

## DELPHI INTERIOR AND LIGHTING

### BOSCH VAN DOOR MOTOR SPECS

No Load Speed:	75 RPM
Stall Torque Clockwise:	34 Nm
Stall Torque Counter-Clockwise:	30 Nm
Stall Current:	44 Amps
All specs at 12 Vdc.	

Bosch Motors are used in the 1999 Toyota Sienna and the 1999 Ford Windstar. If you wish to purchase an additional Bosch motor, you must buy the entire "Power Sliding Door unit". The Bosch motor is the right hand side motor. Great care must be taken when removing the motor from the front door unit. The retaining clips must be removed from the output shaft or damage will occur to the shaft.

### TIAGENE VAN DOOR MOTOR SPECS

No Load Speed:	75 RPM
Stall Torque Clockwise:	37 Nm
Stall Torque Counter-Clockwise:	34 Nm
Stall Current:	40 Amps
All specs at 12 Vdc.	

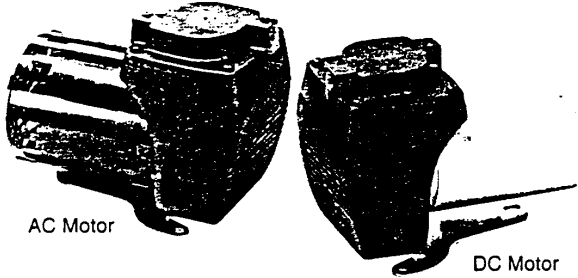
Tiagene Motors are used in 1999 GM Minivans including the Chevy Venture, Pontiac Transport, and Oldsmobile Silhouette. If you wish to purchase an additional Tiagene motor, you must buy the entire "Power Sliding Door unit". Great care must be taken when removing the motor from the front door unit. The retaining clips must be removed from the output shaft or damage will occur to the shaft.

Gast



## Oilless Diaphragm Pump to 1.3 cfm

### Miniature Diaphragm 22D Series

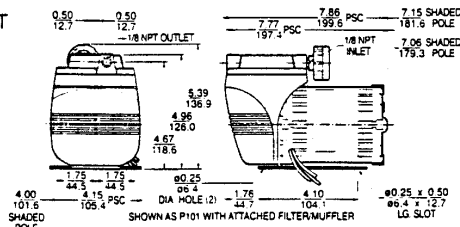


AC Motor

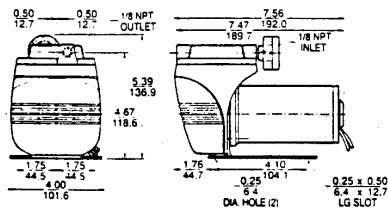
DC Motor

#### Product Dimensions Metric (mm) U.S. Imperial (inches)

##### AC UNIT



##### DC UNIT



#### Product Specifications

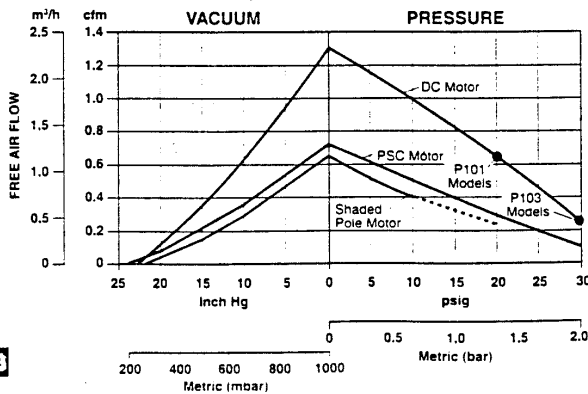
Note: P101 and P103 models are pressure. V102 model is vacuum.

Model Number	Motor	RPM	Running Amps	HP	kw	Net Wt.	
						lbs.	kg
22D1-P101-AKV	115-60-1*	1725	1.6	1/20	0.04	4.8	2.16
22D1-V102-AKV	115-60-1*	1725	1.6	1/20	0.04	4.8	2.16
22D1-P101-DKV	PSC 115-60-1	1725	0.7	1/20	0.04	5.5	2.48
22D1-P101-DPV	PSC 230-50/60-1	1725**	0.8	1/20	0.04	5.5	2.48
22D1-V102-DKV	PSC 115-60-1	1725	0.5	1/20	0.04	5.5	2.48
22D1-P101-KGV	12V DC	3200	6.2	1/8	0.09	4.8	2.16
22D1-P103-KGB	12V DC	3200	6.2	1/8	0.09	4.9	2.21
22D1-V102-KGV	12V DC	3200	5.1	1/8	0.09	4.8	2.16
22D1-P101-KHV	24V DC	3200	3.5	1/8	0.09	4.8	2.16
22D1-P103-KHB	24V DC	3200	3.5	1/8	0.09	4.9	2.21
22D1-V102-KHV	24V DC	3200	2.7	1/8	0.09	4.8	2.16

\*Shaded Pole \*\*@60 Hz - 50 Hz is 1425 RPM

#### Product Performance (Metric, U.S. Imperial)

Solid line indicates continuous duty, dashed line indicates intermittent duty.



#### SHADED POLE MOTOR

10 PSI CONTINUOUS PRESSURE (20 PSI INTER.),  
22" HG MAX. VACUUM, 0.66 CFM OPEN FLOW

#### PSC MOTOR

30 PSI MAX. PRESSURE, 24" HG MAX. VACUUM,  
0.7 CFM OPEN FLOW

#### DC MOTOR

30 PSI MAX. PRESSURE, 22.5" HG MAX. VACUUM,  
1.3 CFM OPEN FLOW

#### PRODUCT FEATURES

- Permanently lubricated ball bearings on rod and motor drive bearing
- Rear sleeve bearing (DC P103 models have ball bearing for higher pressure)
- Field service capability
- PSC models include attached capacitor
- Includes AJ988 filter assembly, unattached

#### MATERIALS OF CONSTRUCTION

- Head assembly and bracket made of polyphenylene sulfide (PPS) for excellent chemical and heat resistance
- Stainless steel valves
- Neoprene/nylon diaphragm standard
- Other diaphragm materials available

#### RECOMMENDED ACCESSORIES

- AA640 Vacuum gauge
- AA204 Vacuum relief valve
- AA644B Pressure gauge
- AA203 Pressure relief valve
- AF584A Rubber feet (3)

**GLOBE MOTOR**

**GLOBE MOTOR AND DRIVE ASSEMBLY SPECS**

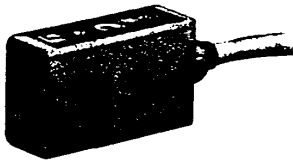
	Motor with Drive Assembly	Motor Only
No Load Speed:	87 RPM $\pm$ 1	97 RPM
Stall Torque:	150 In-lb	30 oz-in
Stall Current:	18.5 Amps	18.5 Amps
No Load Current	0.820 Amps	0.820 Amps
	All specs at 10 Vdc.	

**Warning: The Globe Motor can not support side loads.**

Honeywell

FE7C Series

## Photoelectric Sensors/Controls Miniature AC and DC Sensors



### FEATURES

- 10-foot retroreflective scan range with FE-RR1 reflector
- 1.6 or 3.3 feet diffuse scan range
- 16.4 or 49.2-foot thru scan range
- Miniature and self-contained (AC and DC models)
- Short-circuit protection (DC models only)
- Diagnostic functions (DC models only)
- Self-diagnosis indication (DC models only)
- Remote testing function (DC Through-Scan models only)
- Sensitivity adjustment to detect translucent objects
- Capable of detecting small objects and making highly accurate detections with the proper aperture mask

### GENERAL INFORMATION

FE7C retroreflective scan sensors are self-contained and require no separate amplifier for signal conditioning. Each sensor has its own infrared light source, photodiode, amplifier circuitry, signal strength/alignment indicator, and output transistor. FE7C sensors operate on a broad range of 10 to 28 VDC or from 85 to 250 VAC and provide a 100 mA current sinking and current sourcing output. The DC version's output is convertible from dark operated to light operated.

### FOR A COMPLETE SENSOR

#### Required

- AC Retroreflective sensor – FE7C-RT2-M
- DC Retroreflective sensor – FE7C-RC6G-M
- Appropriately rated power supply for DC devices
- Reflector – FE-RR1

### ORDER GUIDE RETROREFLECTIVE SCAN – 10 FT. RANGE (3 M)

Description	Catalog Listing
82-250 VAC; dark operated (D.O.); horizontal mount	FE7C-RT2-M
85-250 VAC; dark operated (D.O.); vertical mount	FE7C-RT2V-M
10-28 VDC; convertible L.O./D.O. sinking (NPN) output; horizontal mount*	FE7C-RC6G-M
10-28 VDC; convertible L.O./D.O. sourcing (PNP) output; horizontal mount*	FE7C-RF6G-M

### ORDER GUIDE POLARIZED RETROREFLECTIVE SCAN – 10 FT. RANGE (3 M)

Description	Catalog Listing
85-250 VAC; dark operated (D.O.); horizontal mount*	FE7C-RPT2-M
85-250 VAC; dark operated (D.O.); vertical mount*	FE7C-RPT2V-M
85-250 VAC; light operated (L.O.); vertical mount*	FE7C-RPU2V-M
10-28 VDC; convertible L.O./D.O. sinking (NPN) output; horizontal mount*	FE7C-RPC6-M
10-28 VDC; convertible L.O./D.O. sourcing (PNP) output; vertical mount*	FE7C-RPF6V-M

### ORDER GUIDE DIFFUSE SCAN – 1.6 FT. RANGE (.5 M)

Description	Catalog Listing
85-250 VAC; light operated (L.O.); horizontal mount*	FE7C-DT2-M
85-250 VAC; light operated (L.O.); vertical mount*	FE7C-DT2V-M
10-28 VDC; convertible L.O./D.O. sinking (NPN) output; horizontal mount*	FE7C-DC6-M
10-28 VDC; convertible L.O./D.O. sinking (NPN) output; vertical mount*	FE7C-DC6V-M
10-28 VDC; convertible L.O./D.O. sourcing (PNP) output; horizontal mount*	FE7C-DF6-M
10-28 VDC; convertible L.O./D.O. sourcing (PNP) output; vertical mount*	FE7C-DF6V-M

### ORDER GUIDE DIFFUSE SCAN – 3.3 FT. RANGE (1 M)

Description	Catalog Listing
10-28 VDC; convertible L.O./D.O. sinking (NPN) output; horizontal mount*	FE7C-DLC6-M

\* Has sensitivity adjustment.

Thru scan next page.

### FOR A COMPLETE SENSOR

#### Required

- Diffuse scan sensor – FE7C-DC6-M
- Appropriately rated power supply for DC devices

## Photoelectric Sensors/Controls Miniature AC and DC Sensors

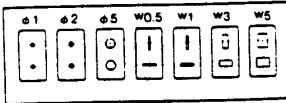
### FOR A COMPLETE SENSOR

#### Required

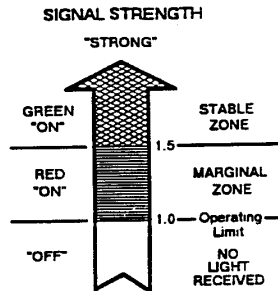
- Thru scan emitter – FE7C-TT2E-M
- Thru scan receiver – FE7C-TT2R-M
- Appropriately rated power supply for DC devices

- Capable of detecting small objects (0.1mm dia.) by use of proper aperture mask

#### FE-PATC3-M



For application information, see page C192.



### ORDER GUIDE THRU SCAN – 16.4 FT. (5 M)

Description	Catalog Listing
Emitter – 85-250 VAC; horizontal mount	FE7C-TT2E-M
Receiver – 85-250 VAC; dark operated (D.O.); horizontal mount	FE7C-TT2R-M
Receiver – 85-250 VAC; light operated (L.O.); horizontal mount	FE7C-TU2R-M
Emitter – 85-250 VAC; vertical mount	FE7C-TT2VE-M
Receiver – 85-250 VAC; dark operated (D.O.); vertical mount	FE7C-TT2VR-M
Emitter – 10-28 VDC; horizontal mount	FE7C-TC6E-M
Receiver – 10-28 VDC; convertible L.O./D.O. sinking (NPN) output; horizontal mount*	FE7C-TC6GR-M
Receiver – 10-28 VDC; convertible L.O./D.O. sourcing (PNP) output; horizontal mount*	FE7C-TF6GR-M
Emitter – 10-28 VDC; vertical mount	FE7C-TC6VE-M
Receiver – 10-28 VDC; convertible L.O./D.O. sinking (NPN) output; vertical mount*	FE7C-TC6VGR-M
Receiver – 10-28 VDC; convertible L.O./D.O. sourcing (PNP) output; vertical mount*	FE7C-TF6VGR-M

### ORDER GUIDE SPECIAL THRU SCAN PRODUCTS – 49.2 FT. (15 M)

Description	Catalog Listing*
Receiver – 10-28 VDC; convertible L.O./D.O. sinking (NPN) output; horizontal mount*	FE7C-TLC6GR-M
Emitter – 10-28 VDC; vertical mount; enables 15 meter scan range when used with long range receivers (FE7C-TLC6GR-M or FE7C-TLC6VGR-M)*	FE7C-TLC6VGE-M
Emitter – 10-28 VDC; will work with AC receivers; horizontal mount	FE7C-TC6E-M
Receiver – 10-28 VDC; convertible L.O./D.O. sinking (NPN) output that will work with AC emitters; vertical mount*	FE7C-TC6VGR-M

### ORDER GUIDE SELF DIAGNOSTIC OUTPUT (10-28 VDC INPUT)

Description	Catalog Listing:
Polarized retroreflective scan; dark operated (D.O.) sourcing (PNP) output; vertical mount*	FE7C-RPD6VP-M
Thru scan emitter; horizontal mount	FE7C-TA6PE-M
Thru scan receiver; dark operated (D.O.) sinking (NPN) output; horizontal mount	FE7C-TA6PR-M

\* Has sensitivity adjustment.

BRN +  
BLU GND  
BLK OUT  
WHT DIAG

For application help: call 1-800-537-6945.

Honeywell • MICRO SWITCH Sensing and Control C103

## Photoelectric Sensors/Controls Miniature AC or DC Sensors

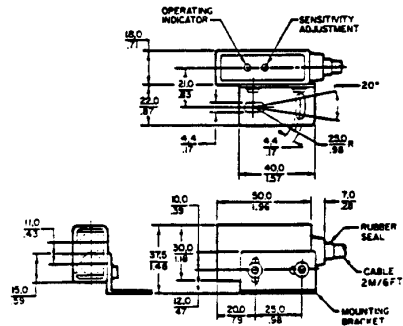
FE7C Series

### SPECIFICATIONS

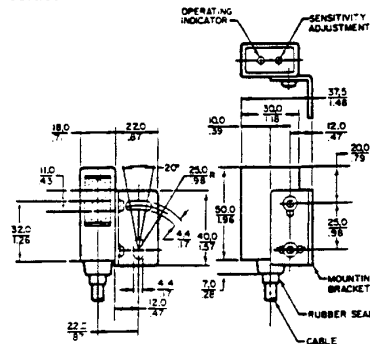
<b>Maximum Scanning Distance (in clean air)</b>		49.2 feet (15 m) thru scan, 3.3 feet (1 m) diffuse scan. 10 feet (3.0 m) with 3 in. reflector (FE-RR1) retro scan	
<b>Supply Voltage</b>		85 to 250 VAC, 50/60 Hz.	10 to 28 VDC, 10% max. power supply ripple
<b>Power Dissipation</b>	Emitter/Receiver	1.25 VA max.	0.42 watts max. (excluding load)
	Diffuse/Retro	0.375 VA max. (excluding load)	0.56 watts max. (excluding load)
<b>Current Consumption</b>	Emitter/Receiver	10 mA max. (emitter 8.5, receiver 1.5)	30 mA max. (excluding load)
	Diffuse/Retro	1.5 mA max. (excluding load)	20 mA max. (excluding load)
<b>Output</b>	Load Current	100 mA max.	100 mA max. (current sinking)
	Voltage Drop	10 VAC max.	1 VDC max. @ 100 mA sinking
	Leakage Current	1.5 mA max. (100 VAC load 10KΩ)	—
<b>Maximum Rate of Operation</b>		1000 operations/minute	15000 operations/minute
<b>Typical Response Time</b>	On	30 msec. (50 msec. max.)	2 msec. (5 msec. max.)
	Off	30 msec. (50 msec. max.)	2 msec. (5 msec. max.)
<b>Circuit Protection</b> False pulsing, Short circuit (DC), Reverse polarity (DC)			
<b>Temperature Range</b>		Operating -4°F to 140°F (-20°C to 60°C)	Storage -40°F to 158°F (-40°C to +70°C)
<b>Sealing</b> NEMA 12 and IP64			
<b>Housing</b> Case ABS resin, Lens PMMA acrylic resin, Cable vinyl			
<b>Mounting</b> Horizontal or vertical side mounting brackets included			
<b>Weight</b> 2.5 oz. (70 g) thru scan pair 5 oz. (150 g)			
<b>Logic</b> Built-in ON-OFF (immediate response) control; light or dark operated by individual catalog listing			

### MOUNTING DIMENSIONS

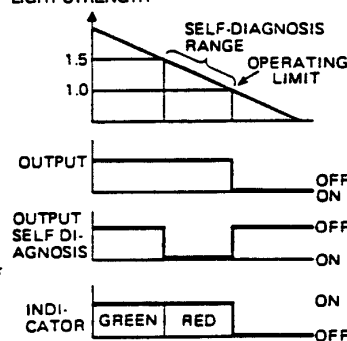
#### Horizontal Mount



#### Vertical Mount



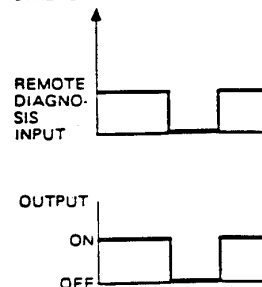
### FE7C Typical Self-Diagnosis Output Sequence



A self diagnostic output function provides early warning of malfunctions due to dust or other lens residue or if the sensor becomes marginally misaligned. Whenever received light drops to 150% of minimum operating level the self diagnostic output switches on. If light intensity continues to drop to minimum operating level, the diagnostic output switches off along with the sensor. The self diagnostic output provides an external communication link of the red alignment LED condition. Current rating is 50 mA max. and is the same as the sensor (NPN or PNP). See circuit diagram for further description.

**Remote testing function.** The self diagnostic emitter FE7C-TA6PE-M has a remote testing function of the receiver it is used with. A positive voltage applied to the emitters pink wire disables it. Check the receiver for a change in output. If no change is noted, the receiver is not functioning properly.

### FE7C Through-Scan Remote Diagnosis Emitter Light Strength



## Photoelectric Sensors/Controls Miniature AC and DC Sensors

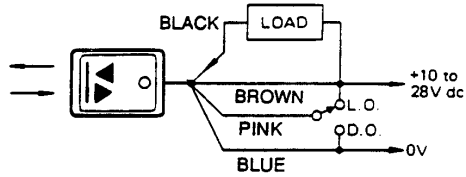
FE7C Series

### WIRING

#### FE7C series Dark Operated/Light Operated Selectable Output types Typical Wiring

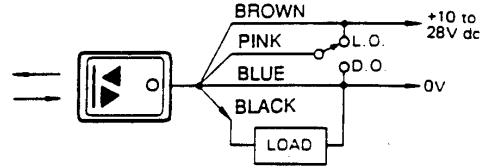
##### NPN: Dark Operated/Light Operated (Selectable)

Through-scan (Receiver unit) type  
Retroreflective-scan type  
Polarized Retroreflective-scan type  
Diffuse-scan type\*



##### PNP: Dark Operated/Light Operated (Selectable)

Through-scan (Receiver unit) type  
Retroreflective-scan type  
Polarized Retroreflective-scan type  
Diffuse-scan type\*

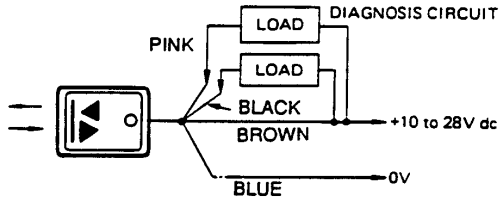


\*For Diffuse-Scan, L.O. and D.O. Switch positions are in the reverse.

#### FE7C series Diagnosis Output types Typical Wiring

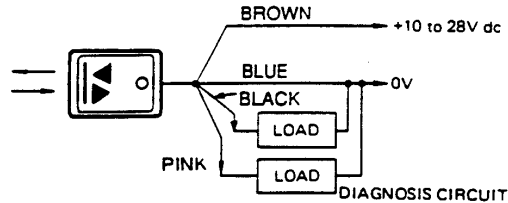
##### NPN with Diagnosis Outputs:

Through-scan (Receiver unit) type  
Retroreflective-scan type  
Polarized Retroreflective-scan type  
Diffuse-scan type



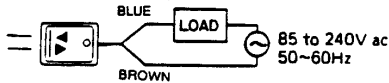
##### PNP with Diagnosis Outputs:

Through-scan (Receiver unit) type  
Retroreflective-scan type  
Polarized Retroreflective-scan type  
Diffuse-scan type



#### FE7C series AC types, Light Operated or Dark Operated

Retroreflective-scan type  
Polarized Retroreflective-scan type  
Diffuse-scan type



For application help: call 1-800-537-6945.

Honeywell • MICRO SWITCH Sensing and Control C105

# Innovation First

# Victor 883

December 1998

www.innovationfirst.com

Data Sheet

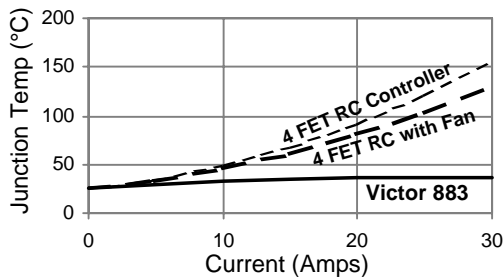
### General Description:

The Victor 883 is a speed controller specifically engineered for robotic applications. The high current capacity, low voltage drop, and peak surge capacity make the Victor 883 ideal for drive systems while its braking options and precise control meet the demanding needs of arms and lift systems. Innovative FET switching architecture and an integral cooling fan ensures cool FET junction temperatures. The low voltage drop and high switching speed ensures the motor receives maximum power, providing significant improvements in acceleration, direction changes, and lifting torque.

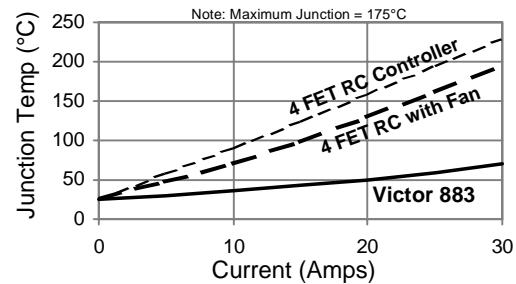
### Features:

- 12 low Rds(on) FETs, 6 forward and 6 reverse
- extremely fast FET rise/fall time
- brake or coast option (used while in neutral)
- simplified calibration procedure
- pre-calibrated for the FIRST control system
- identifies absence of PWM input
- integral fan to provide optimized cooling
- sturdy high current screw terminal connections
- high visibility LED
- rugged construction
- two mounting hole for secure installations

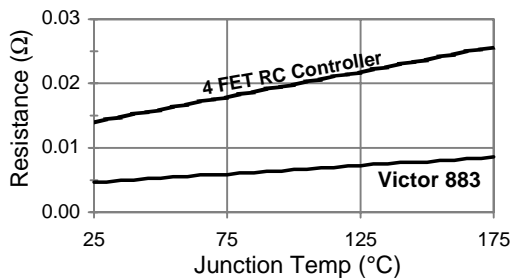
Junction Temp Vs. Current at Full Throttle



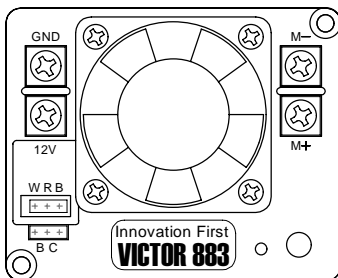
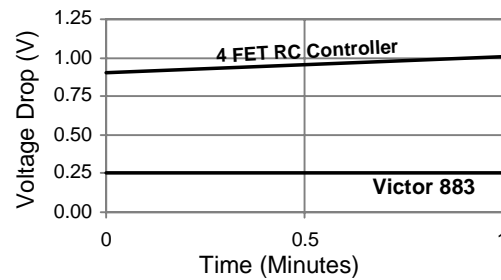
Junction Temp Vs. Current at Low Throttle



FET On-Resistance Vs. Temperature



Voltage Drop Vs. Run Time



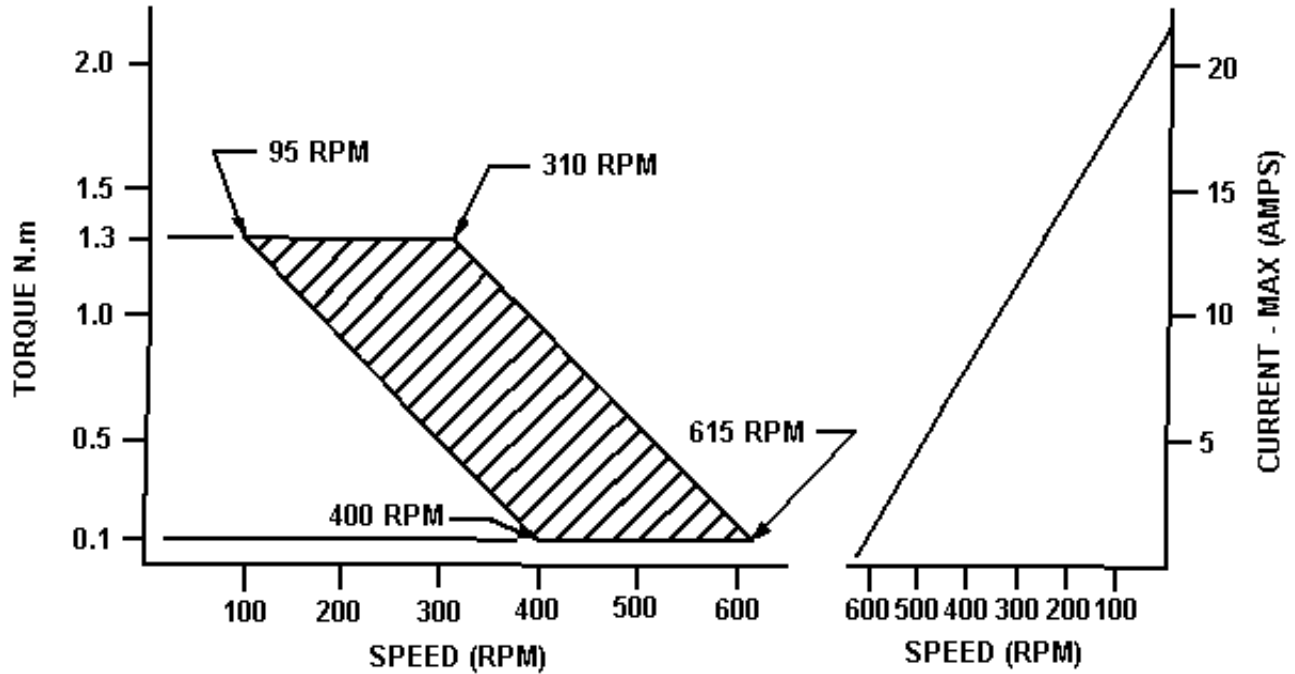
Parameter	Conditions	Min	Typ	Max	Units
DC Input Voltage		7	12	15	V
Forward On-Resistance	Measured at 30A		.0094		Ω
Reverse On-Resistance	Measured at 30A		.0094		Ω
3 FET On-Resistance	Use for comparison	.0023		.0032	Ω
Switching Frequency			2000		Hz
Recommended for Continuous Use				58	A
Current, Low Throttle	FET Thermal Limit			105	A
Current, Full Throttle	FET Thermal Limit			420	A
Current, Continuous	Electrical Limit			348	A
Current, Pulse	<300 μS			1200	A

**WARNING:** This product is not designed for toy cars!

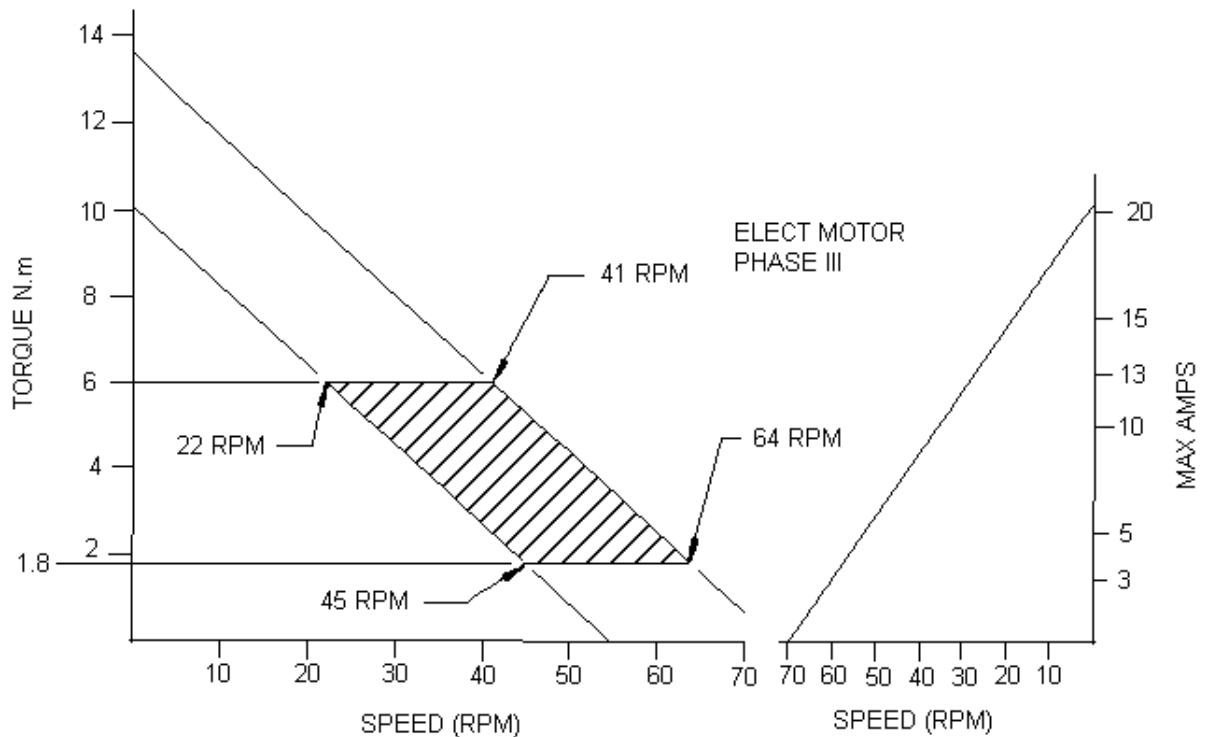


ITT AUTOMOTIVE

SEAT MOTOR SPEED-TORQUE CURVE



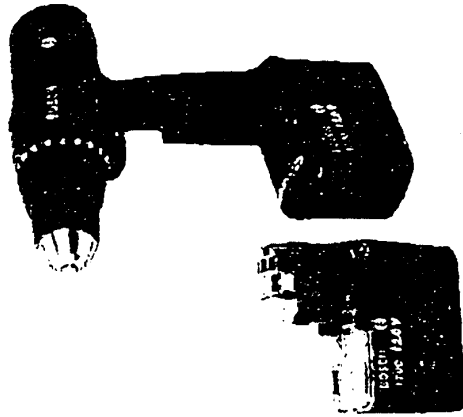
WINDOW LIFT MOTOR SPEED-TORQUE CURVE



Bosch

**BOSCH**

PRODUCT SUMMARY



MODEL: 3310K-10  
PRODUCT: 12 Volt Drill Driver  
UPC CODE: 000 346 301960

KEY PRODUCT FEATURES:

- 12 Volt Power
- 225 Inch Lbs Torque
- T-Handle Styling and Balance
- VSR Switch 0-400 / 0-1200 RPM
- Clutch with 15 Torque Settings





JOHNSON ELECTRIC INDUSTRIAL MANUFACTORY LTD.

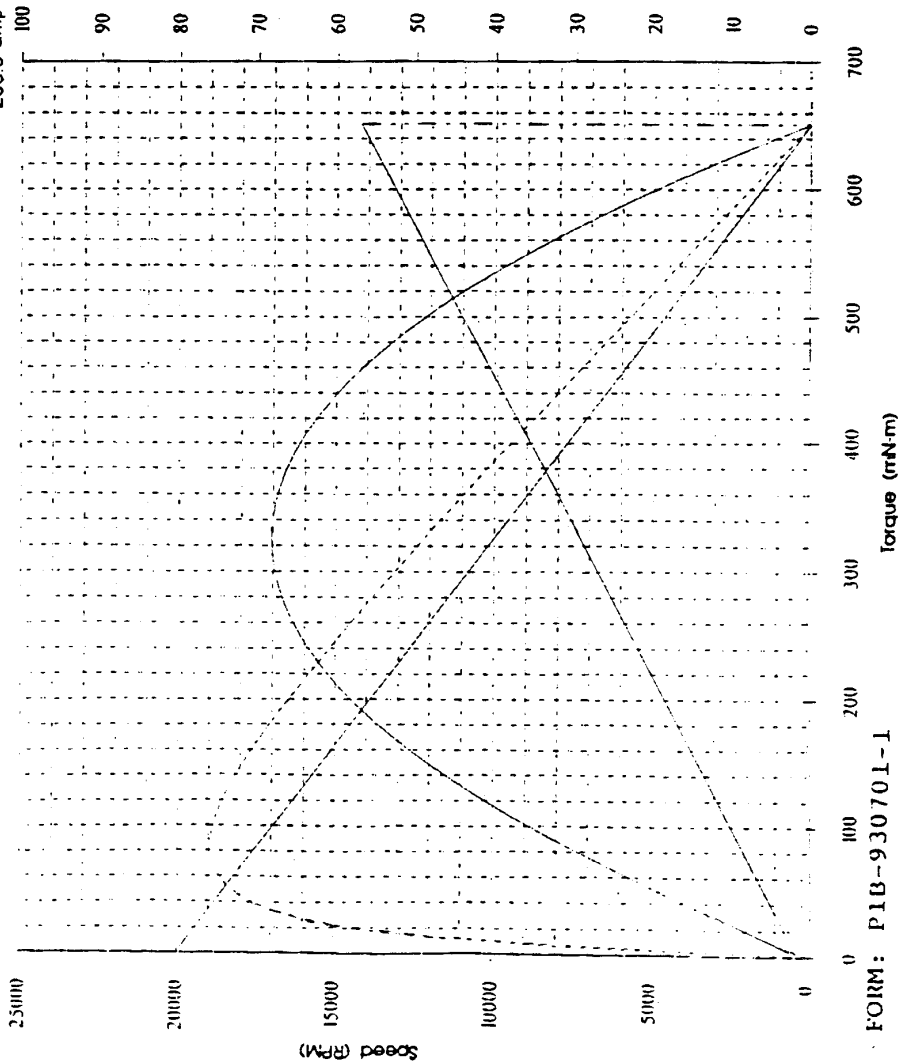
35 years of excellence in micro-motors

Johnson Building, 14-16 Lee Chung Street, Hong Kong

SOF NO : 28189 94J042/05/13  
 Whdng : 80 - 10.0  
 Motor test reference no : HC785L G/ES/350G0/3E1/F

Date : 10/09/96  
 Full scale : 100.0 watt  
 500.0 watt  
 200.0 amp

Performance (In an ambient temperature of 25-30 °C.)  
 Motor tested rapidly to prevent significant temperature rise.  
 At a constant voltage of : 12.00 Volts  
 With a circuit resistance of : 0.000 Ohms



<b>At NO LOAD</b>	Speed : 20023 RPM
	Current : 2.450 AMPS
<b>At stall (Extrapolated)</b>	Torque : 650.982 mN-m
	Current : 114.002 AMPS
<b>At maximum efficiency</b>	Efficiency : 75.84 %
	Torque : 84.628 mN-m
	Speed : 17420 RPM
	Current : 16.952 AMPS
<b>At maximum Power output</b>	Output : 341.02 Watts
	Torque : 325.491 mN-m
	Speed : 10012 RPM
	Current : 58.226 AMPS
<b>Characteristics</b>	Torque constant : 5.836 mN-m/AMP
	E.M.F. constant : 5.836 mV/rad/sec
	Dynamic resistance : 0.105 Ohms
	Motor regulation : 30.759 PRM/mN-m

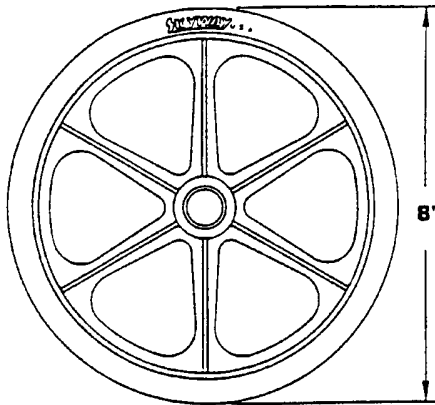
FORM: PIB-930701-1

Skyway

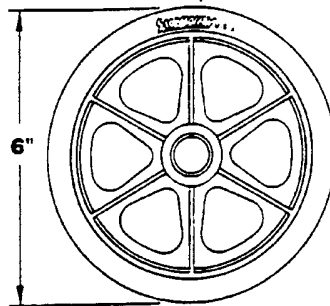


4451 Caterpillar Rd., Redding, CA 96003  
916/243-5151 (FAX 916/243-5104)

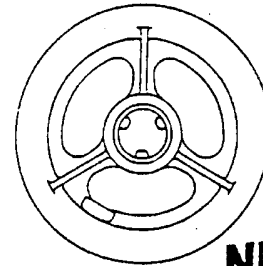
STANDARD UTILITY WHEELS  
WHEELCHAIR WHEELS  
WHEELCHAIR ACCESSORIES  
CASTER WHEELS



**8" CASTER  
NON-PNEUMATIC**



**6" CASTER  
NON-PNEUMATIC**



**5" CASTER  
PNEUMATIC OR  
NON-PNEUMATIC**

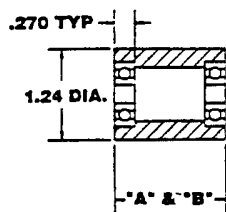
SKYWAY 6" and 8" Non-Pneumatic caster wheels feature a molded DuPont ZYTEL<sup>®</sup> nylon wheel with a coinjected Monsanto Santoprene<sup>®</sup> thermoplastic rubber molded-on tire.

Accepts 6" x 1-1/4" Pneumatic Tires. Also Accepts Various 5" & 6" Non-Pneumatic Snap-On Tires. Available Only In Hub #1. 1" Precision Bearing.

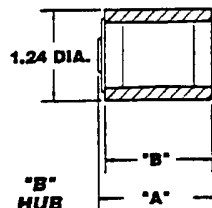
**CASTER HUB SPECIFICATIONS**

Hub configurations shown are SKYWAY standards, however, if you require a custom design, we stand ready to work with you to create a special hub to suit your needs.

5" Caster Only Available with Standard Hub #1, 1" Overall Width.



**HUB #1**  
Precision Bearing Hub  
7/8" O.D. Maximum x 5/16" and 3/8" I.D.'s



**HUB #2**  
Unground, Flanged Bearing Hub  
.906 O.D. Maximum x 1/4", 5/16", 3/8" and 7/16" I.D.'s

	BASIC OVERALL	"A" ACROSS BEARING REFERENCE	"B" HUB WIDTH
<b>PRECISION BEARING</b>			
HUB #1 For 5", 6" & 8" casters only	1"	.99	.98
HUB #1 For 6" & 8" casters only	1-1/2"	1.50	1.48
HUB #1 For 6" & 8" casters only	2-3/16"	2.18	2.17
<b>UNGROUND, FLANGED BEARING</b>			
HUB #2 For 6" & 8" casters only	1"	1.23	.98
HUB #2 For 6" & 8" casters only	2-3/16"	2.43	2.17
HUB #2 For 6" & 8" casters only	1-1/2"	1.73	1.48

While we recommend uses for our products based on tests done in laboratories we in no way guarantee particular methods of use or applications or performance when installed or made to operate under special conditions. Skyway has a policy of continuous improvement of products and reserves the right to make improvements or changes on products without notice. ©1992 SKYWAY PRINTED IN U.S.A.

## MODEL VB3: USED WITH THE SAME CONFIDENCE AS A FUSE.

### YESTERDAYS TECHNOLOGY

**FUSE:** Locating a blown plastic incased fuse in the panel is difficult since visual detection can only be made by its removal. Replacement fuses are usually packaged in groups of various ratings which you do not need, or all of the same ratings in anticipation of the need for continuous replacement. The fuse is a very inconvenient, antiquated means of protection.

**CIRCUIT BREAKERS:** Little improvement has been made in this field in the last 30 to 40 years. In the cycling type the sensing elements lose contact pressure as the current increases, promotes arcing, tacking and may stick causing the breaker to fail. The non-cycling breakers with the same type sensor, use a heater wire to prevent the contacts from closing, generating excessive heat that can effect the calibration of other breakers, which contribute to the extensive use of the fuse.



### TO FUSE OR NOT TO RE-FUSE? NO LONGER THE QUESTION.

Locating the cause of overload can take many blown fuses. **ONE MODEL VB3 IS THE ANSWER.**

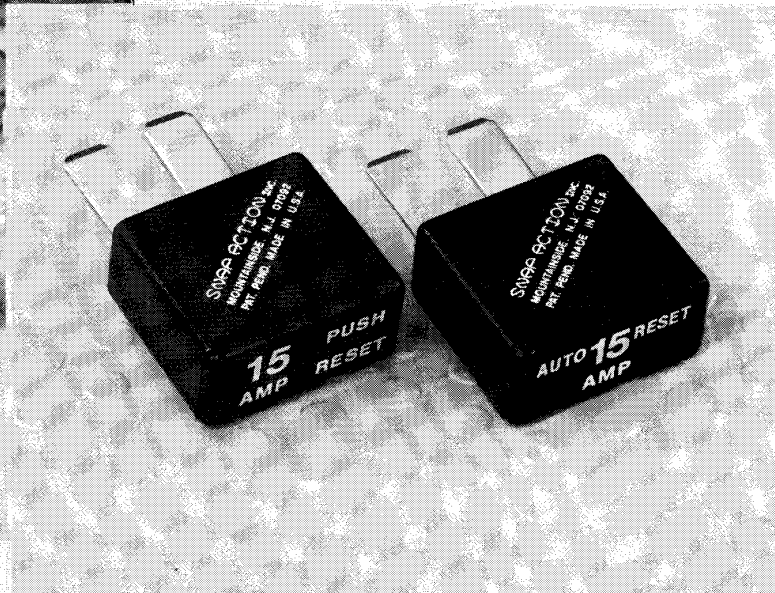
### DESIRED OBJECTIVES

#### PROVIDE:

- Calibrated snap acting sensor which opens with significant amplitude, due to maximum current and contact pressure being reached simultaneously.
- Convenient visible evidence of an over-load condition (VB3-M).
- Mechanical means of holding the open circuit condition (SAE Type II).
- Manual means of resetting.
- SAE Type I cycling unit with a well defined timed open/close cycle.
- A small cross-section area of the sensor for a fail-safe condition.
- A size and configuration for fuse replacement.

#### ELIMINATE:

- Sensors with decreasing contact pressure that tend to arc, tack and weld.
- Heater wires that generate significant heat to maintain an open circuit condition (SAE Type II).
- The large mass of the sensor that will not provide a fail-safe condition.



### CAPABLE OF WITHSTANDING NUMEROUS HIGH OVERLOADS YET SENSITIVE ENOUGH TO ULTIMATELY FAIL SAFE.

Model VB3-M (left) & VB3-A (right), shown above with standard terminal configuration.





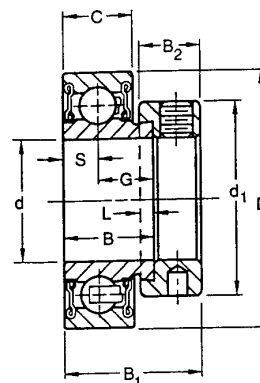
## WIDE INNER RING BEARINGS

### RA-RR, RA-RRB Series Non-Relubricatable Types

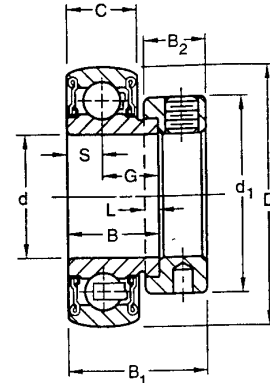
The RA-RR Series bearings are extended inner ring type with self-locking collar. A positive contact, land riding R-seal provides improved protection against harmful contaminants and effectively retains the lubricant under severe operating conditions. A 6/6 molded nylon retainer has proven extremely effective under conditions of misalignment. RA-RR Series bearings are factory prelubricated.

The RA-RR Series has cylindrical outside diameters.

The RA-RRB Series has spherical outside diameters for use in housings with corresponding spherical inside surfaces to provide unrestricted initial self-alignment.



RA-RR Two Seals  
Cylindrical O.D.



RA-RRB Two Seals  
Spherical O.D.

Recommended shaft tolerances:  $\frac{1}{2}$ "-1 $\frac{1}{16}$ ", nominal to  $-.0005$ ",  $-.013$ mm;  
2"-2 $\frac{3}{8}$ ", nominal to  $-.0010$ ",  $-.025$ mm.

TO ORDER, SPECIFY BEARING NUMBER FOLLOWED BY "AND COLLAR". EXAMPLE: RA100RRB AND COLLAR.

Bearing Number	Collar Number	Basic Outer Size	Bore <sup>(1)</sup>		O.D. D	Ring Widths		S	G	L	d <sub>1</sub>	B <sub>2</sub>	B <sub>1</sub>	Brg. & Collar Wt.		Static Load C <sub>0</sub>	Extended Dynamic Rating C <sub>E</sub>
			in.	mm		in.	mm							B Inner	C Outer		
RA008RR	RA008RRB	S1008K	$\frac{1}{2}$		1.5748	0.750	0.512 <sup>(3)</sup>	0.256	0.494	$\frac{1}{2}$	1 $\frac{1}{4}$	$\frac{1}{2}$	1 $\frac{1}{4}$	0.34	0.154	1000	2360
RA009RR	RA009RRB	S1009K	$\frac{3}{8}$		40	19.05	13	6.5	12.55	4.0	28.6	13.5	28.6	0.32	0.145	4400	10600
RA010RR	RA010RRB	S1010K	$\frac{3}{8}$	17										0.28	0.127		
RAE17RR	RAE17RRB	SE17K												0.28	0.127		
RA012RR	RA012RRB	S1012K	$\frac{3}{4}$		1.8504	0.844	0.591 <sup>(3)</sup>	0.295	0.548	$\frac{3}{2}$	1 $\frac{3}{4}$	$\frac{1}{2}$	1 $\frac{1}{2}$	0.29	0.132	1400	3200
RAE20RR	RAE20RRB	SE20K		20	47	21.44	15	7.49	13.92	4.0	33.3	13.5	31	0.29	0.132	6200	14300
RA013RR	RA013RRB	S1013K	$\frac{1}{2}$		2.0472	0.844	0.591	0.295	0.548	$\frac{3}{2}$	1 $\frac{1}{2}$	$\frac{1}{2}$	1 $\frac{1}{2}$	0.51	0.231	1560	3450
RA014RR	RA014RRB	S1014K	$\frac{3}{8}$		52	21.44	15	7.49	13.92	4.0	38.1	13.5	31	0.47	0.213	6950	15600
RA015RR	RA015RRB	S1015K	$\frac{1}{2}$											0.44	0.2		
RA100RR	RA100RRB	S1100K	1											0.41	0.186		
RAE25RR	RAE25RRB	SE25K		25										0.41	0.186		
RA101RR	RA101RRB	S1101K	1 $\frac{1}{8}$		2.4409	0.938	0.709	0.354	0.583	$\frac{3}{2}$	1 $\frac{3}{4}$	5/8	1 $\frac{1}{2}$	0.77	0.349	2280	4800
RA102RR	RA102RRB	S1102K	1 $\frac{1}{4}$		62	23.82	18	8.99	14.81	4.0	44.1	15.9	35.7	0.72	0.327	10000	21600
RA103RR	RA103RRB	S1103K	1 $\frac{3}{8}$											0.7	0.318		
RA103RR2	RA103RRB2	S1103K3	1 $\frac{1}{4}$											0.65	0.295		
RAE30RR	RAE30RRB	SE30K		30										0.7	0.318		
RA104RR	RA104RRB	S1104K	1 $\frac{1}{2}$		2.8346	1.000	0.748	0.374	0.626	$\frac{3}{2}$	2 $\frac{1}{4}$	$\frac{3}{4}$	1 $\frac{1}{2}$	1.24	0.562	3050	6400
RA105RR	RA105RRB	S1105K	1 $\frac{3}{8}$		72	25.4	19	9.5	15.9	4.0	54.40	17.1	38.9	1.19	0.54	13700	28500
RA106RR	RA106RRB	S1106K	1 $\frac{1}{2}$											1.13	0.513		
RA107RR	RA107RRB	S1107K	1 $\frac{1}{8}$											1.05	0.476		
RAE35RR	RAE35RRB	SE35K		35										1.13	0.513		
RA108RR	RA108RRB	S1108KT	1 $\frac{1}{2}$		3.1496	1.188	0.866 <sup>(4)</sup>	0.433	0.755	$\frac{3}{8}$	2 $\frac{1}{4}$	$\frac{3}{2}$	1 $\frac{3}{2}$	1.53	0.694	4000	8150
RA109RR	RA109RRB	S1109KT	1 $\frac{1}{8}$		80	30.18	22	11	19.18	4.8	60.3	18.3	43.7	1.43	0.649	17600	36000
RAE40RR	RAE40RRB	SE40K		40										1.43	0.649		
RA110RR	RA110RRB	S1110K	1 $\frac{3}{8}$											1.72	0.78		
RA111RR	RA111RRB	S1111K	1 $\frac{1}{8}$		3.3465	1.188	0.866	0.433	0.755	$\frac{3}{8}$	2 $\frac{1}{2}$	$\frac{3}{2}$	1 $\frac{3}{2}$	1.62	0.735	4000	8150
RA112RR	RA112RRB	S1112K	1 $\frac{1}{4}$		85	30.18	22	11	19.18	4.8	63.5	18.3	43.7	1.5	0.68	17600	36000
RAE45RR	RAE45RRB	SE45K		45										1.5	0.68		
RA113RR	RA113RRB	S1113K	1 $\frac{1}{8}$											1.94	0.88		
RA114RR	RA114RRB	S1114K	1 $\frac{1}{4}$		3.5433	1.188	0.866	0.433	0.755	$\frac{3}{8}$	2 $\frac{3}{4}$	$\frac{3}{2}$	1 $\frac{3}{2}$	1.83	0.83	4500	8800
RA115RR	RA115RRB	S1115K	1 $\frac{1}{8}$		90	30.18	22	11	19.18	4.8	69.9	18.3	43.7	1.70	0.771	19600	3900
RA115RR2	RA115RRB2	S1115K2	2											1.58	0.717		
RAE50RR	RAE50RRB	SE50K		50										1.79	0.771		
RA200RR	RA200RRB	S1200K	2											2.12	0.962		
RA201RR	RA201RRB	S1201K	2 $\frac{1}{8}$		3.9370	1.281	0.945	0.472	0.809	$\frac{3}{8}$	3	$\frac{1}{2}$	1 $\frac{3}{2}$	1.98	0.898	5630	10800
RA202RR	RA202RRB	S1202K	2 $\frac{1}{4}$		100	32.54	24	11.99	20.55	4.8	76.2	20.6	48.4	1.89	0.857	25000	48000
RA203RR	RA203RRB	S1203K	2 $\frac{1}{8}$											1.78	0.807		
RAE55RR	RAE55RRB	SE55K		55										1.78	0.807		

<sup>(1)</sup> Bore tolerance is nominal to  $+0.0005$ ",  $.013$ mm

<sup>(2)</sup> Spherical O.D. outer ring width is  $.472$ ",  $12$ mm

<sup>(3)</sup> Spherical O.D. outer ring width is  $.551$ ",  $14$ mm

<sup>(4)</sup> Spherical O.D. outer ring width is  $.827$ ",  $21$ mm



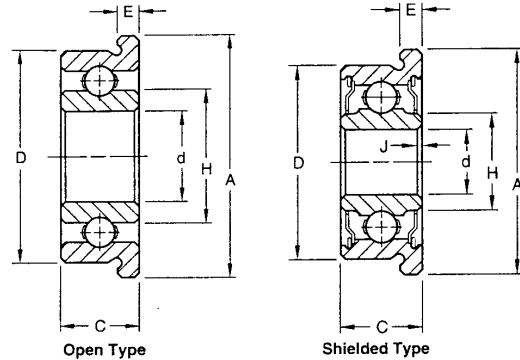


### Flanged Series

#### CYLINDRICAL O.D.

Four sizes in the cylindrical O.D. series are offered in a flanged construction. Flanged bearings have integral shoulders for mounting in through-bored housings. These flanged bearings have straight outside diameters and are interchangeable with the corresponding unflanged sizes. The flanged group is available with double shields.

These bearings are electric motor quality for applications where extra quietness is a requirement.



#### DIMENSIONS – TOLERANCES

Bearing Number	Bore d		Outside Diameter D		Width C	Inner Ring Shoulder	Flange		Shielded Type Overall Width		Wt	Static Load Rating C <sub>0</sub>	Extended Dynamic Load Rating C <sub>E</sub>												
	open	shielded*	chamfer J x 45°			H min	A	E	H min	H min															
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kg.	lbs.	N	lbs.	N									
F3K3	F33KDD3	0.1250	3.175	0.012	0.30	0.3750	9.525	0.155	3.96	0.202	5.13	0.440	11.18	0.030	0.76	0.156	3.96	0.183	4.65	0.01	0.005	48	212	160	710
F3K5	F33KDD5	0.1875	4.762	0.012	0.30	0.5000	12.700	0.156	3.96	0.270	6.86	0.565	14.35	0.042	1.07	0.196	4.98	0.248	6.30	0.01	0.005	110	490	325	1430
FS1K7	FS1KDD <sup>(1)</sup>	0.2500	6.350	0.012	0.30	0.6250	15.875	0.196	4.98	0.349	8.86	0.690	17.53	0.042	1.07	0.196	4.98	0.332	8.43	0.01	0.005	125	560	365	1630
FS3K	FS3KDD <sup>(1)</sup>	0.3750	9.525	0.016	0.41	0.8750	22.225	0.219	5.56	0.517	13.13	0.969	24.61	0.062	1.57	0.281	7.14	0.475	12.06	0.02	0.009	310	1400	830	3650

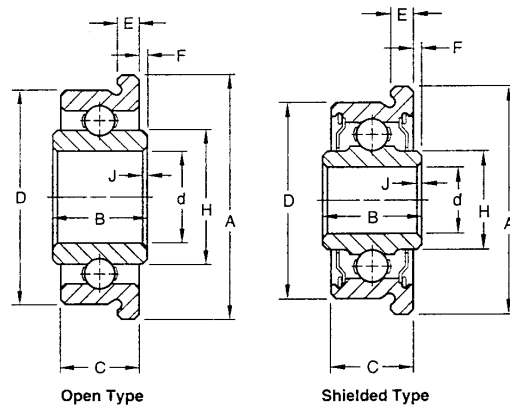
<sup>(1)</sup> Also available in stainless steel. To specify, add prefix "A" before bearing number.  
\* Also available with two contact seals. To specify, replace "KDD" in part number with "PP".

#### TAPERED O.D.

The F Flanged Series has shoulders integral with the bearings for mounting in through-bored housings. They are used where compactness is essential or where it is not desirable to machine housing shoulders. All sizes in this series have tapered outside diameters, and all are available with double shields.

These bearings are particularly suitable for such applications as precision instruments, packaging machinery, motion picture projectors and the like. Several sizes in this series are manufactured in both standard bearing quality, chromium-alloy, high carbon steel and stainless steel, as indicated in the tables. To specify stainless steel, use the prefix A before the basic bearing number. Example: AF4.

These bearings are electric motor quality for applications where extra quietness is a requirement.



#### DIMENSIONS – TOLERANCES

Bearing Number	Bore d		Outside Diameter D		Inner Width B	Ring Widths		Flange		Wt	Static Load Rating C <sub>0</sub>	Extended Dynamic Load Rating C <sub>E</sub>															
	open	shielded	chamfer J x 45°			Inner	Outer Width C	A	E																		
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kg.	lbs.	N	lbs.	N									
F2 <sup>(1)</sup>	—	0.1875	4.762	0.010	0.25	0.4382	11.130	0.189	4.80	0.016	0.41	0.273	6.93	0.163	4.14	0.080	2.03	0.500	12.70	0.042	1.07	0.01	0.005	106	465	260	1160
—	F2DD-2	0.1250	3.175	0.010	0.25	0.3757	9.534	0.188	4.77	0.015	0.38	0.181	4.60	0.163	4.14	0.075	1.90	0.438	11.13	0.037	0.94	0.01	0.005	48	212	160	710
F3	—	0.1875	4.762	0.010	0.25	0.5632	14.305	0.218	5.54	0.015	0.38	0.273	6.93	0.195	4.95	0.080	2.03	0.625	15.88	0.042	1.07	0.01	0.005	110	490	325	1430
—	F3DD	0.1875	4.762	0.010	0.25	0.5632	14.305	0.250	6.35	0.015	0.38	0.245	6.22	0.226	5.74	0.068	1.73	0.625	15.88	0.042	1.07	0.01	0.005	110	490	325	1430
F4	F4DD	0.2500	6.350	0.010	0.25	0.6257	15.893	0.250	6.35	0.015	0.38	0.331	8.41	0.226	5.74	0.068	1.73	0.687	17.45	0.042	1.07	0.01	0.005	125	560	365	1630
F5	F5DD	0.3125	7.938	0.010	0.25	0.6882	17.480	0.250	6.35	0.015	0.38	0.410 <sup>(2)</sup>	10.41	0.226	5.74	0.068	1.73	0.750	19.05	0.042	1.07	0.01	0.005	196	865	540	2400

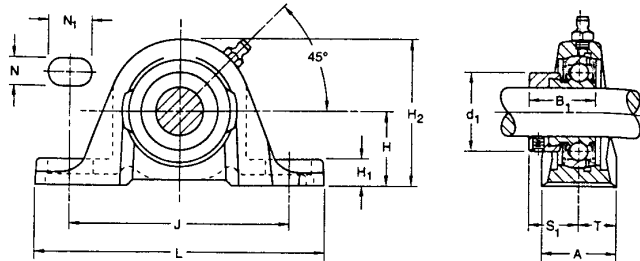
<sup>(1)</sup> Full type, no retainer. Not recommended for speeds over 500 RPM.  
<sup>(2)</sup> H dimension is .381" (9.68 mm) for F5DD.  
<sup>(3)</sup> Land dimension of the inner ring.



## PILLOW BLOCKS/CAST IRON

### VAK Standard Series

This streamlined, rugged one-piece VAK pillow block unit combines Fafnir's proven RAK housing and unique RA-RR extended inner ring bearing. The RA-RR bearing employs a positive contact land-riding seal and a Fafnir originated self-locking collar to assure positive shaft retention. The VAK pillow block can be mounted and will operate in any position. Bearing housed units are factory prelubricated but a grease fitting is provided to allow for relubrication if required.



Recommended shaft tolerances: 1/4"-1 1/4", nominal to -.0005", -.013mm;  
2"-2 3/4", nominal to -.0010", -.025mm.

#### Bearing Data

Unit	Bearing Number	Dimensions and Load Ratings
VAK	GRA-KRRB	Page 163

TO ORDER, SPECIFY UNIT AND SHAFT DIAMETER. EXAMPLE: VAK 1"

Unit	Shaft Diam.	H	H <sub>2</sub>	B <sub>1</sub>	J	L	A	H <sub>1</sub>	N	N <sub>1</sub>	d <sub>1</sub>	S <sub>1</sub>	T	Bolt Size	Bearing Number	Collar Number	Housing Number	Unit Wt.
	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	mm			new (old)	lbs kg
VAK	1/2														GRA008RRB	S1008K		
VAK	3/8														GRA009RRB	S1009K	T-40238	1
VAK	1/2														GRA010RRB	S1010K	(T-30595)	0.454
VAK	17														GRAE17RRB	SE17K		
VAK	3/4														GRA012RRB	S1012K	T-40239	1.24
VAK	20														GRAE20RRB	SE20K	(T-30555)	0.563
VAK	1 1/8														GRA013RRB	S1013K		
VAK	3/8														GRA014RRB	S1014K		
VAK	1 1/8														GRA015RRB	S1015K	T-30365	1.67
VAK	1														GRA100RRB	S1100K		0.758
VAK	25														GRAE25RRB	SE25K		
VAK	1 1/8														GRA101RRB	S1101K		
VAK	1 1/8														GRA102RRB	S1102K	T-40241	2.72
VAK	1 1/8														GRA103RRB	S1103K	(T-30300)	1.235
VAK	1 1/4 S														GRA103RRB2	S1103K3		
VAK	30														GRAE30RRB	SE30K		
VAK	1 1/4														GRA104RRB	S1104K		
VAK	1 3/8														GRA105RRB	S1105K	T-40242	3.51
VAK	1 3/8														GRA106RRB	S1106K	(T-30410)	1.594
VAK	1 3/8														GRA107RRB	S1107K		
VAK	35														GRAE35RRB	SE35K		
VAK	1 1/2														GRA108RRB	S1108KT	T-40243	4.48
VAK	1 3/8														GRA109RRB	S1109KT	(T-30484)	2.034
VAK	40														GRAE40RRB	SE40K		



## DRAWN CUP ROLLER CLUTCHES

### Type DC Roller Clutches

Nominal dimensions with rounded conversions are shown below. Shaft raceway and housing bore diameters necessary for proper mounting and operation are listed on the opposite page.

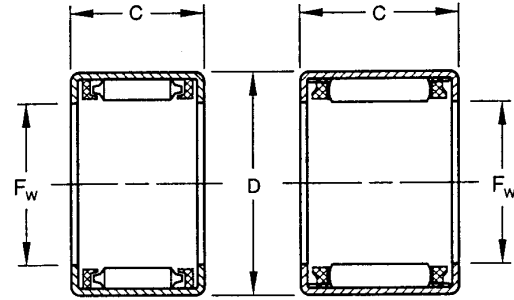
Types FC, FCS, FCL-K and RC-FS clutches have stainless steel springs inserted in the molded cage to position the rollers for instantaneous lockup.

Type RC clutches have springs integrally molded with the cage to position the rollers for instantaneous lockup.

Before ordering any clutch check for availability.



The mounted clutch engages when the housing is rotated relative to the shaft in the direction of the arrow marking (←LOCK) stamped on the cup.



Type FC

Types FCS, FCL-K  
RC and RC-FS

### DIMENSIONS AND RATINGS

F <sub>w</sub> Bore		D O.D.		C Width		Clutch Designation		Torque Rating †	Z Minimum O.D. of Steel Housing for Rated Torque		Overrun Limiting Speed
(nominal)		(nominal)		+0.000 -0.010	+0.00 -0.25	with Stainless Steel Springs	with Integral Springs		lb <sub>f</sub> • in.	inch	
inch	mm	inch	mm	inch	mm						
¼	3.18	⅝	7.14	0.250	6.35	—	RC-02	2.86	0.44	11	50000
0.16	4	0.31	8	0.236	6	FC-4-K	—	2.78	0.44	11	50000
0.24	6	0.39	10	0.472	12	FCS-6	—	18.60	0.55	14	39300
¼	6.35	⅞	11.11	0.500	12.70	—	RC-040708	17.20	0.62	16	38000
0.31	8	0.47	12	0.472	12	FCL-8-K	—	28.70	0.67	17	28700
0.31	8	0.55	14	0.472	12	FC-8	—	35.80	0.79	20	30500
¾	9.52	¾	15.88	0.500	12.70	RC-061008-FS*	RC-061008	45.40	0.88	22	25300
0.39	10	0.55	14	0.472	12	FCL-10-K	—	39.10	0.77	20	22700
0.39	10	0.63	16	0.472	12	FC-10	—	50.40	0.98	25	23700
0.47	12	0.71	18	0.630	16	FC-12	—	118	1.10	27	19300
½	12.70	¾	19.05	0.500	12.70	RC-081208-FS*	RC-081208	73.60	1.10	28	18700
½	15.88	⅞	22.22	0.625	15.88	RC-101410-FS*	RC-101410	143	1.20	30	14700
0.63	16	0.87	22	0.630	16	FC-16	—	182	1.20	31	14000
¾	19.05	1	25.40	0.625	15.88	RC-121610-FS*	RC-121610	196	1.40	36	11300
0.79	20	1.02	26	0.630	16	FC-20	—	274	1.50	38	10700
0.98	25	1.26	32	0.787	20	FC-25	—	605	1.80	46	8670
1	25.40	1 ¼	33.34	0.625	15.88	RC-162110-FS*	RC-162110	412	1.90	48	8670
1.18	30	1.46	37	0.787	20	FC-30	—	845	2.0	51	7330

\* Suffix "-FS" is not always stamped on the clutch cup. Type RC-FS with stainless steel springs is always readily identified by RED clutch cage.

† Torque ratings are given in pound force inches: 1 lb<sub>f</sub> • in = 0.113 N • m = 0.0115 kgf • m

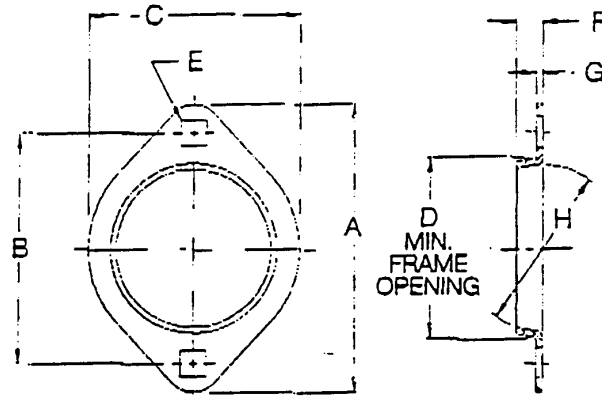
## General Flangette Information

LUTCO is the largest manufacturer of precision flangettes in North America. With an extensive tooling inventory, we are able to offer a wide variety of standard and custom units.

Fit and surface contact between the flangettes and the bearing contribute to the life of the assembly. By allowing the bearing to misalign in the housing under a predetermined torque, premature failure can be eliminated. Sophisticated measuring and torque rating equipment are employed to provide statistical process control, through charting and minimum 1.0 CPK values.

For more specific information on the processes utilized, please contact the factory.

## 2 Bolt Self-Aligning Flangettes



PART NUMBER	A	B	C	D	E	F	G	H	RADIAL LOAD LBS. N	UNIT WT. LBS.
	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	in. mm	nom. mm		
2 BOLT										
35MST	2 <sup>7</sup> / <sub>8</sub> 73.0	2 <sup>1</sup> / <sub>2</sub> 63.50	2 <sup>9</sup> / <sub>16</sub> 58.74	1 <sup>1</sup> / <sub>8</sub> 41.28	9 <sup>3</sup> / <sub>32</sub> 7.14	7 <sup>1</sup> / <sub>32</sub> 5.54	0.054 1.37	35	350 1556	0.06
→ 40MST	3 <sup>3</sup> / <sub>16</sub> 80.96	2 <sup>1</sup> / <sub>2</sub> 63.50	2 <sup>7</sup> / <sub>16</sub> 58.74	1 <sup>1</sup> / <sub>4</sub> 47.63	9 <sup>3</sup> / <sub>32</sub> 7.14	9 <sup>3</sup> / <sub>32</sub> 7.14	0.075 1.905	40	750 3100	0.08
47MST	3 <sup>5</sup> / <sub>16</sub> 90.49	2 <sup>13</sup> / <sub>16</sub> 71.44	2 <sup>5</sup> / <sub>8</sub> 66.68	2 <sup>1</sup> / <sub>16</sub> 55.55	1 <sup>1</sup> / <sub>32</sub> 8.73	5 <sup>1</sup> / <sub>16</sub> 7.94	0.083 2.11	47	900 3900	0.10
52MST	3 <sup>3</sup> / <sub>4</sub> 95.25	3 76.20	2 <sup>5</sup> / <sub>16</sub> 71.04	2 <sup>7</sup> / <sub>8</sub> 60.33	1 <sup>1</sup> / <sub>32</sub> 8.73	1 <sup>1</sup> / <sub>32</sub> 8.73	0.083 2.11	52	1000 4450	0.11
62MST	4 <sup>1</sup> / <sub>8</sub> 112.71	3 <sup>3</sup> / <sub>16</sub> 90.49	3 <sup>1</sup> / <sub>16</sub> 84.14	2 <sup>13</sup> / <sub>16</sub> 71.44	1 <sup>9</sup> / <sub>32</sub> 10.31	3 <sup>1</sup> / <sub>8</sub> 9.53	0.104 2.64	62	1400 6200	0.33
72MST	4 <sup>1</sup> / <sub>2</sub> 125.41	3 <sup>1</sup> / <sub>16</sub> 100.01	3 <sup>1</sup> / <sub>16</sub> 93.66	3 <sup>3</sup> / <sub>16</sub> 80.96	1 <sup>1</sup> / <sub>32</sub> 10.31	1 <sup>3</sup> / <sub>32</sub> 10.31	0.104 2.64	72	1750 7500	0.40

For Torque rated flangettes, add the prefix "T".  
Add, "ZP" for standard zinc plate and "YZP" for yellow chromate finishes.  
Special designs available upon request.