bit microprocessor, is designed for digital closed loop operation of up to 2 horsepower DC permanent magnet motors. This control features a true P-I-D algorithm, for extremely responsive and precise control over a wide variety of desired speeds and applications. The **MDII Series is designed as a companion or direct replacement control to the MD Series, while offering significantly improved performance.**

Set or actual speed is displayed directly in RPM, FPM, PROCESS TIME, or other engineering units. Field programming permits customizing specific operating parameters.

The integrated RS485/RS422/RS232 serial interface port is perfect for monitoring or control using almost any computer or process controller. Units can even be attached in a Local Area Network, and can then be controlled and programmed either individually or all at once. Multiple programs allow the user to choose between a "menu" of up to six programmed configurations.

The MDII series is the ultimate answer for precise, responsive, cost-effective and flexible closed loop motor speed control.

COMMUNICATION FEATURES

- RS485; RS422; RS232 serial interface port for remote monitoring/control/programming allows the following:
 - Continuous output of actual shaft speed
 - Remote speed setting
 - Programming or listing of all field programmable parameters
 - Dartnet network allows multiple controls to be attached via one cable. Controls can be individually programmed or integrated.
 - Programmable communication baud rate - 300 to 9600 baud
- Network Follower mode allows widely remote controls to be followed together over single RS485 twisted pair wire or over existing network

- Compact 1/8 or 1/4 DIN sturdy aluminum housing for panel mounting; or NEMA 4/12 enclosure
- Microprocessor based; utilizes powerful 16-bit Motorola C68HC11
- Field Programmable operating parameters
- Displays actual or desired speed directly in RPM, FPM, process time, or other engineering units
- P-I-D digital closed loop control; gains setable for optimum system performance; Fast settling time
- Accuracy $\pm 1/2$ RPM of set speed
- Master/Follower operation
- Variety of pick-up inputs; Hall-Effect, Photoelectric, or any TTL; control accepts up to 1.2 million pulses/min. max
- Non-volatile memory retains speed setting and all field programmable parameters
- Internal A/D interface permits using potentiometer, 4 to 20mA or 0 to +5 VDC signal in lieu of digital pick-up signal or to control target speed, current program or frequency generator output
- Inhibit circuit permits start and stop without breaking AC lines; pre-selecting speed, or simultaneous start-up of multiple control units
- Up/down pushbuttons for set points - slow-fast sweep; front panel lockout prevents accidental setting changes
- Self-contained power supply for transducer (+5V, 25mA)
- Transient voltage protection
- Exclusive user assignable outputs - to drive relays, alarms, etc. Can be activated by any combination of conditions; upper speed limit exceeded, etc.
- Independent frequency generator allows units to produce own leader frequency.
- Barrier type terminal strip
- G.E. Lexan™ membrane seals faceplate from environment
- Multi-mode of operation allows multiple constants, settings, and upper/lower limits. Up to six different configurations can be selected from the front panel via the up/down pushbutton switches
- The MD20P is "cUL Recognized" - File # E78180

PROGRAMMING FEATURES

- All programming from front panel "Menu Driven"
- User selectable "programming protect" prevents unauthorized access
- LED function indicators
- Programmable parameters include:
 - Lower/upper limits for speed setting
 - Accel/decel 0 to 30 seconds for 0-1000 RPM change
 - Pick-up pulses per revolution
 - P-I-D gain settings
 - Constants to allow display in desired user engineering units - rate or time
 - Decimal point or colon
 - "Stall detector" time-out for annunciation and shutdown
 - Multiple programs permit up to six different desired set-ups to be programmed
 - Selectable display blanking point
 - Operation mode (master rate, master time, standard follower, Network Follower)
 - Unit address for multiple control networking
 - Selectable serial communication rate
 - Front panel lockout for speed setting and/or program changes
 - Numerous other features

MDII SERIES SELECTION GUIDE

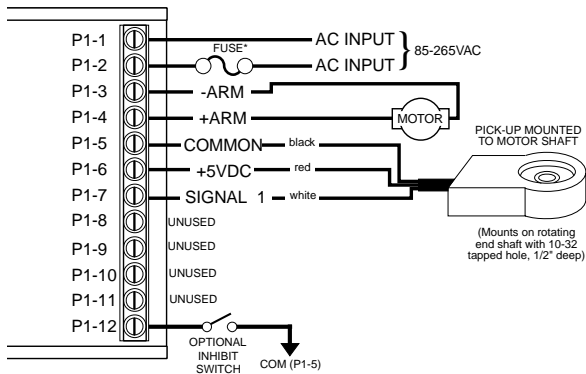
MODEL NUMBER	MAX. ARM DC AMPS	MAX H.P.	INPUT	OUTPUT
MD20P	5	1/2	120 VAC	0-90 VDC
		1	240 VAC	0-180 VDC
MD30P	10	1	120 VAC	0-90 VDC
		2	240 VAC	0-180 VDC
MD30E	10	1	120 VAC	0-90 VDC
		2	240 VAC	0-180 VDC

- All models accept 85-265 VAC Single Phase Input.
- NOTE: The new design features of the MD30P and the MD30E described in this catalog will be available the week of September 2, 2002. Until then, continue to order the model MD30P and the MD30E for 120 VAC input and the MD30P-5 and the MD30E-5 for 240 VAC input. The MD20P is currently available as described in this catalog.
- 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.

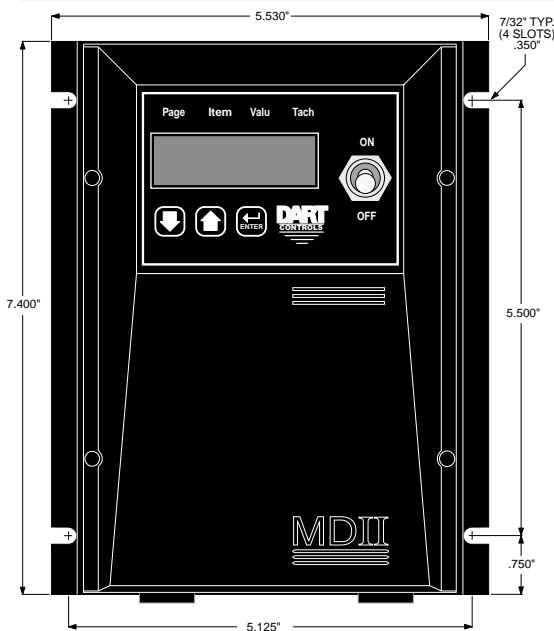
OPTION DESCRIPTION

OPTION Auto-Off-Manual control for 4-20mA or 0-5 VDC analog signal input (MD30E and MD30E-5 only) **SUFFIX** -7

WIRING DIAGRAM - MASTER



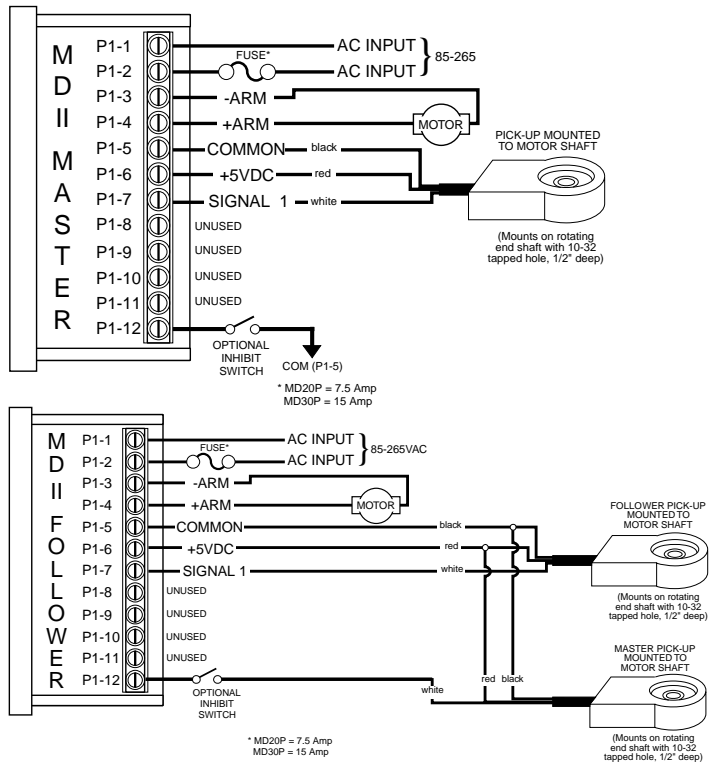
MOUNTING SPECIFICATIONS - MD30E



OPERATING SPECIFICATIONS

Temperature -10° to +45° C.
 AC Input Voltage 85-265 VAC
 Input Frequency 50/60 Hz.
 Overload Capacity 200% for 1 minute
 Transducer Signal Input 0-5 to 0-25 VDC square wave

WIRING DIAGRAM-MASTER/FOLLOWER

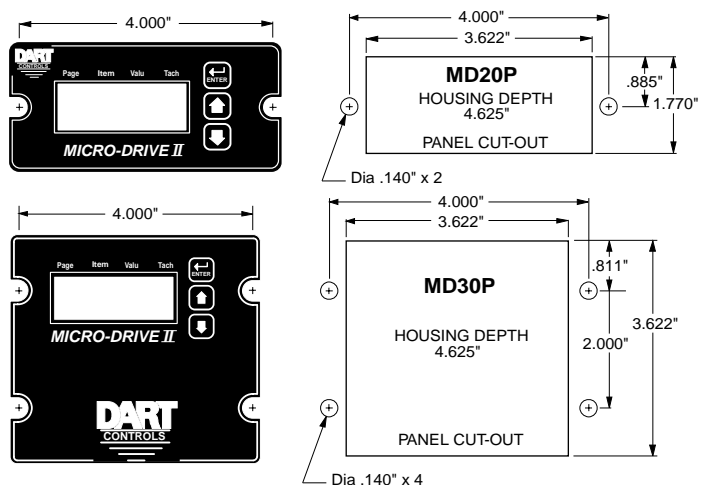


* MD30E uses a 15 Amp fuse and internally mounted on-off switch. No external fusing or switch needed.

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
MD20P 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)
MD30P 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 - MD20P / MD30P



Accu-Set Series Digital Closed Loop Interface for Improved AC or DC Drive System Performance

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 rugged screw type 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	85-265 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)
Output support	± 10 VDC or 0 - 20 VDC

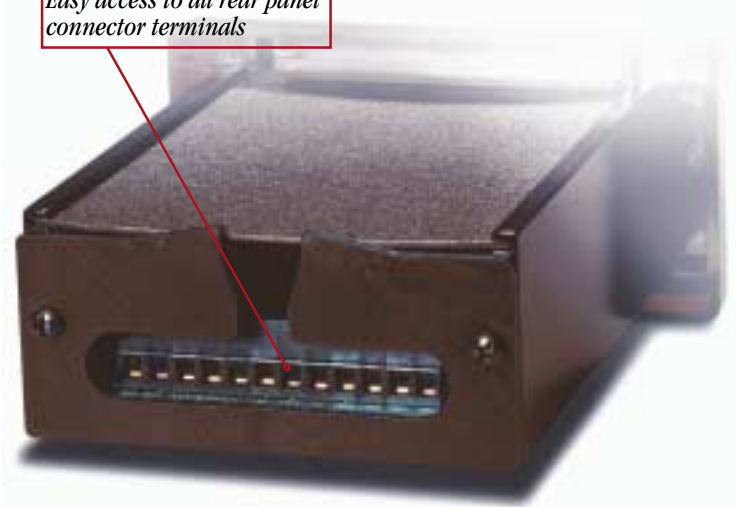
New universal power supply will support any AC input voltage from 85 to 265 VAC



Display adjustable for intensity, decimal point positions, and zero blanking

User can program all configurations through easy-to-use front panel push button switches

Easy access to all rear panel connector terminals



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
- Programming buttons have adjustable rate and mode; linear or non-linear
- Display is programmable for any engineering unit of measure
- Display options include zero-blanking, 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 – 265 VAC
- Compatible with Dart line of low-cost digital pick-ups or other suitable pick-ups
- Programmable user output supporting up to 230VAC @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
- Output support for bipolar connections with power supplies of ± 10 VDC or lower (Regen Applications)

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

• *NOTE: The new design features of the ASP10 described in this catalog will be available the week of September 2, 2002. Until then, continue to order the model ASP10 for 120 VAC input and the ASP10-5 for 240 VAC input.*

OPTION DESCRIPTION

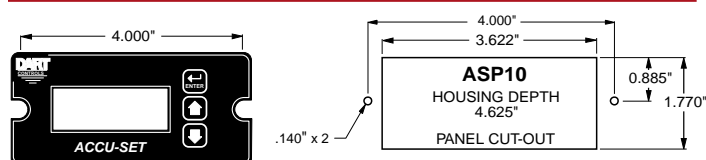
OPTION	SUFFIX
Provisions for remote pushbutton switches	-1
Pluggable terminal strip	-P*

*Check factory for availability.

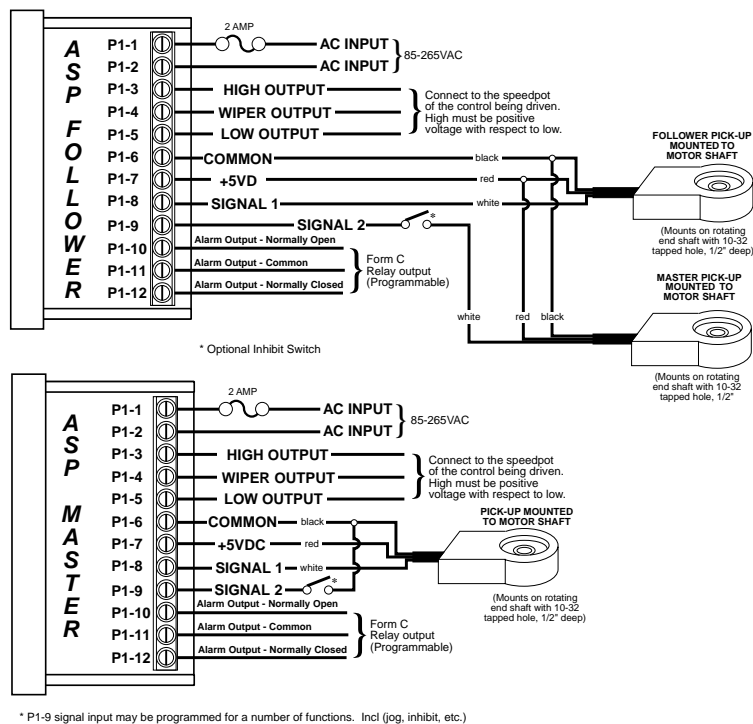
DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
<i>ASP 10 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)

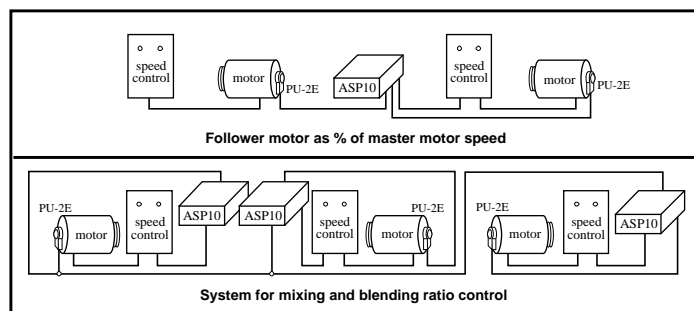
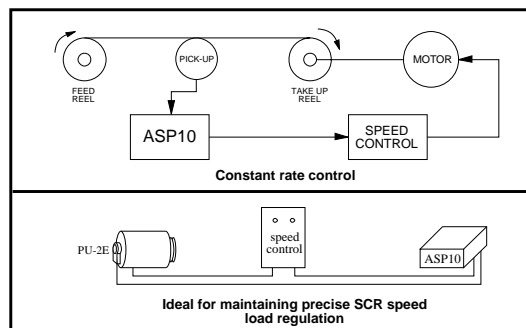
MOUNTING SPECIFICATIONS



ACCU-SET HOOK-UP- MASTER AND FOLLOWER



ASP CONFIGURATIONS





Accu-Set II Series Digital Closed Loop System for Use with Conventional AC Frequency or DC Drives

The Accu-Set II Series digital control unit, with an advanced 16-bit Microprocessor, is designed for use with conventional AC frequency or DC drives, any horsepower, to provide: LED display of set or actual speed, closed loop motor speed control, Master or Follower modes, and Serial communications.

The Accu-Set II Series is a companion control to the Accu-Set Series, while offering significantly improved performance. This control features a *true* P-I-D algorithm, for extremely responsive and precise control over a wide variety of desired speeds and applications.

Set or actual speed is displayed directly in RPM, FPM, Process Time, or other engineering units. Field programming permits customizing specific operating parameters.

The integrated RS485/RS422/RS232 serial interface port is perfect for monitoring or control using almost any computer or process controller. Units can even be attached in a Local Area Network, and can then be controlled and programmed either individually or all at once. Multiple programs allow the user to choose between a "menu" of up to six programmed configurations.

The Accu-Set II Series is ideally suited for commercial or industrial applications, including system up-grades.

COMMUNICATION FEATURES

- RS485; RS422; RS232 serial interface port for remote monitoring/control/programming allows the following:
 - Continuous output of actual shaft speed
 - Remote speed setting
 - Programming or listing of all field programmable parameters
 - Dartnet network allows multiple controls to be attached via one cable. Controls can be individually programmed or integrated.
 - Programmable communication baud rate for 300 to 9600 baud
 - Network Follower mode allows widely remote controls to be followed together over single RS485 twisted pair wire or over existing network

- Compact 1/8 DIN aluminum housing for panel mounting
- Microprocessor based; utilizes powerful 16-bit Motorola MC68HC11
- Field Programmable operating parameters
- Displays actual or desired speed directly in RPM, FPM, process time, or other engineering units
- P-I-D digital closed loop control; gains setable for optimum system performance; Fast settling time
- Accuracy $\pm 1/2$ RPM of set speed
- Master/Follower operation
- Variety of pick-up inputs; Hall-Effect, Photoelectric, or any TTL; accepts up to 1.2 million pulses/min. maximum
- Non-volatile memory retains speed setting and all field programmable parameters
- Internal A/D interface permits using potentiometer, 4 to 20 mA or 0 to +5 VDC signal in lieu of digital pick-up signal or to control target speed, current program or frequency generator output
- Inhibit circuit permits start and stop without breaking AC lines; pre-selecting speed, or simultaneous start-up of multiple control units
- Up/down pushbuttons for set points - slow-fast sweep; front panel lockout prevents accidental setting changes
- Self-contained power supply for transducer (+5V, 25mA)
- Exclusive user assignable outputs - to drive relays, alarms, etc. Can be activated by any combination of conditions; upper speed limit exceeded, etc.
- Independent frequency generator allows units to produce own leader frequency.
- Barrier type terminal strip
- G.E. Lexan™ membrane seals faceplate from environment
- Multi-mode of operation allows multiple constants, settings, and upper/lower limits. Up to six different configurations can be selected from the front panel via the up/down pushbutton switches

PROGRAMMING FEATURES

- All programming from front panel "Menu Driven"
- User selectable "programming protect" prevents unauthorized access
- LED function indicators
- Programmable parameters include:
 - Lower/upper limits for speed setting
 - Accel/decel 0 to 30 seconds for 0-1000 RPM change
 - Pick-up pulses per revolution
 - P-I-D gain settings
 - Constants to allow display in desired user engineering units— rate or time
 - Decimal point or colon
 - "Stall detector" time-out for annunciation and shutdown
 - Multiple programs permit up to six different desired set-ups to be programmed
 - Selectable display blanking point
 - Operation mode (master rate, master time, standard follower, Network Follower)
 - Unit address for multiple control networking
 - Selectable serial communication rate
 - Front panel lockout for speed setting and/or program changes
 - Numerous other features

ACCU-SET II SERIES ASP20 SELECTION GUIDE

MODEL	INPUT	DISPLAY UNITS	STD. SPEED RANGE
ASP20	120/240 VAC	Rate or Time	Field Programmable*

Requires Dart PU-E or other pick-up.

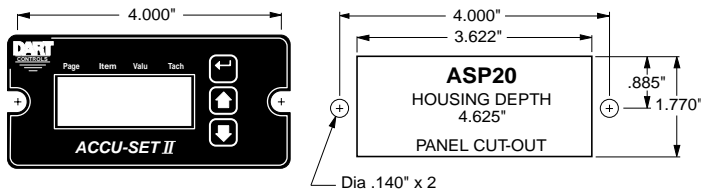
* Shipped set for 0 - 3600 RPM with one pulse per revolution.

• **NOTE:** The new design features of the ASP20 described in this catalog will be available the week of August 26, 2002. Until then, continue to order the model ASP20 for 120 VAC input and the ASP20-5 for 240 VAC input.

OPERATING SPECIFICATIONS

Temperature	-10° to +45° C.
AC input voltage	85-265 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)

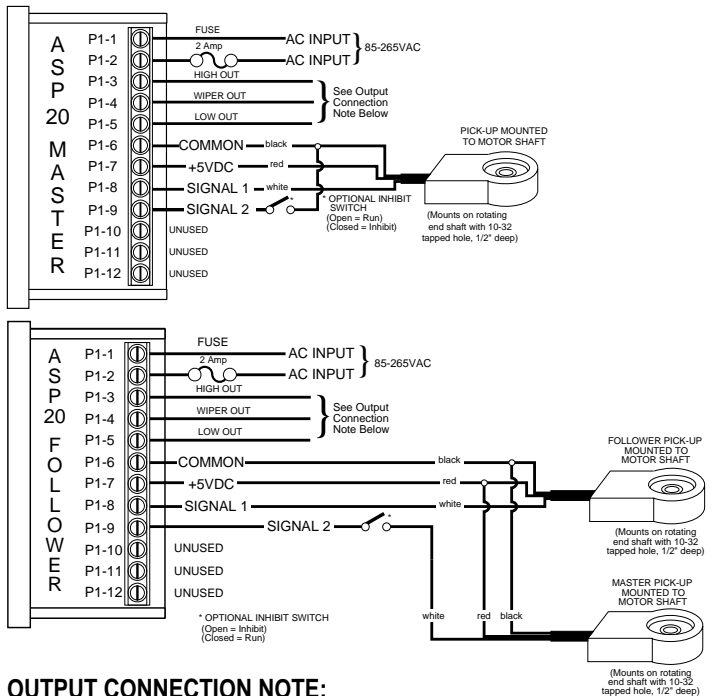
MOUNTING SPECIFICATIONS - ASP20



DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
<i>ASP20 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)

HOOK-UP DIAGRAMS - ASP20



OUTPUT CONNECTION NOTE:

Connect to Speedpot input of the device being driven (P1-3) must be positive in respect to P1-5). If driven device has a positive supply, connect P1-3 to the Positive supply terminal (Pot High) and set Page 7 Item 11 (see ASP20/MD20 instruction manual) to a value of zero. If driven device has a negative power supply, connect P1-3 to the Common terminal (Pot Low) and set Page 7 Item 11 to a value of 1.

HOOK-UP PROCEDURE:

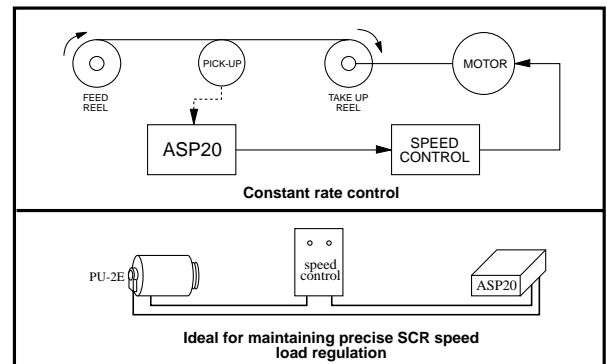
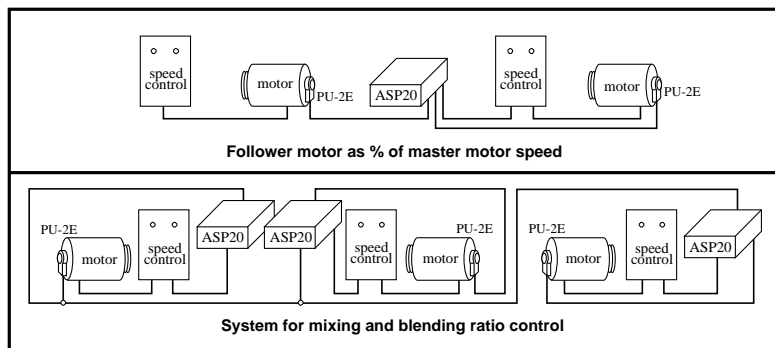
- STEP 1: Connect the proper input voltage to P1-1 and P1-2.
 NOTE: Fusing should be added in the AC line to protect the control. A 2 amp fuse is recommended.
 STEP 2: Connect the PU-E as shown in hook-up diagram above.
 STEP 3: Wire the pot output of the ASP20 to the control being driven.
 STEP 4: You are now ready to apply power to your system.

NOTE: Shielded cable is recommended for applications where pick-up cord length is in excess of 6 feet.

Connect the shield to the common terminal of the ASP20, leaving the shield at the pick-up end floating.

CAUTION: When pick-up signal is lost, a master ASP20 will run at full speed, while a follower ASP20 will go to zero speed.

ACCU-SET SERIES CONFIGURATIONS



DP4 Series Digital Potentiometer with Scaleable Display and User I/O

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 Series 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 Regen

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)

• *NOTE: The new design features of the DP4 described in this catalog will be available the week of September 2, 2002. Until then, continue to order the model DP4 for 120 VAC input and the DP4-5 for 240 VAC input.*

OPTION DESCRIPTION

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

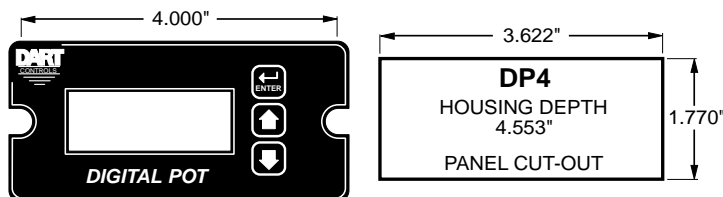
*Check factory for availability.



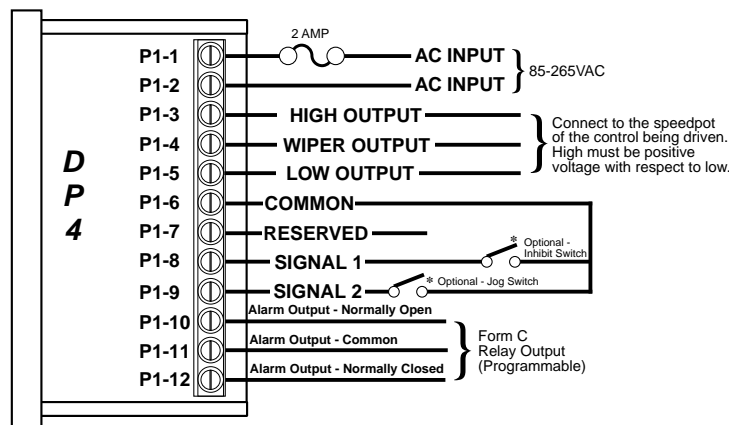
OPERATING SPECIFICATIONS

Temperature -10° to +45° C
 AC input voltage 85–265 VAC
 Input frequency 50/60 Hz
 Output compatible any drive input impedance of
 1000 ohms to 10,000,000 ohms.
 Output support ±10 VDC or lower or 0 to +20 VDC

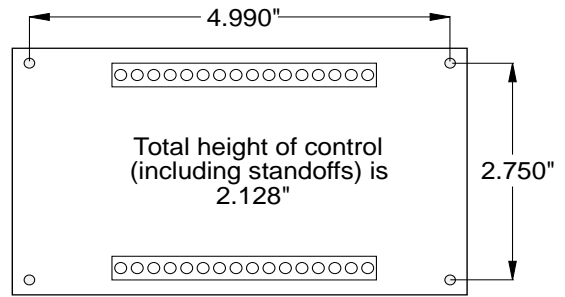
MOUNTING SPECIFICATIONS



DP4 HOOK-UP



* P1-8 and P1-9 are programmed for a number of functions.



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

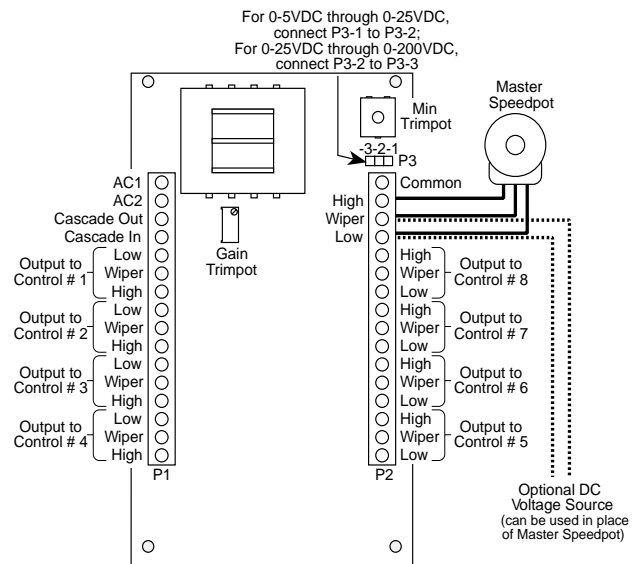
DIMENSIONAL SPECIFICATIONS

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

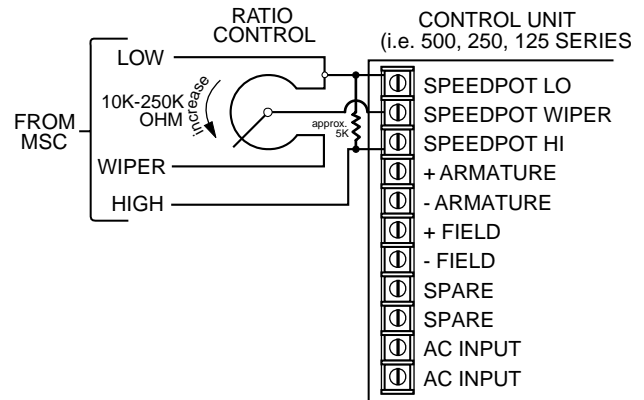
OPERATING CONDITIONS

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

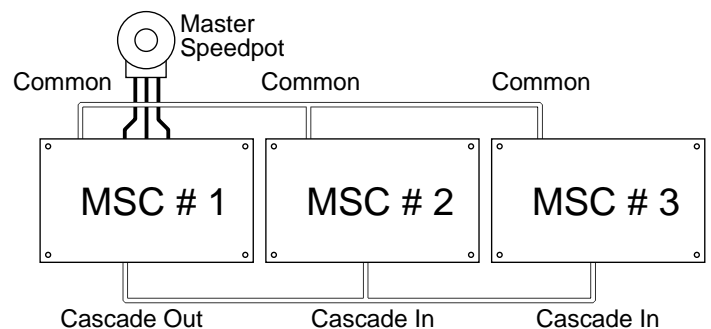
MSC38A HOOK-UP FOR DIRECT OPERATION



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.



New universal power supply will support any AC input voltage from 85 to 265 VAC

Easy access to all rear panel connector terminals

Display adjustable for intensity, decimal point positions, and zero blanking

User can program all configurations through easy-to-use front panel push button switches

DM8000 Series Microprocessor Based Digital Tachometer and Process Meter

An economical microprocessor-based digital tachometer system capable of measuring shaft speeds lower than 1 RPM. An on-board microcomputer coupled with sophisticated internal software, quartz crystal controlled reference frequency, and display updating on every pulse or every .5 seconds (whichever is longer), permits 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 isolated high and low alarm output (separately settable), and optional RS 232 output for display data, permit local or remote annunciation or process monitoring. Designed to use a variety of inputs, including the Dart patented Hall-Effect solid state PU-E pick-up, the system delivers trouble free operation at an economical cost.

The DM8000 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.

DM8000 STANDARD FEATURES

- Selectable alarm output modes: 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)

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

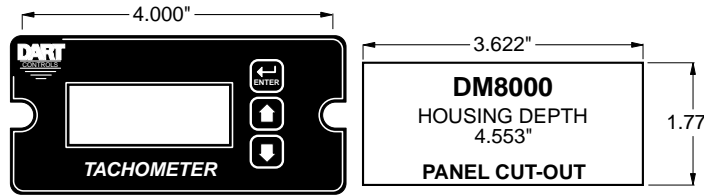
OPTION	SUFFIX
Second alarm output relay	-R
Provision for remote pushbutton switches	-1
Pluggable terminal strip	-P*

*Check factory for availability.

DM8000 OPERATING SPECIFICATIONS

AC input voltage	85–265 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 max settable range: 0 to 9999
Transducer signal input	0-5 to 0-24 VDC square wave

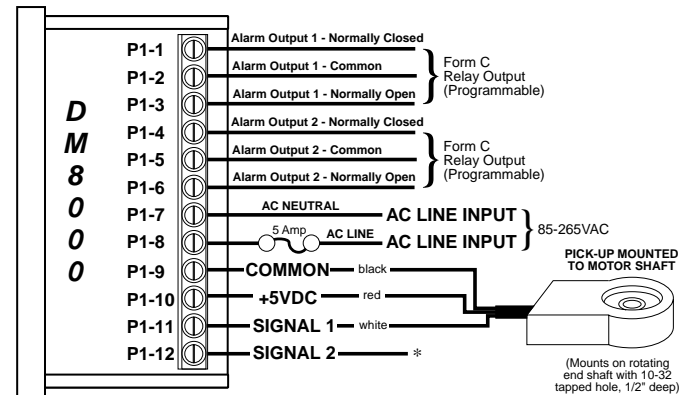
DM8000 MOUNTING SPECIFICATIONS



DM8000 DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	HEIGHT	DEPTH
<i>DM8000 Inches (millimeters)</i>			
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



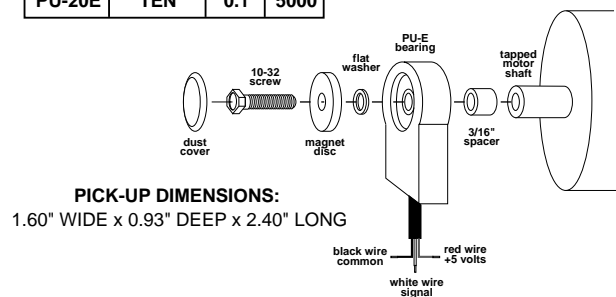
* Used for various functions, including quadrature counter mode.

DART PU-E SELECTION AND MOUNTING

MODEL	PULSES PER REV	MIN. RPM	MAX. RPM
PU-2E	ONE	1.0	5000
PU-20E	TEN	0.1	5000

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.





DM4000 Series Field Programmable Digital Tachometer for Rate and Time

A compact, accurate and economical rate and time meter for the OEM and user market. The Dart DM4000 Series is field programmable for user desired units: RPM, FPM, GPM, Process Time, or other engineering units. Large 1/2 inch 4-digit LED display allows viewing under the most adverse conditions.

Designed to use a variety of speed inputs, including the Dart patented Hall-Effect PU-E pick-up. The unit's self-contained power supply uses 120 VAC, 50/60 Hz. power source, while the -5 option operates from 240 VAC, 50/60 Hz. input. The system delivers accurate (\pm one count) trouble free operation.

The attractive, panel mounted unit, with rugged aluminum housing, removable faceplate, and rear mounted barrier type terminal strip, allow for easy installation.

DM4000 STANDARD FEATURES

- Field programmable to directly display RPM, FPM, GPM, Process Time, or other engineering units
- Uses a variety of Pick-up inputs;
 - Dart PU-E
 - Hall-Effect
 - Photoelectric
 - Magnetic
 - Any TTL NPN open collector
- Input pulse rate: 125 minimum; 600,000 maximum pulses per minute
- Display accuracy ± one count
- Illuminated decimal points
- Screw type barrier terminal strip
- Compact 1/8DIN sturdy aluminum housing for panel mount
- Large four digit 1/2" LED displays
- Self-contained power supply for transducer (+5 VDC, 75mA output)

DM4000 SELECTION GUIDE

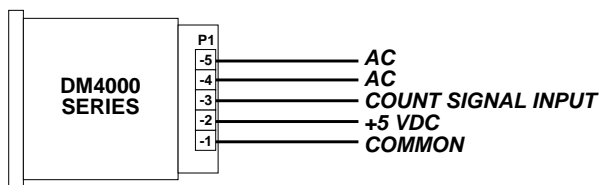
MODEL	INPUT	DISPLAY UNITS
DM4004	120 VAC	Rate
DM4004-5	240 VAC	Rate
DM4005	120 VAC	Time (in-process)

Requires Dart PU-E or other suitable pick-up.

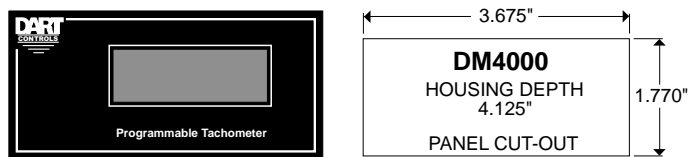
DM4000 OPERATING CONDITIONS

Temperature -10° to +45° C.
 AC Input Voltage ±10% Rated Line Voltage
 Input Frequency 50/60 Hz.
 Transducer Signal Input 0-5 VDC to 0-24 VDC
 or a magnetic sine wave not to exceed 24V peak-peak

DM4000 HOOK-UP



DM4000 DIMENSIONAL SPECIFICATIONS



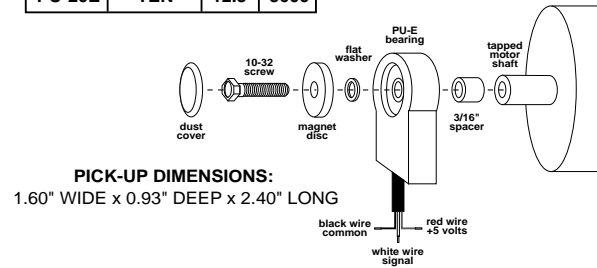
MODEL	WIDTH	HEIGHT	DEPTH
<i>English (inches)</i>			
Housing	3.62	1.66	4.13
Lens	4.42	2.25	0.25
<i>Metric (centimeters)</i>			
Housing	9.19	4.22	10.48
Lens	11.27	5.71	00.64

DART PU-E SELECTION AND MOUNTING

MODEL	PULSES PER REV	MIN. RPM	MAX. RPM
PU-2E	ONE	125	5000
PU-20E	TEN	12.5	5000

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.



PICK-UP DIMENSIONS:
 1.60" WIDE x 0.93" DEEP x 2.40" LONG

DM4004 PROGRAMMING PROCEDURE

REMOVE THE RED LENS. USE THE FORMULA BELOW:

$$MS = \frac{R \times 3600}{lp}$$

Where:

M = Input Count Multiplier

S = Count time in one cycle per second increments

R = Ratio of: $\frac{\text{desired display reading at known RPM}}{\text{known RPM}}$

lp = Input pulses per revolution

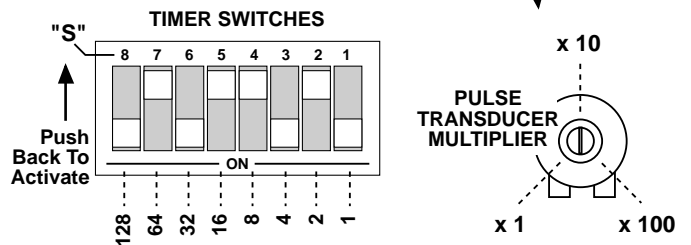
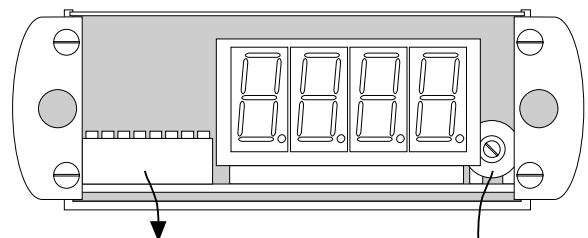
Notes: When 50 Hz. is used, substitute 3000 for 3600 in programming formula.
 Up-date time range = .0167 to 4.25 seconds, "S" value dependant.
 DM4004 up-date time = .0167 x S (in seconds).

Example: To read 400 ft/min at 1600RPM with lp = 1

MS = 900

R = 400/1600 = .25

Let M = 10, then S = 90 (S2, S4, S5, S7 activated)





700/Commutrol™ Series DC Brushless Motor Controls

Dart's 700/Commutrol™ Series of DC brushless motor controls provides variable speed operation for most brushless motors. Compact, economical, and efficient, the 700/Commutrol™ Series provides the newest alternative in motor control.

The 700/Commutrol™ is ideal where high speed or quiet operation is needed, completely eliminating brush wear. The 700/Commutrol™ Series can be provided with a pluggable connector and fixed speed 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 +6.2, VDC 20 mA supply for motor Hall-Effect sensors
- 5K ohm speedpot with 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

Model 700BDC	Open Loop
Model 701BDC	Closed Loop

For 710A Series

Model 710ADC	Open Loop
Model 711ADC	Closed Loop

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	LENGTH	DEPTH	WEIGHT
<i>English (inches)</i>				
700/1BDC	3.63	4.25	1.30	6 oz.
710/1ADC	3.62	7.00	2.00	16 oz.

Metric (centimeters)

700/1BDC	9.21	10.80	3.30	170 gm.
710/1ADC	9.20	17.78	5.08	453 gm.

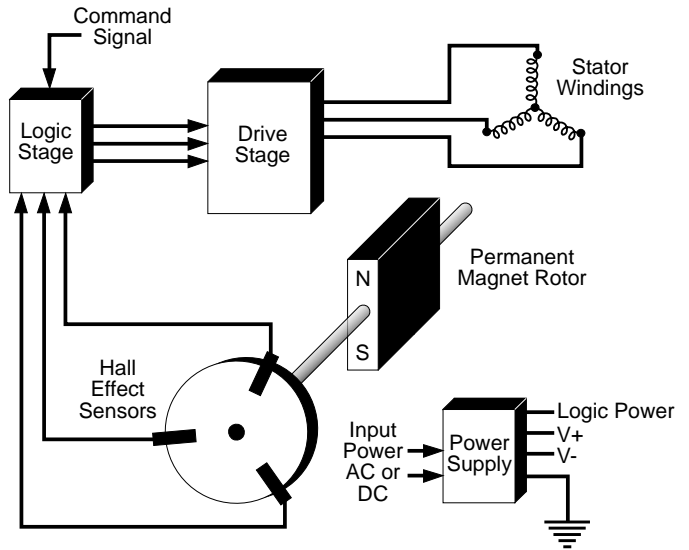
700/COMMUTROL™ SPECIFICATIONS

	700B SERIES	710A SERIES
Input Voltage	11-40 VDC Input ¹	10-54 VDC Input ²
Output Voltage	0 - Input Voltage	0 - Input Voltage
Load Current	5 Amps continuous	20 Amps continuous
Overload Current	150% for 30 seconds	200% for 30 seconds
Speed Adjustment	Potentiometer or 0-6.2 VDC Analog Input Signal	Potentiometer or 0-6.2 VDC Analog Input Signal
Speed Range	50:1	50:1
Current Limit	Adjustable Trimpot	Adjustable Trimpot
Motor Hall Spacing <small>(electrical degrees)</small>	60 or 120 degrees (field selectable)	60 or 120 degrees (field selectable)
Acceleration	Fixed, fast start	Fixed, fast start
Min Speed	Adjustable; 0-30% of max.	Adjustable; 0-30% of max.
Max Speed	Adjustable; 60-100% of max.	Adjustable; 60-100% of max.
Input/Output Connections	Terminal block	Terminal block
Speed Regulation	Open loop Closed loop ±1/2% of base speed	Open loop Closed loop ±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.

BRUSHLESS DC MOTOR SYSTEM





65 Series Battery Operated DC Motor Speed Control

A high performance control for 12, 24, and 36 volt battery powered equipment providing smooth control with high efficiency. The 65 Series is a pulse width modulated battery control utilizing power FET's. The control's advanced design permits a substantial increase in the equipment running time between charges over conventional techniques.

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 control is designed for heavy duty battery operated PM motors, such as: power floor scrubbers, small personnel carriers, AGV's, agricultural sprayers and a vast variety of portable equipment.

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 without 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>	
65E20-12	20 Amps
65E40-12	40 Amps
65E60-12	60 Amps
<i>24/36 VDC Input, 0-24/0-36 VDC Output</i>	
65E20	20 Amps
65E40	40 Amps
65E60	60 Amps

65 SERIES SPECIFICATIONS

	65E20	65E40	65E60
Load Current (continuous)	20A continuous	40A continuous	60A continuous
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 100% to 200% of full motor load, up to continuous current rating (see 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 / 12 Ga. to 6 Ga. maximum		
Speed Regulation	1% of base speed		
Package Configuration	Black anodized aluminum extrusion		
Internal Operating Frequency	Approximately 1.6K Hertz		
Thermal Protection	Not Available	Current foldback at 80°C. heatsink temperature	

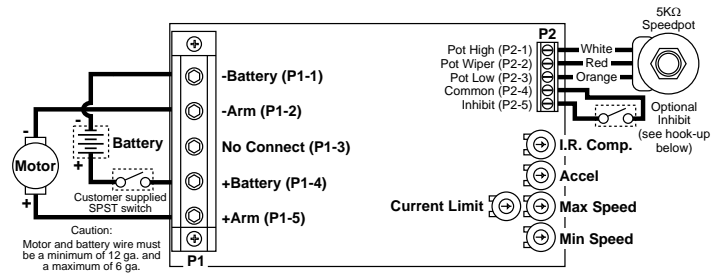
OPERATING CONDITIONS

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

DIMENSIONAL SPECIFICATIONS

MODEL	WIDTH	LENGTH	DEPTH	WEIGHT
<i>English (inches)</i>				
65E20	3.70	7.00	1.70	10.5 oz.
65E40	3.70	7.00	1.70	13.4 oz.
65E60	6.70	9.00	2.27	34.0 oz.
<i>Metric (centimeters)</i>				
65E20	9.40	17.78	4.32	297 gm.
65E40	9.40	17.78	4.32	379 gm.
65E60	17.02	22.86	5.77	962 gm.

65 SERIES HOOK-UP DIAGRAM



NEMA 1 Enclosure



1200 Series AC Inverter Drive

BIG INVERTER FEATURES IN A SMALL PACKAGE

The Dart 1200 Series AC Inverter is designed to save cabinet space and still offer many of the features available on larger controls; multiple preset speeds, JOG speed, dynamic and DC injection braking, built-in PID process control loop, just to name a few. Friendly operator control via the onboard (or remote mount) text display keeps you up to date on motor and control functions. Ideally suited for variable torque, constant torque or constant horsepower applications.

- Dual microprocessor controlled PWM output
- DC injection braking
- Optional remote keypad
- Free run or ramp stop
- Analog meter output
- Membrane tactile feel keys
- Controlled reversing
- Relay contact output
- Stop and Jog commands
- Selectable preset speeds
- Two analog inputs
- Parameter setting and display
- Dynamic braking
- Process control (PID)
- Forward/Reverse command
- NEMA 1 enclosure standard

1200 SERIES SPECIFICATIONS

Output Ratings	Overload Capacity	150% for 60 seconds 200% for 2 seconds		
	Frequency	0 - 120 Hertz		
	Voltage	0-230 volt 3 phase or 0-max input 3 phase		
Input Ratings	Frequency	50 - 60 Hertz		
	Voltage	96 - 130 VAC	180 - 264 VAC	340 - 528 VAC
	Phase	Single Phase	Three Phase or Single Phase with derate	
Control Specifications	Control Method	Sinewave carrier input, PWM output		
	PWM Frequency	Rated at 7.5 KHz Adjustable 2.5 - 7.5 KHz		
	V/Hz Ratio	Linear to Squared Reduced		
	Torque Boost	0 - 15%, Adjustable		
	Brake Torque	Up to 60%, external resistor required		
	Frequency Setting	0 - 5VDC, 0 - 10VDC, 4 - 20mA, Digital via Keypad		
	Accel/Decel	Separate Accel/Decel Rates 0 - 600 Seconds		
Protective Functions	Inverter Trip	Over Voltage, Over Current, Under Voltage, External Trip, Heatsink Thermal, Motor Overload		
	External Output	NO and NC relay and LED indicator for trip		
	Short Circuit	Output phase to ground and phase to phase		
Ambient Conditions	Temperature	0 - 40 deg C, Derate for up to 55 deg C		
	Cooling	Forced air included when required		

1200 SERIES SELECTION GUIDE

Hp	kW	Rated Input Voltage	Rated Output Voltage	Output Current			1200 Series Model Number
				Continuous	60 Sec. Overload	2 Sec. Overload	
1/3	0.25	115	230	1.6	2.4	3.2	1200ACHA
1/2	0.37	115	230	2.3	3.5	4.6	1200ACCA
3/4	0.56	115	230	3.2	4.8	6.4	1200ACDA
1.0	0.75	115	230	4.2	6.3	8.4	1200ACEA
1.0	0.75	230	230	4.2	6.3	8.4	1200AEEA
1.5	1.1	230	230	6.0	9.0	12.0	1200AEJA
2.0	1.5	230	230	6.8	10.2	13.4	1200AEFA
3.0	2.2	230	230	9.6	14.4	19.2	1200AEGA
1.0	0.75	460	460	2.1	3.2	4.2	1200AHEA
1.5	1.1	460	460	3.0	4.5	6.0	1200AHJA
2.0	1.5	460	460	3.4	5.1	6.8	1200AHFA
3.0	2.2	460	460	4.8	7.2	9.6	1200AHGA
5.0	3.7	460	460	7.6	11.4	15.2	1200AHKA

OPTIONAL ACCESSORIES

Dynamic Braking Assemblies

The Dart Dynamic Braking Resistor Kits provide a simple method of adding a DB resistor to the motor control. The 1200DB Kit mounts with the same foot print as the 1200 Series and can be sandwiched between the motor control and mounting surface. All braking assembly kits require

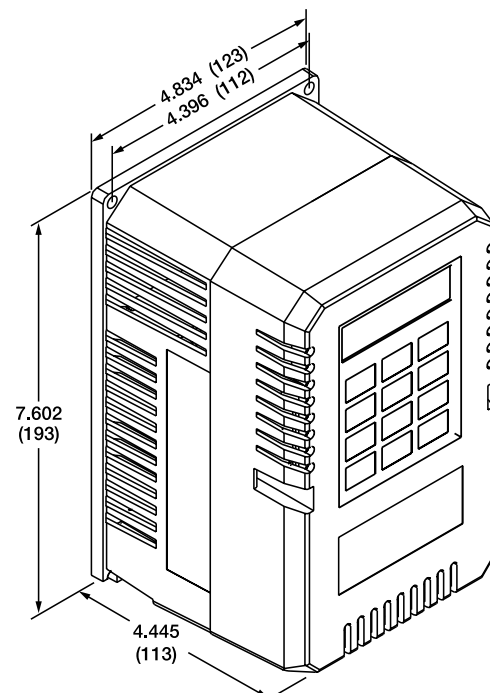
two connections to the control power terminal strip. The braking resistor should be selected to meet the correct ohm value for the control and adequate continuous watts capacity to meet load requirements. Contact Dart Controls for more information on Dynamic Braking Kits and Assemblies.

HP	1200 Series Input Voltage	Minimum Dynamic Brake Ohms	Continuous Rated Watts		
			100	200	300
.33-3.0	115 or 230	60	1200DB160	1200DB260	1200DB360
2-5	460	120	1200DB1120	1200DB2120	1200DB3120
1-1.5	460	150	1200DB1150	1200DB2150	1200DB3150

Remote Operator Keypad with Cable Assembly for the 1200 Series

The 1200KP030 keypad assembly provides a 32 character LCD keypad and pre-wired cable assembly for remote mounting of the 1200 Series operator control panel. The remote keypad can be located up to 100 feet from the motor control and when mounted properly will maintain a NEMA 4X indoor enclosure.

DIMENSIONAL SCHEMATIC





1000 Series AC Inverter

The 1000 Series is an unprecedented breakthrough in microprocessor-controlled AC Micro Variable Speed Drives. Innovative in size, unique in mounting, unrivaled in simplicity, and evolutionary in design the 1000 Series is the latest in a long line of successful and reliable adjustable speed drives from Dart Controls. The 1000 Series was designed to provide:

- Microprocessor AC motor control
- Microsized package for maximum mounting flexibility
- Simple set-up adjustments

The 1000 Series is a fully digital microprocessor-controlled AC drive which uses the latest generation IGBT and micro controller technology to provide a product that is extremely flexible in mounting and operation. The 1000 Series provides all of the control that you expect from a Dart Controls Variable Speed Drive.

1000 SERIES SPECIFICATIONS

HP Range	Up to 1/2 HP
AC Input Voltage	120 or 220 VAC Single Phase $\pm 10\%$
Input Frequency	45 - 65 Hz
Output Voltage	0 to 220 VAC 3 ϕ
Output Frequency	0 to 50/60 or 100/120 Hz
Switching Frequency	8 kHz
Overload Capacity	150% for 60 seconds
Mounting	Chassis, NEMA 1, and NEMA 4 Enclosures; (DIN rail mountable)
Ambient Temperature	0° C to +50° C
Certification	UL, cUL & CE Approved
Operating Modes	Speed Mode, 2 or 3 wire control
Stop Modes	Ramp Stop, DC Injection Braking
LEDs	Power ON, Fault
Load	Constant Torque or Fan (Variable Torque)

TERMINAL CONNECTIONS

- 0 Volts Logic Common
- +15 Volts DC (50 mA max.)
- Speed Demand (Reference)
- Run, +15V Forward or 0V Reverse
- +10 Volts DC (5mA max.)
- Enable +15V to Run
- Fault Output (Open Collector 50 mA max.)

PROTECTION FEATURES

- Overtemperature
- Undervoltage
- Overcurrent @ 200%
- Overvoltage
- Input AC MOV
- Electronic Timed Overcurrent

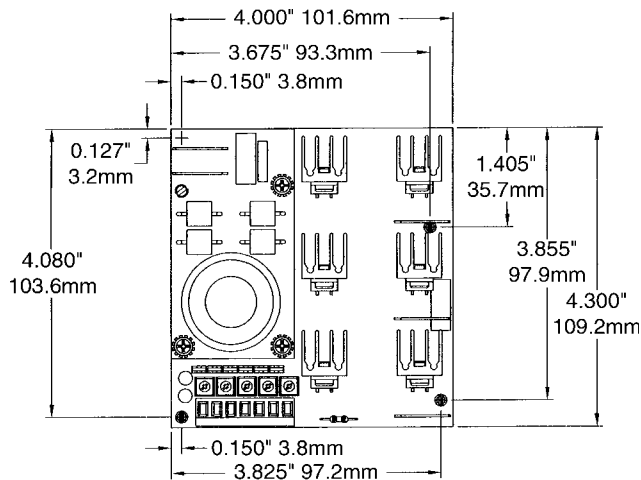
SET-UP JUMPERS

- Motor Base Speed (50/60 Hz)
- Speed Range (x1/x2)
- Constant Torque/Variable Torque
- Ramp to Stop/DC Injection Brake
- Manual Start/Auto Start
- 2 Wire/3 Wire Operation

SET-UP ADJUSTMENTS

- Min. Speed
- Accel. Rate
- Max. Speed
- Decel. Rate
- Timed Current Limit

DIMENSIONS



MOUNTS ON DIA. 0.157" (4mm)
HOLES, 4 PLACES. TOTAL
HEIGHT 2.70" (68.6mm)

POWER CONNECTIONS

- Connect the fused/protected 220 (or 110VAC) volt 50/60Hz supply to the 2 supply 0.25" fastons. Polarity is not important. Ensure the supply is adequately fused/protected depending on the latest codes of practice for electrical installation.
- Connect the 220 volt (even for 110VAC input) 3 phase 0.5HP (or 0.25HP) motor to the 3 motor 0.25" fastons. Polarity determines direction.

CONTROL CONNECTIONS

• The control inputs are as follows:

Term 1 0 volt or control common (connected to -DC of power circuit) (NOT isolated)

Term 2 Speed reference input from 0 to 10 volts.

Term 3 +10 volt output for the 5kW Speed potentiometer

Term 4 +15 volt output for Term 5 and 6, and the fault output Term 7

Terminals	Link 6	Actions +15V connected	0V connected	Disconnect from 0V or +15V
Term 5	2-wire Mode Link 6 in	Run Forward and Reset	Run Reverse and Reset	Stop and Reset
Term 6		Enable output and Reset	Disable output and Reset	Disable output and Reset
Term 5	3-wire Mode Link 6 out	(momentary) Run Forward and Reset	(momentary) Run Reverse and Reset	No action
Term 6		Allow to Run and Reset	Stop and Reset	Stop and Reset

Term 7 fault output, open collector energized when drive powered and not in fault i.e.: Red LED not flashing and Green LED On continuously

1000 SERIES SELECTION GUIDE

Input Voltage	HP	Output Current Amps (Pk)	Model Number	Dimensions (in.)			Weight (lbs.)	Enclosure Type
				H	W	D		
220V 1 ϕ	1/2 HP	2.3A	1000CECA	2.7	4.0	4.3	0.6	Chassis
220V 1 ϕ	1/2 HP	2.3A	1000AECA	10.0	6.7	4.75	2.67	NEMA 1
220V 1 ϕ	1/2 HP	2.3A	1000BECA	10.0	6.7	4.75	2.93	NEMA 4/12
120V 1 ϕ	1/2 HP	2.3A	1000CCCA	2.7	4.0	4.3	0.66	Chassis
120V 1 ϕ	1/2 HP	2.3A	1000ACCA	10.0	6.7	4.75	2.73	NEMA 1
120V 1 ϕ	1/2 HP	2.3A	1000BCCA	10.0	6.7	4.75	2.99	NEMA 4/12
120V 1 ϕ	1/4 HP	1.2A	1000CCBA	2.7	4.0	4.3	0.6	Chassis
120V 1 ϕ	1/4 HP	1.2A	1000ACBA	10.0	6.7	4.75	2.67	NEMA 1
120V 1 ϕ	1/4 HP	1.2A	1000BCBA	10.0	6.7	4.75	2.93	NEMA 4/12

DART CONTROLS

55 SERIES

55AC10-21

Min speed trim pot

55AC10



55 Series Variable AC Voltage Supply

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, permanent split-phase, universal motors or any resistive load. It is not designed for capacitor start motors.

55 SERIES SELECTION GUIDE

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

AC INPUT MODEL	AC OUTPUT AMPS	WATTS
55AC10	10	1150
55AC15	15	1725

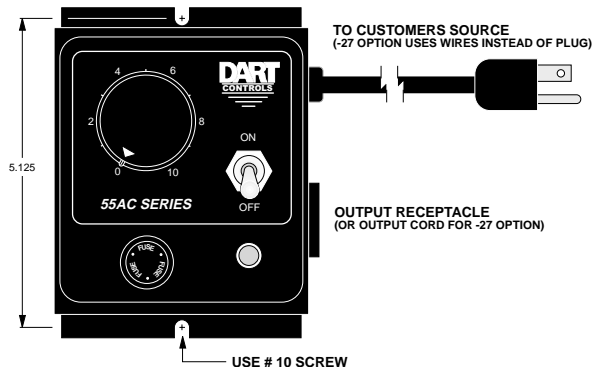
240 VAC Single Phase Input 50/60 Hz., 0-240 VAC Output

AC INPUT MODEL	AC OUTPUT AMPS	WATTS
57AC10	10	2300
57AC15	15	3450

DIMENSIONAL SPECIFICATIONS

MODEL/OPTION	WIDTH	LENGTH	DEPTH
<i>English (inches)</i>			
55AC10/15	2.90	1.80	2.20
57AC10/15	2.90	3.50	2.20
-21 Option	4.00	5.53	3.80
-27 Option	4.00	5.53	3.80
<i>Metric (centimeters)</i>			
55AC10/15	7.37	4.57	5.59
57AC10/15	7.37	8.89	5.59
-21 Option	10.16	14.07	9.65
-27 Option	10.16	14.07	9.65

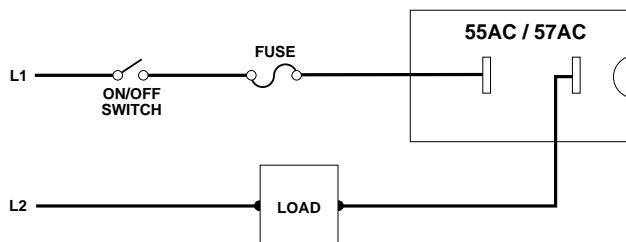
ENCLOSURE DIAGRAM



OPERATING CONDITIONS

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

HOOK-UP DIAGRAM



NOTE: Switch and fuse furnished with enclosed unit only.

OPTION DESCRIPTION

OPTION	SUFFIX
Enclosed version for 55AC10/15 with minimum 15" long.	
AC input cord and AC output receptacle (120V)	-21
Enclosed version for 57AC10/15 with minimum 60" long.	
AC input cord and output cord (240V)	-27
Half-wave DC output available for all chassis versions.	
Usually utilized in vibratory feeder applications	-D*
Half-wave DC output for the appropriate enclosed version	-21D, -27D*

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



PU-2E

PATENT # 4,376,915

PU-E Series Hall-Effect Pick-up

The PU-E Series pick-up is an economical and reliable way to **monitor motor speed**. Its patented design provides ease of installation in otherwise difficult to reach areas. The PU-E 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-E 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.

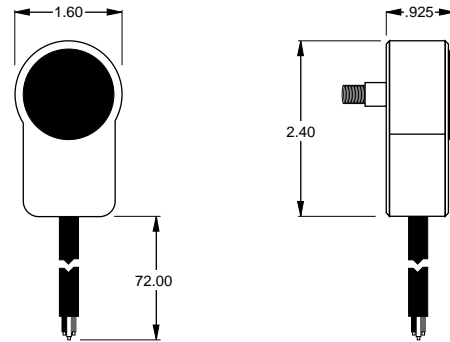
STANDARD FEATURES

- PU-E Series pick-up mounts directly on shaft being monitored using single 10-32 screw.
- Maximum speed: 5,000 RPM or 50,000 pulses per minute.
- Supply voltage +4.5 VDC to +24 VDC.
- NPN 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: -10° C. to +45° 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-E SERIES SELECTION GUIDE

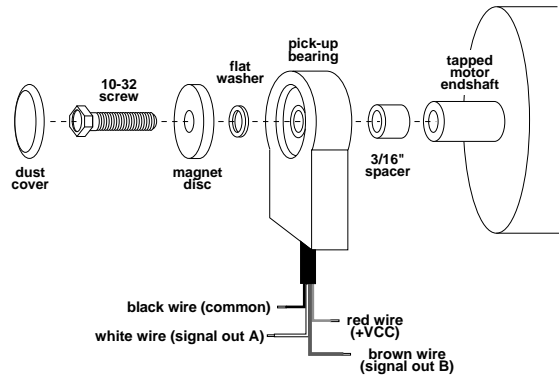
MODEL	PULSES PER REVOLUTION
PU-2E	1
PU-4E	2
PU-10E	5
PU-20E	10
PU-20EQUAD (quadrature pick-up)	10

DIMENSIONAL SPECIFICATIONS



No other mounting brackets or screws are necessary, as the cord will keep the unit from rotating. The PU-E 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.

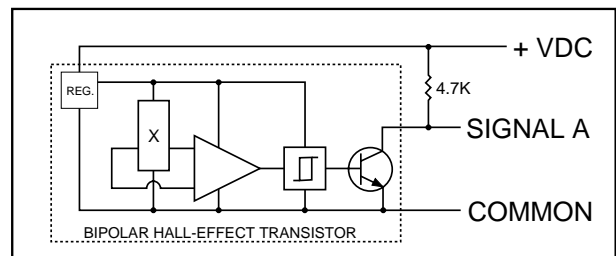
INSTALLATION AND WIRING

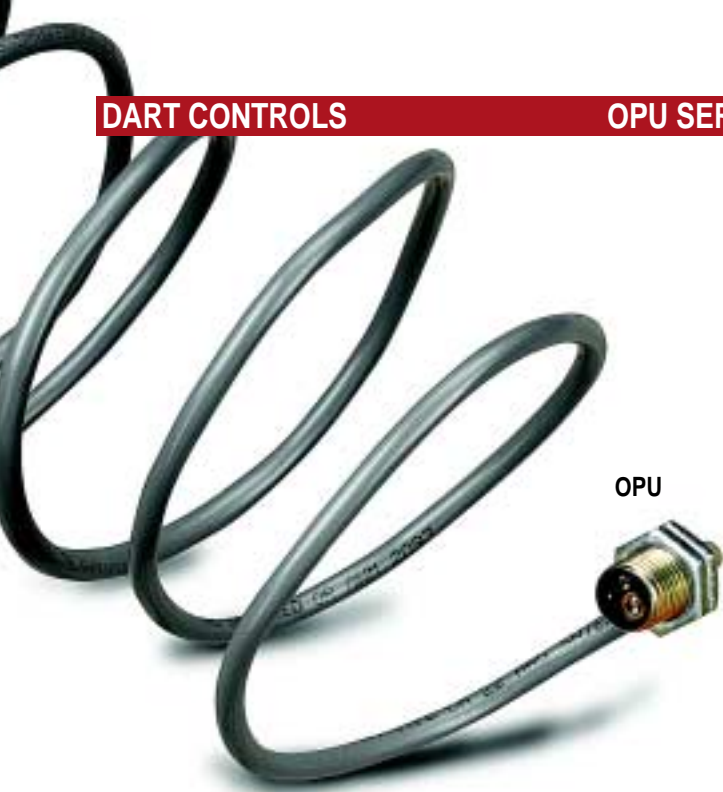


CAUTION: DO NOT OVER TIGHTEN MOUNTING SCREW !!!

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

PU-2E, PU-4E, PU-10E, PU-20E SCHEMATIC





OPU

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.

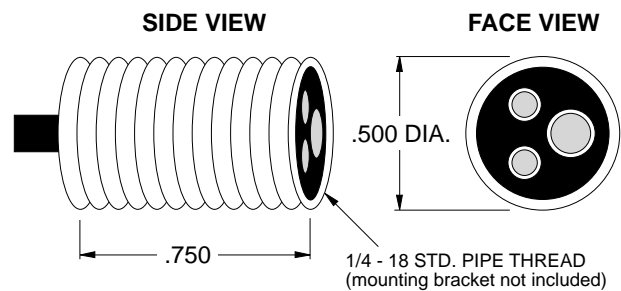
STANDARD FEATURES

- 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

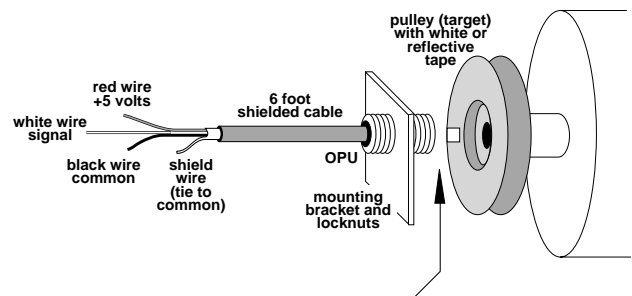
MODEL	PULSES PER REVOLUTION
OPU	Based on the number of reflective bands on target

DIMENSIONAL SPECIFICATIONS



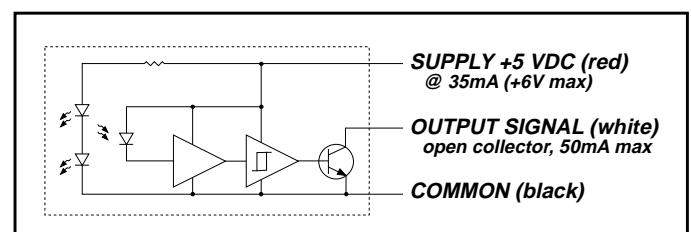
CAUTION: The OPU cable should not be grouped with any other wires or cords. Applications with OPU wires over 6 feet long, or particularly noisy environments may become sensitive to electrical noise.

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 SCHEMATIC





- 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 square wave 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

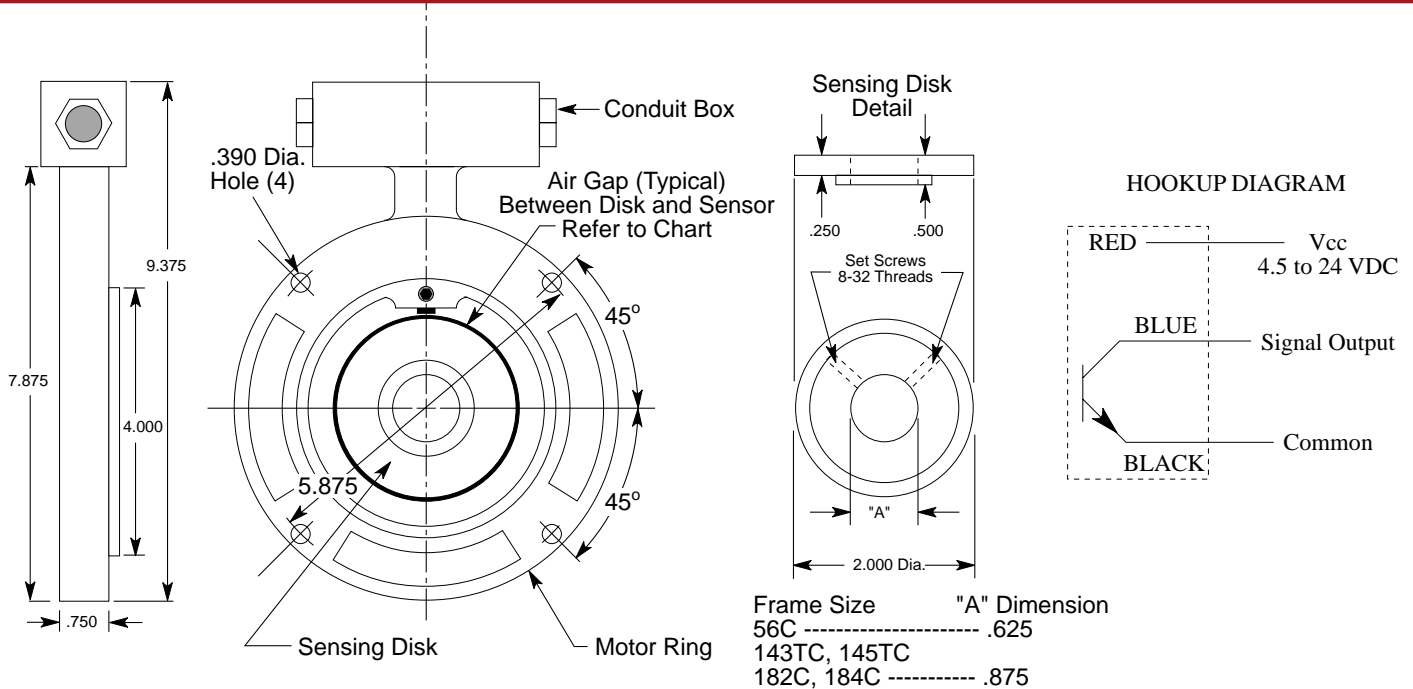
* Frame sizes 143TC, 145TC, 182C, 184C

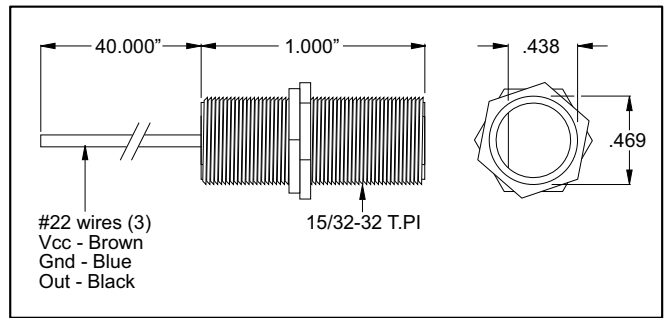
CF Series Hall-Effect Pick-up Kit

The CF SERIES pick-up kit can be used in place of the PUE 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





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 COM-MON 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.

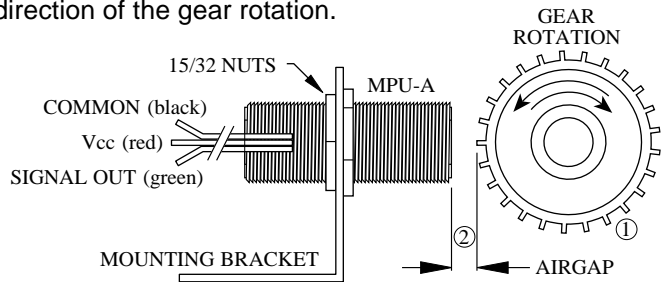


FIGURE 1

1) The practical **minimum** target dimensions are: 0.10" top of tooth, 0.15" tooth depth, and 0.10" spacing between teeth.

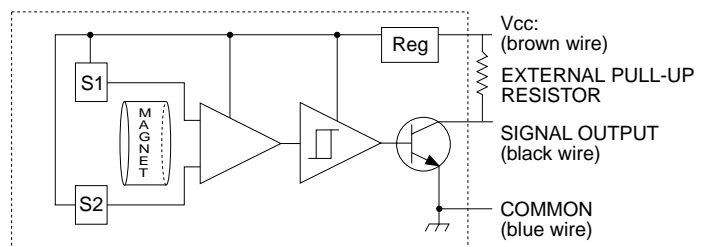
2) The working airgap for target dimensions approaching the minimum is approximately .005", and up to .100" for larger targets. Optimum airgap performance is achieved using target materials with a high magnetic permeability such as low carbon steels.

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:

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

where Isink is the desired sink current (typically 5 mA, max. 20 mA). For 5 volt Vcc 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

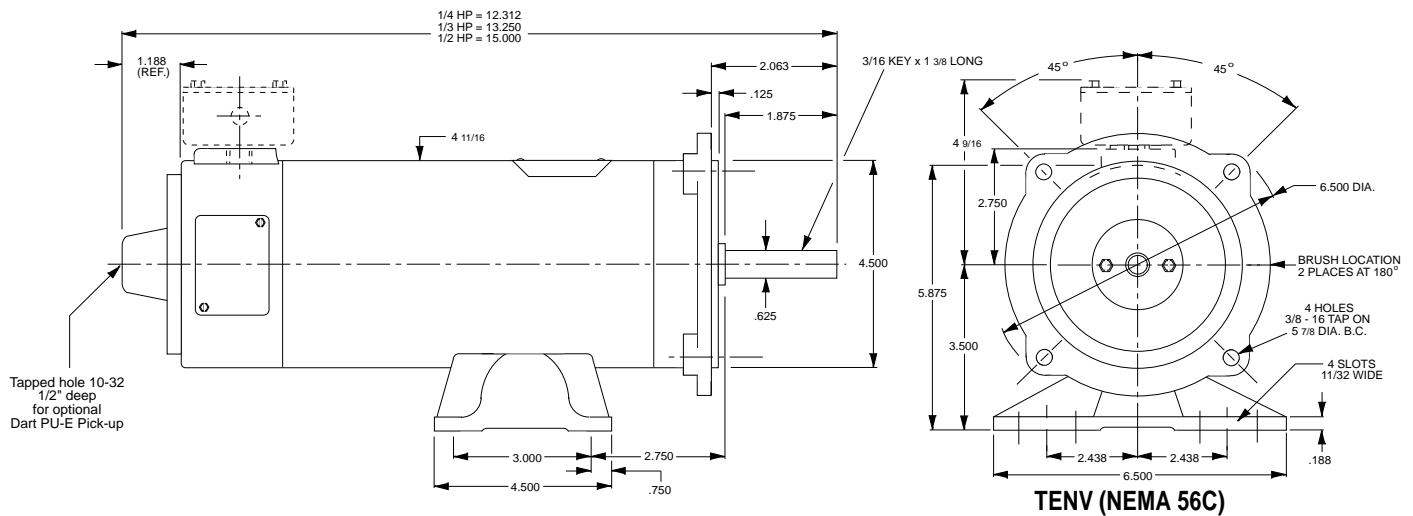


The advantages of DC adjustable speed drives with PM motors for low horsepower applications are: higher starting torque, wider usable speed and torque range, simpler dynamic braking, lower system cost, faster response, smaller size, more efficient and reliable.

Standard features include: permanent magnetic field (1/4 horsepower to 2 horsepower), NEMA56 C-face and bolt-on mounting, 1750 RPM base speed, U.L., C.S.A. and C.E. mark listed, provisions for mounting Dart's PU-E pick-up, available from stock.

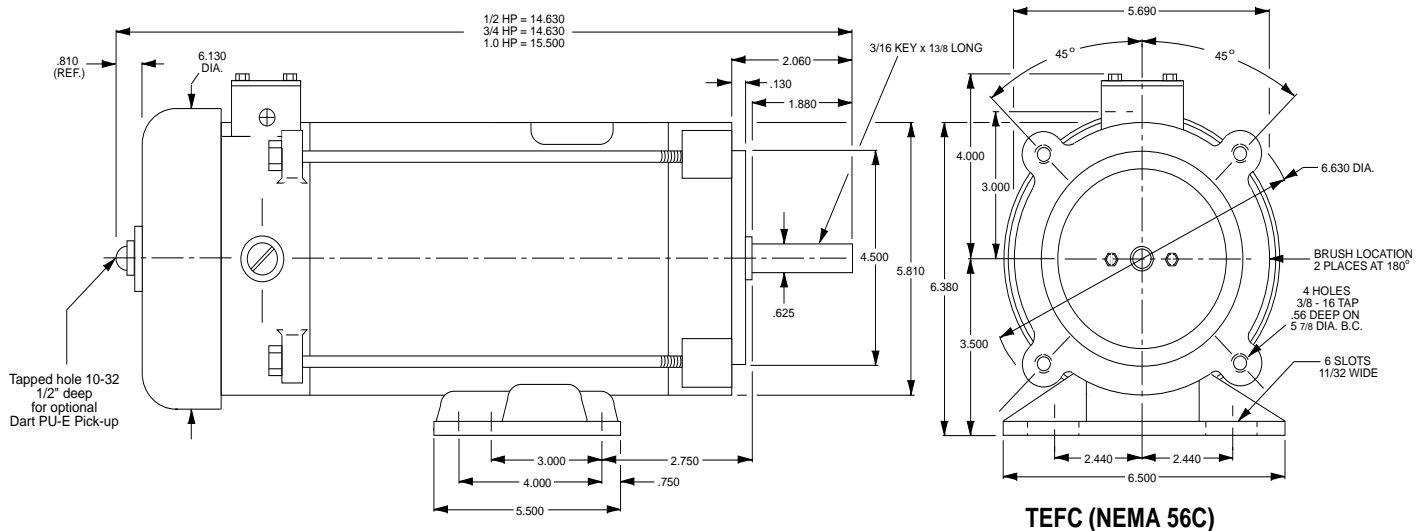
TENV MOTOR SPECIFICATIONS AND SELECTION

H.P.	ENCLOSURE	BASE SPEED	ARMATURE DC VOLTS	FULL LOAD AMPERAGE	FULL LOAD TORQUE	MOTOR MODEL NUMBER	APPROXIMATE SHIP WEIGHT
1/4	TENV	1750 RPM	90 VDC	2.5 Amps	0.75 lb. ft.	DMS1825B-56BC	26 lbs.
1/3	TENV	1750 RPM	90 VDC	3.2 Amps	1.00 lb. ft.	DMS1833B-56BC	28 lbs.
1/2	TENV	1750 RPM	90 VDC	4.8 Amps	1.50 lb. ft.	DMS1850B-56BC	31 lbs.



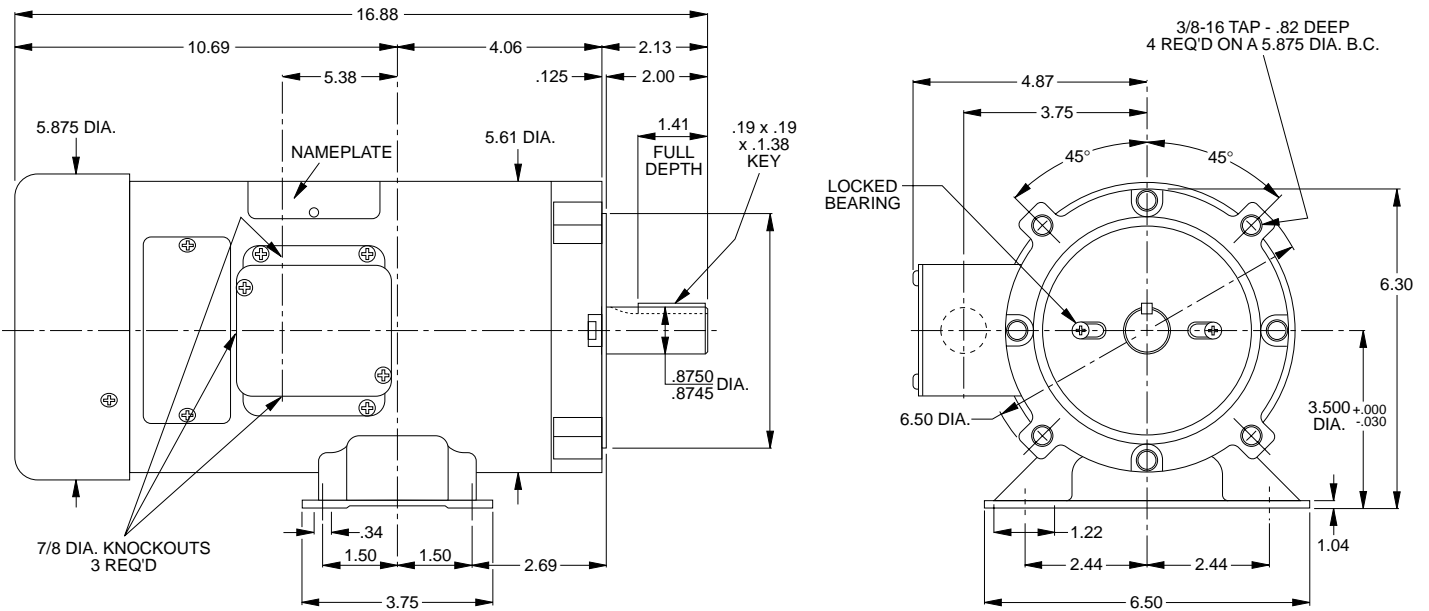
TEFC MOTOR SPECIFICATIONS AND SELECTION

H.P.	ENCLOSURE	BASE SPEED	ARMATURE DC VOLTS	FULL LOAD AMPERAGE	FULL LOAD TORQUE	MOTOR MODEL NUMBER	APPROXIMATE SHIP WEIGHT
3/4	TEFC	1750 RPM	90 VDC	7.0 Amps	2.25 lb. ft.	DMS1875B-56BC	39 lbs.
1	TEFC	1750 RPM	90 VDC	10.0 Amps	3.00 lb. ft.	DMS1810B-56BC	43 lbs.
1/2	TEFC	1750 RPM	180 VDC	2.5 Amps	1.50 lb. ft.	DMS18500B-56BC	31 lbs.
3/4	TEFC	1750 RPM	180 VDC	3.7 Amps	2.25 lb. ft.	DMS18750B-56BC	36 lbs.
1	TEFC	1750 RPM	180 VDC	5.0 Amps	3.00 lb. ft.	DMS18100B-56BC	42 lbs.



TEFC MOTOR SPECIFICATIONS AND SELECTION*

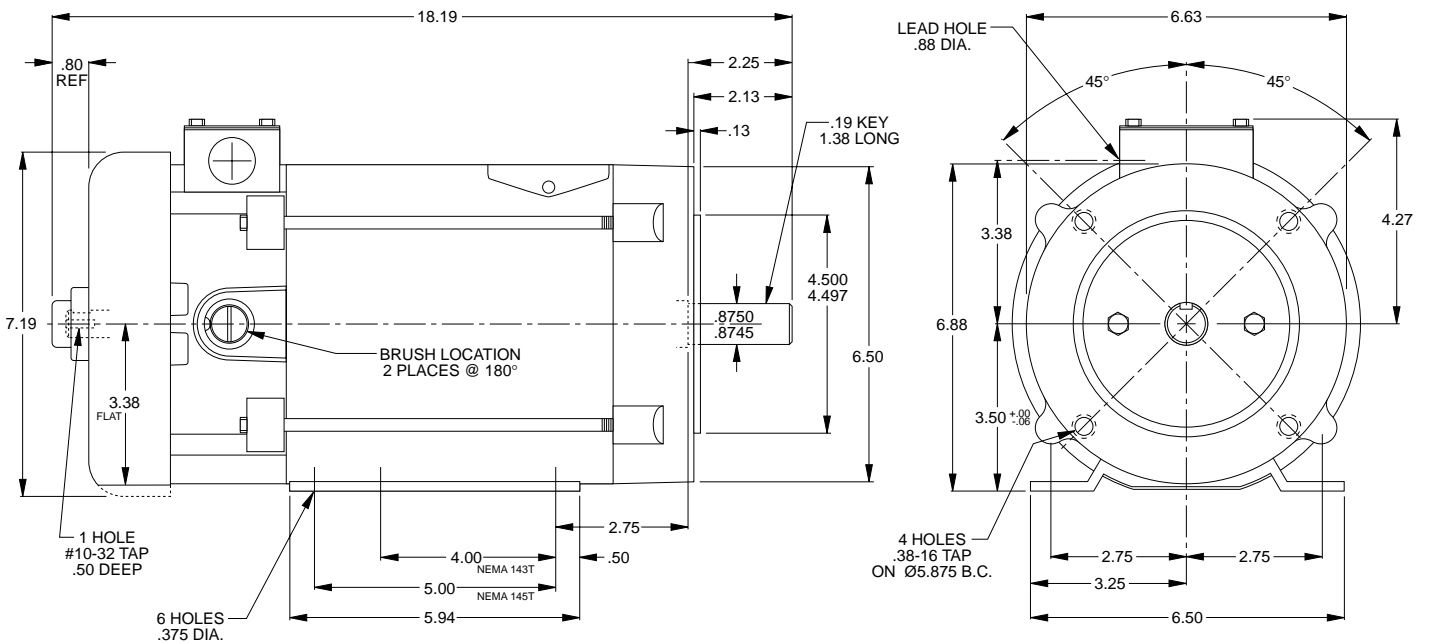
H.P.	ENCLOSURE	BASE SPEED	ARMATURE DC VOLTS	FULL LOAD AMPERAGE	FULL LOAD TORQUE	MOTOR MODEL NUMBER	APPROXIMATE SHIPPING WEIGHT
1.5	TEFC	1750RPM	180 VDC	7.6 Amps	4.50 lb. ft.	DMS18150L-145BC	50 lbs.



* NEMA Frame ZLS56CZ/145TC (NEMA 145TC frame; shaft $7/8 \leq x \leq 2 \ 1/4 \leq$ and NEMA 56 removable base).

TEFC MOTOR SPECIFICATIONS AND SELECTION*

H.P.	ENCLOSURE	BASE SPEED	ARMATURE DC VOLTS	FULL LOAD AMPERAGE	FULL LOAD TORQUE	MOTOR MODEL NUMBER	APPROXIMATE SHIPPING WEIGHT
2.0	TEFC	1750 RPM	180 VDC	9.6Amps	6.00lb.ft.	DMS18200B-145TC	75lbs.



* NEMA frame 145TC.

NOTES - TEFC AND TENV ENCLOSURES

- 1) 20:1 Speed range at constant torque.
- 2) Includes provision for Dart Control's PU-E pick-up, mounted on motor rear end shaft.
- 3) Keyway key and conduit box are supplied with motor.
- 4) Designs and specifications may change without notice.
- 5) All dimensions in inches unless noted otherwise.

DEFINITION OF TERMS

1. 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.

2. 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.

3. 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.

4. LINE VOLTAGE COMPENSATION

Holds the motor speed constant when the line voltage fluctuates over a range of +/- 10%.

5. IR COMPENSATION

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

6. SPEED ADJUSTMENT POTENTIOMETER

The standard speed control is a single turn, 300° potentiometer. Ten turn potentiometers are available.

7 CONTROLLED (TIMED) ACCELERATION

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

8. 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.

9. CHASSIS MOUNT (LESS ENCLOSURE)

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

10. 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.

11. 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 1/2 %.

12. TACHOMETER SPEED REGULATION

This feature normally used in conjunction with Tachometer Feedback (Item 11) 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.

13. TACHOMETER FOLLOWER

Permits the speed control to be controlled by a remote tachometer. The speed control maximum trimpot 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.

14. 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.

15. 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.

16. 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.

17. 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.

18. 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.

19. 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.

20. COGGING

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

21. 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.

22. PUSHBUTTON SPEED CONTROL

Permits the selection of speed settings via pushbuttons.

23. 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.

24. CONTROL BY REMOTE SIGNAL

Remote signal controls take the form of voltage or current signals in the following ranges; 4-20 mA, 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).

25. 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.

26. 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.

27. 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.

28. 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 increase 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.

29. 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 equipments lowest operating speed determines the horsepower of the drive.

30. HORSEPOWER OR TORQUE REQUIRED

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

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

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

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

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

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

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

WHY DART'S CONTROLS ARE THE BEST

Dart Controls has been building the best variable speed motor drives in the industry since 1963. Our commitment to innovation, high quality control standards, and a dedicated workforce are some of the reasons why Dart has retained its leadership position in this marketplace.

Here are a few more reasons why Dart's controls are the best...

1) Dart Controls is a "Solutions" Provider

With the broadest product line in the industry, Dart Controls is your 'Total Solutions Provider'. In addition, Dart's products are truly designed with you, the customer, in mind. Our manufacturing process is flexible to accommodate your special requirements and our products are designed with maximum adaptability built in. Consider the following:

- Our products are available in a wide range of connection methods including: barrier terminal strips, pluggable terminal strips, spade connects, and even finger-proof screwless terminals on select models.
- Products are designed to meet demanding domestic and international requirements including: CSA, UL and CE.
- All products are shipped with potentiometers and dial plates in the box, even though most drive manufacturers require these to be ordered separately.
- All analog products are designed for dual voltage operation, so you only need to stock one control and it will meet multiple voltage applications.

2) Quality Control is a Number One Priority

Intensive quality control measures are incorporated throughout Dart's manufacturing process. Incoming components are carefully inspected and rejected for even the smallest imperfections, and we conduct a 100% test on all finished products. Dart Controls is currently ISO 9001 Registered.

3) Dart's Controls Help Protect Your Motors

Dart's controls are equipped with proprietary High-Integration Current Limit Circuitry which will protect your motors from demagnetization, even if they are being pushed to their limits. In addition, this circuitry is also designed to prevent nuisance trip-outs during high torque startups. Dart Controls offers the best overall protection system of this type, balancing a high level of motor protection, with a decreased occurrence (or elimination) of nuisance trip-outs. Dart's superior technology doesn't make any sacrifices in achieving the best motor protection possible.

4) Dart's Controls Provide Maximum Flexibility and Ease of Use

Dart Controls' products are shipped ready to use. No special resistors have to be ordered and installed and no complicated calibration is necessary. Dart's drives are calibrated prior to shipping for the high end of the operating range to ensure they will perform even without any adjustments. For optimal performance in your unique situation, the current limit and the trimpots should be adjusted by using a standard screwdriver and following a simple diagram (a 15 second operation if you take your time). Unlike some manufacturers, our trimpots are also protected from the risk of short circuiting during this simple calibration procedure.

The capability of making these adjustments allows a Dart drive to be easily adapted to multiple horsepower rated motors. Some drive manufacturers force you to stock a different resistor for every different Hp motor that you might use, and their drives won't work at all without the proper resistors installed. Although these manufacturers claim that their special resistors eliminate the need for any manual calibration, fine tuning adjustments are still required, so all you gain is a shelf full of resistors, increased costs and more hassles. Purchasing Dart drives simplifies your ordering process, reduces your inventory and costs, and achieves the greatest flexibility possible.

5) Dart's Advanced Engineered Heat Sinks Provide Optimal Performance

Dart Controls utilizes an advanced heat sink design that allows it to be smaller and thinner than the heat sinks on most other drives. Our heat sinks are precisely engineered to provide maximum cooling and performance, while reducing unnecessary weight, space and shipping costs. Dart performs detailed thermal analysis to develop the most efficient and effective heat sinks possible, but some manufacturers use the age old approach of simply applying more metal to solve the problem. Our competitors love to take shots at our superior designs, but our outstanding record of reliability and satisfied customers tells the real story. Perhaps our competitors are just a little jealous (its OK, we forgive them).

6) Dart Uses the Highest Quality Materials and Components Available for More Accurate and Durable Controls

Accuracy, repeatability and durability are assured due to the high quality components and materials that go into our drives. Cermet trimpots and other components that are not affected by variations in temperature or humidity are standard in Dart drives. We also incorporate high quality fuses and short circuit protection to help protect our drives from damage if the motor fails. In addition, Dart's unique two-fuse system makes our products safer for people to use them, and also provides for better fire prevention. Tachometer feedback is also built in to most of our drives.

All Dart drives also have transient suppressors for added protection. Some of Dart's products use the traditional MOV suppressors, but in drives where an additional level of protection is required, the superior TVS suppressor technology is used.

Dart's drives are also designed to be the most durable on the market. One measure used, is that all Dart drives are designed to withstand as much as 200% of the specified load for a certain time period without causing any damage to the control and without affecting operation.

7) Dart's Controls Enhance Motor Brush Life in Rapid and Frequent Cycling Applications

Premature brush wear is caused by extreme motor operation and startups. Dart's proprietary High-Integration Current Limit Circuit provides added protection for your motor during high torque startups and harsh motor operation. This protection will extend the life of your motor by reducing wear on the brushes.

Dart's drives also eliminate wear and tear on your motors by providing consistently smooth starts and operation. In addition, Dart's drives do not require a 5 - 10 second wait before restarting after turning off the AC power. Some manufacturers' drives do require this waiting period or severe surging can occur, which can cause damage to the motor. Dart's LVC Circuitry (Line Voltage Compensation) also prevents AC line fluctuations from affecting motor speed or torque, and thus, assures a consistent and reliable motor speed.

8) Dart's Controls Eliminate Motor Cogging

To prevent motor cogging, Dart Controls incorporates opto-couplers or pulse transformers. Opto-couplers are a more traditional technique for preventing motor cogging and they are extremely reliable and proven devices, but in certain situations, pulse transformers may be a better solution. Dart has a tremendous amount of experience with both of these methods and fully understands the advantages and disadvantages of each of them depending on the situation. Wisely, we have kept our manufacturing process flexible enough that we can choose the best solution for each unique situation. Most other drive manufacturers have chosen one method over the other for their manufacturing process, and are no longer free to choose the best solution. This is a perfect example of why Dart Controls is a "solutions" provider, and not just another drive manufacturer.

9) Dart Offers the Greatest Variety of Enclosure Options

Dart offers a wide range of enclosure configurations including: open chassis, NEMA 1, NEMA 4, and NEMA 12. Enclosures are made of aluminum and advanced polymers which provide high-impact resistance and worry-free use in a wide range of temperatures. Dart's enclosures also provide a sleek, high-tech, industrial appearance that is unmatched in the industry. Our competitors have tried to make people believe that our polymer enclosure can't possibly be as strong as their metal box, but let's see them run over their enclosure with a truck like we did to ours.

10) Dart Offers the Broadest Product Line

Dart offers both line-powered AC and DC controls as well as low-voltage AC and DC controls. We also offer a full range of analog and digital products, as well as sensors, tachometers and other accessories.

ACCENT ON PRODUCT

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

For product and application assistance, please contact us.

- **SCR and Digital DC speed controls for AC line voltage to three horsepower.**
- **Brushless DC speed controls.**
- **Battery operated DC speed controls.**
- **AC inverter drives to 5 HP**
- **Open and closed loop control systems.**
- **Digital tachometer for rate and time.**
- **Speed sensors.**
- **Variable AC voltage supply.**
- **Standard stock DC motors.**

AVAILABLE FROM:

ACCENT ON SERVICE

Dart has perfected 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:

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FOR THE MOST RECENT UPDATES ON DART PRODUCT INNOVATIONS SEE OUR WEBSITE AT:

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