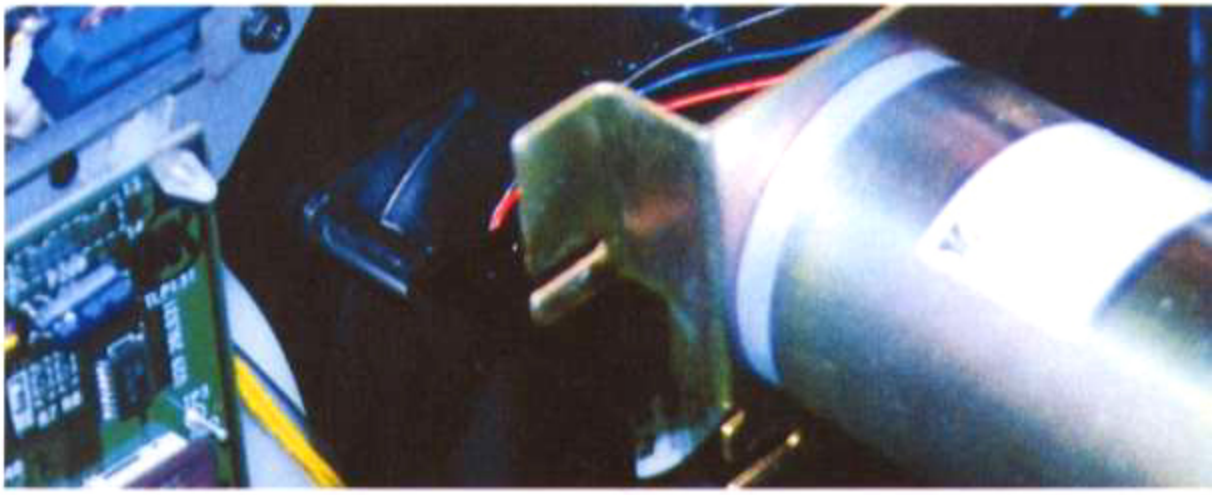
MINERTIA MOTOR F SERIES

SMALL SIZE DC SERVOMOTORS

TYPE UGFMED-B1 20E,-B5 20E,-C9 A20E



YASKAWA

A BREAKTHROUGH IN OFFICE AUTOMATION

YASKAWA'S DC SERVOMOTORS WITH ENCODER

FROM THIS···

(BY STEPPING MOTORS)

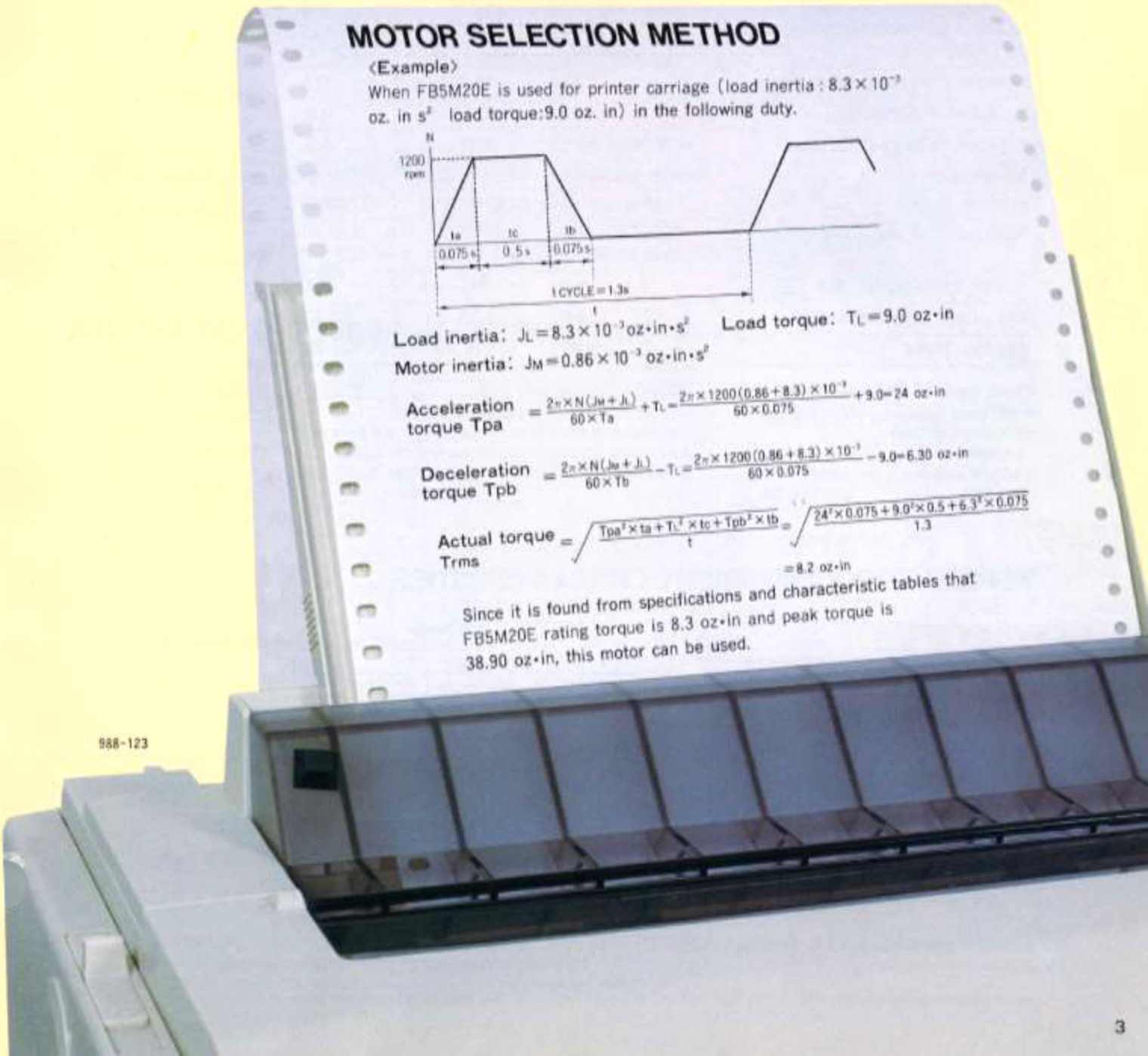
TO THIS···

(BY DC SERVOMOTORS)

OPTIMUM SPECIAL DESIGN—SMALL AND LIGHT

Stepping motors have been used for serial printers however, DC motors have been employed recently following the development of multi-function printers. This is because DC servomotors can provide stable drive operation in a wider range of speed.

YASKAWA MINERTIA MOTORS F SERIES are small and light DC servomotors which have achieved reduction of torque ripple by optimum special design. F SERIES have been accepted for a large variety of applications, such as SERIAL PRINTERS, PLOTTERS, COPY MACHINES, etc.



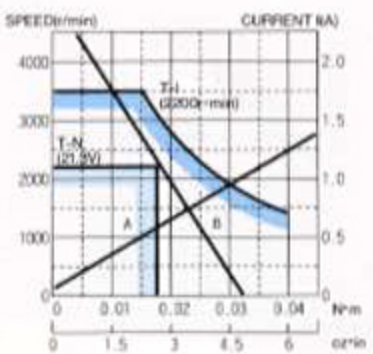
■RATINGS AND SPECIFICATIONS

Item \ Motor Type UGFMED-		B1T20E	B1M20E
Rated Output	W	4.3	5.4
Rated Torque	N·m (oz·in)	0.019 (2.64)	0.024 (3.33)
Rated Speed	r/min	2200	2200
Rated Voltage	V	21.3	20.2
Rated Current	A	0.59	0.67
Pated Power Rate	kW/s	0.29	0.35
Rated Angular Acceleration	rad/s^2	15800	15000
Instantaneous Peak Torque	N·m (oz·in)	0.050 (7.1)	0.059 (8.5)
Instantaneous Max. Speed	r/min	3500	3500
Moment of Ineria (with Encoder) J_M ($=GD^2_M/4$)	kg·m^2 (oz·in·s^2)	1.18×10^{-6} (1.67×10^{-4})	1.57×10^{-6} (2.22×10^{-4})
Armature Winding Resistance	Ω	15.7	11.5
Armature Inductance	mH	9.1	8.0
Induced Voltage Constant	V/1000(r/min)	3.93	4.3
Torque Constant	N·m/A (oz·in/A)	0.037 (5.28)	0.041 (5.83)
Friction Torgue	N·m (oz·in)	0.0019 (0.26)	0.002 (0.28)
Viscous Damping Coefficint	N·m/ (r/min) (oz·in/(r/min))	1.57×10^{-6} (2.2×10^{-5})	1.57×10^{-6} (2.2×10^{-5})
Inertia Time Constant	ms	13.1	11.0
Inductive Time Constant	ms	0.58	0.70
Approx. Mass	g (oz)	125 (4.41)	135 (4.76)

- **Time Rating:** Continuous
- **Withstand Voltage:** 500VAC/1 min
- **Ambient Conditions**
  - **Location:** Indoor
  - **Temperature:** − 10 to + 40℃
  - **Humidity:** 80% RH Max.
- **Direction of Rotation:** When (+) voltage is supplid to red lead, it rotates counterclockwise (CCW) from the drive end.
- **Allowable Thrust Load:** 4.9N (1.1lb) or below
- **Allowable Radial Load:** 10mm (0.39in) from the surface, 9.8N (2.2lb) or below

■SPEED-TORQUE-CURRENT CHARACTERISTICS

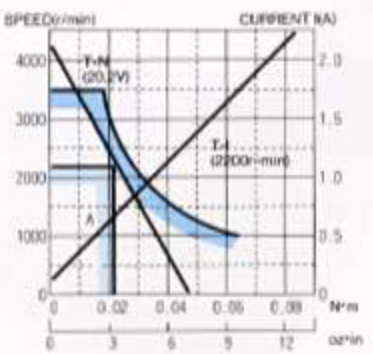
- UGFMED-B1T20E



A: Area of safe continuous duty without air cooling.
B: Area of intermittent duty.

Note: Motor mounted on 100 × 100 × 3 (mm)(4 × 4 × 0.12 (in)) heat sink.

- UGFMED-B1M20E

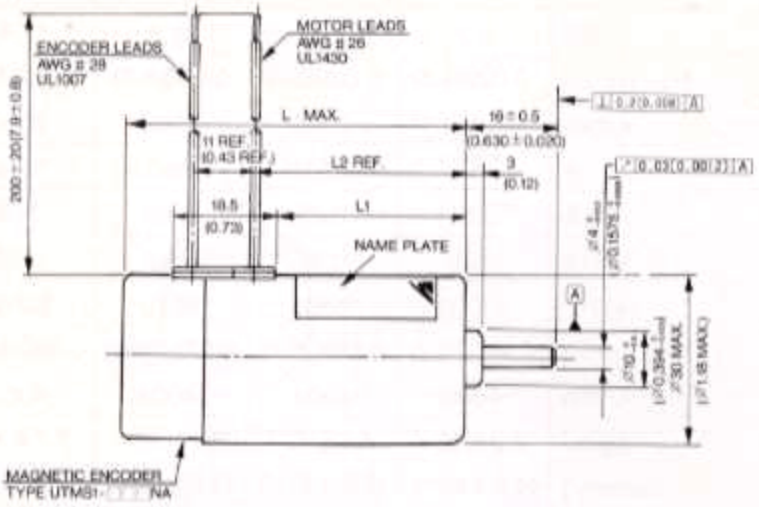


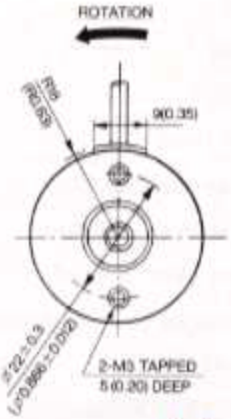
Environmental conditions:
Temperature 25℃ Humidity 80% max.

Curve data for an armature temp. of 100℃

90 to 200 pulses/rev

■DIMENSIONS in mm(inches)





Type	L	L1	L2
UGFMED-B1T20E	55 (2.17)	27.4 (1.08)	31.3 (1.23)
UGFMED-B1M20E	61 (2.40)	33.4 (1.31)	37.3 (1.47)

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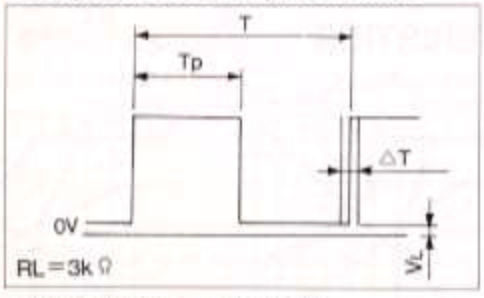
■MAGNETIC ENCODER CHARACTERISTIC TABLES

Type	P/rev
UTMSI-009NA	90
UTMSI-01BNA	116
UTMSI-01ANA	134
UTMSI-020NA	200

Input Power Requirement	+5VDC ±5% 15mA Max.
Waveform	Square Wave, 1 Channel
Output Signal Level	Open Collector Output (V_L: 0.4V Max. at Isink 8mA)
Flutter	360° ±9° (5%p-p Max.)
Pulse Duty Cycle	50 ± 15% (180° ± 54°)
Rising and Falling Time	5 μs Max.
Frequency Range	15kHz

●Output Wave Pull-up Resistance



Pulse Duty Cycle = Tp/T×100(%)
Flutter = △T/T×100(%)

●Encoder Lead

Input	+5VDC	ORANGE
	0V	BLACK
Output	Signal Output	YELLOW

Notes:

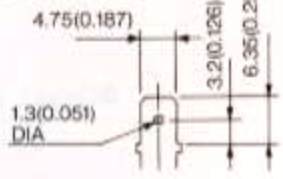
1. Avoid vibration or shock on the encoder or its output shaft.
2. Do not perform the insulation test or measure the insulation resistance.

■RATINGS AND SPECIFICATIONS

Item \ Motor Type UGFMED-		B5T20E	B5S20E	B5M20E	B5L20E
Rated Output	W	6.2	8.2	12.3	17.4
Rated Torque	N·m (oz·in)	0.029(4.2)	0.039(5.6)	0.059(8.3)	0.083(11.8)
Rated Speed	r/min	2000	2000	2000	2000
Rated Voltage	V	16.1	26.0	30.0	19.4
Rated Current	A	1.0	0.66	0.76	1.66
Rated Power Rate	kW/s	0.29	0.35	0.57	0.90
Rated Angular Acceleration	rad/s²	10000	8880	9670	10760
Instantaneous Peak Torque	N·m (oz·in)	0.157(22.2)	0.186(26.4)	0.275(38.9)	0.392(55.6)
Instantaneous Max. Speed	r/min	4000	4000	4000	4000
Moment of Inertia (with Encoder)	kg·m²	2.9×10^{-6}	4.4×10^{-6}	6.1×10^{-6}	7.7×10^{-6}
J_M (=$GD^2_M/4$)	(oz·in·s²)	(4.2×10^{-4})	(6.3×10^{-4})	(8.6×10^{-4})	(11×10^{-4})
Armature Winding Resistance	Ω	6.2	12.5	11.2	3.1
Armature Inductance	mH	2.4	6.0	6.2	1.9
Induced Voltage Constant	V/1000 (r/min)	3.8	7.6	9.7	6.2
Torque Constant	N·m/A (oz·in/A)	0.036(5.1)	0.073(10.3)	0.092(13.1)	0.059(8.38)
Friction Torque	N·m (oz·in)	0.0039 (0.56)	0.0048 (0.70)	0.0059 (0.83)	0.0069 (0.97)
Viscous Damping Coefficient	N·m/ (r/min) (oz·in/ (r/min))	0.39×10^{-6} (5.6×10^{-5})	0.59×10^{-6} (8.3×10^{-5})	0.88×10^{-6} (12.5×10^{-5})	0.98×10^{-6} (14×10^{-5})
Inertia Time Constant	ms	14	10.5	8.4	6.9
Inductive Time Constant	ms	0.39	0.48	0.55	0.61
Approx. Mass	g (oz)	280(9.88)	330(11.6)	390(13.8)	450(15.9)

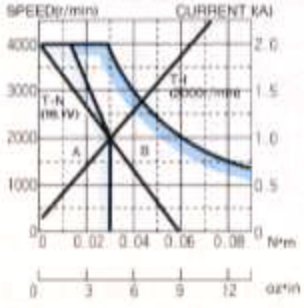
- **Time Rating:** Continuous
- **Withstand Voltage:** 500 VAC/1 min
- **Ambient Conditions**
  - **Location:** Indoor
  - **Temperature:** − 10 to + 40℃
  - **Humidity:** 80% RH Max.
- **Direction of Rotation:** When (+) voltage is supplied to terminals with red cap, it rotates counterclockwise (CCW) from the drive end.
- **Allowable Thrust Load:** 9.8N (2.2lb) or below
- **Allowable Radial Load:** 18mm (0.71in) from the surface, 19.6N (4.4lb) or below

FASTON 187 SERIES TAB or equivalent

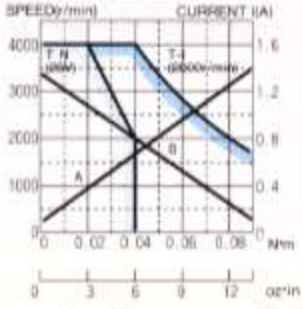


■SPEED-TORQUE-CURRENT CHARACTERISTICS

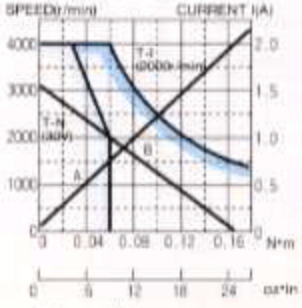
- UGFMED-B5T20E



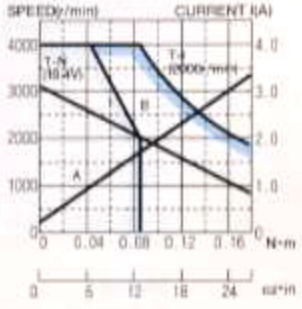
- UGFMED-B5S20E



- UGFMED-B5M20E



- UGFMED-B5L20E



A: Area of safe continuous duty without air cooling.
B: Area of intermittent duty.

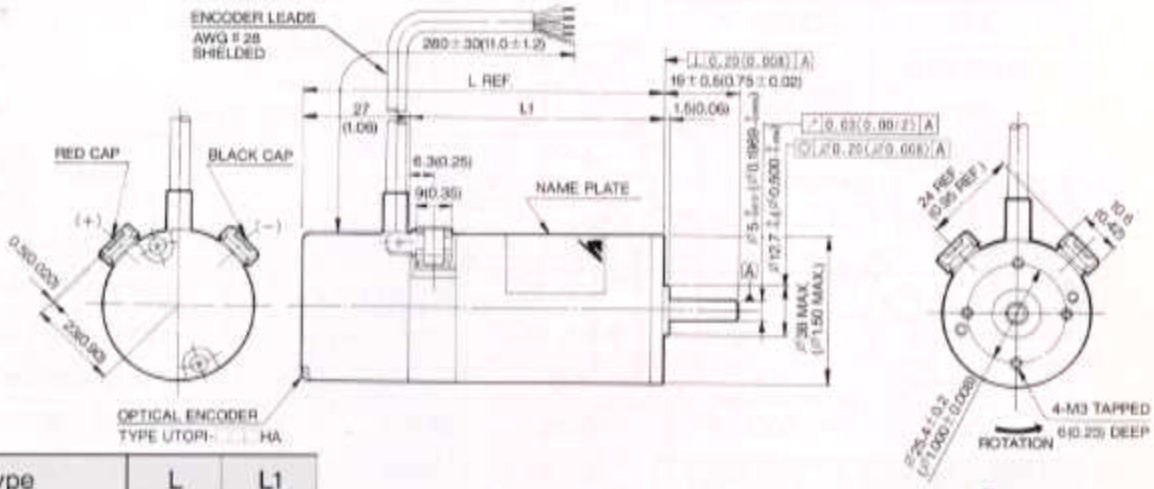
Environmental conditions:
Temperature 25℃ Humidity 80% max.

Note: Motor mounted on 100 × 100 × 3 (mm)(4 × 4 × 0.12(in)) heat sink. Curve data for an armature temp. of 100℃

WITH HIGH ACCURACY ENCODER "HA" TYPE

500 to 1000 pulses/rev

■DIMENSIONS in mm(inches)



Type	L	L1
UGFMED-B5T20E	70.5 (2.78)	43.5 (1.72)
UGFMED-B5S20E	81.5 (3.21)	54.5 (2.15)
UGFMED-B5M20E	92.0 (3.62)	65.0 (2.56)
UGFMED-B5L20E	102.0 (4.02)	75.0 (2.96)

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■OPTICAL ENCODER CHARACTERISTIC TABLES

Type	P/rev
UTPOI-050HA	500
UTOPI-060HA	600
UTOPI-080HA	800
UTOPI-100HA	1000

Input Power Requirement	+5VDC ±5% 100mA Max.
Waveform	Square Wave, 2 Channel
Output Circuit	TTL Compatible
Flutter	360° ±9° (5%p-p Max.)
Pulse Duty Cycle	180° ±30° (50±8.3%)
Phase Offset	90° ±36° (25±11%)
Frequency Range	20kHz

●Signal Waveform

(CCW rotation when viewed from shaft drive end)

●Encoder Lead

Input	+5VDC	RED
	0V	BLACK
Output	Channel A	WHITE
	Channel B	GREEN
	Shield	——

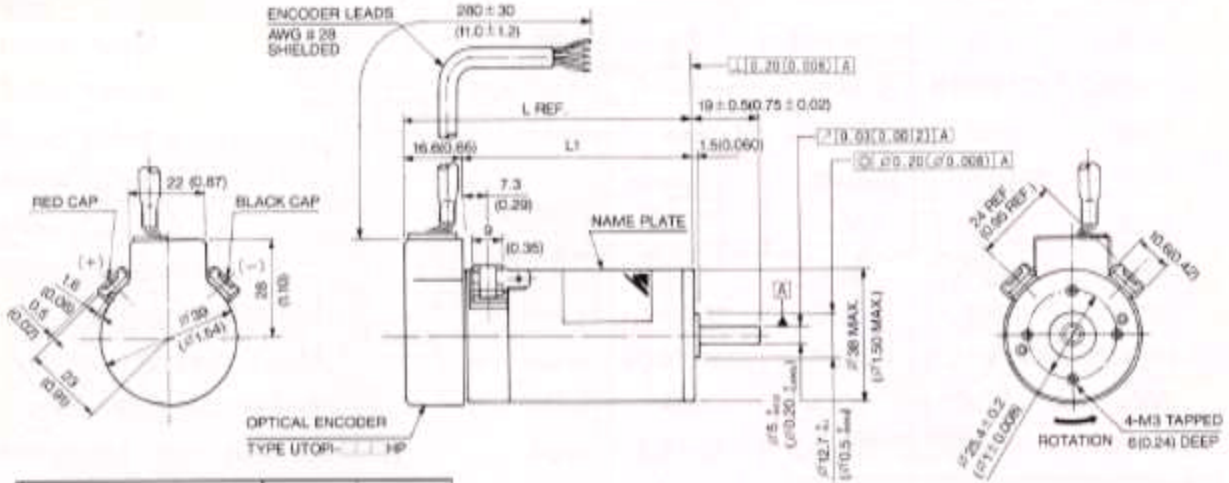
Notes:

1. The relation of A and B channels to the motor rotating direction must correctly be set. If not so, overtravel may occur.
2. Avoid vibration or shock on the encoder or its output shaft.
3. Do not perform the insulation test or measure the insulation resistance.

WITH LOW COST ENCODER "HP" TYPE

100 to 400 pulses/rev

■DIMENSIONS in mm(inches)



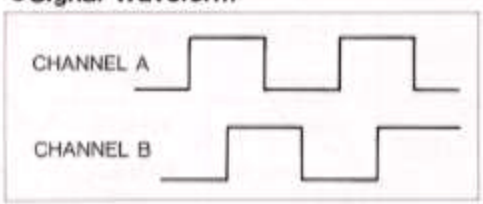
Type	L	L1
UGFMED-B5T20E	61.1 (2.41)	44.5 (1.76)
UGFMED-B5S20E	72.1 (2.84)	55.5 (2.19)
UGFMED-B5M20E	82.6 (3.25)	66.0 (2.60)
UGFMED-B5L20E	92.6 (3.65)	76.0 (3.00)

■OPTICAL ENCODER CHARACTERISTIC TABLES

Type	P/rev
UTOPI-010HP	100
UTOPI-012HP	120
UTOPI-020HP	200
UTOPI-02BHP	288
UTOPI-030HP	300
UTOPI-040HP	400

Input Power Requirement	+5VDC ±5% 40mA Max.
Waveform	Square Wave, 2 Channel
Output Circuit	TTL Compatible
Flutter	360° ±9° (5%p-p Max.)
Pulse Duty Cycle	180° ±30° (50±8.3%)
Phase Offset	90° ±36° (25±10%)
Frequency Range	20kHz

●Signal Waveform



(CCW rotation when viewed from shaft drive end)

●Encoder Lead

Output	Channel A	WHITE
	Channel B	GREEN
Input	+5VDC	RED
	0V	BLACK
	Shield	—

Notes :

1. The relation of A and B channels to the motor rotating direction must correctly be set. If not so, overtravel may occur.
2. Avoid vibration or shock on the encoder its output shaft.
3. Do not perform the insulation test or measure the insulation resistance.

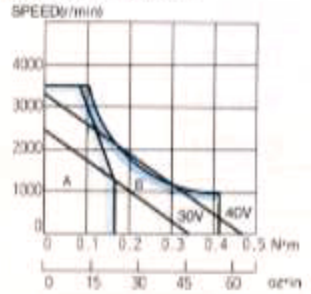
■RATINGS AND SPECIFICATIONS

Item \ Motor Type UGFMED-		C9SA20E	C9EA20E	C9MA20E
Rated Output	W	20.1	26.4	35.2
Rated Torque	N·m (oz·in)	0.16 (22.7)	0.21 (29.8)	0.28 (39.8)
Rated Speed	r/min	1200	1200	1200
Rated Voltage	V	29.4	30	30.7
Rated Current	A	1.5	1.8	2.1
Rated Power Rate	kW/s	1.66	2.24	2.76
Rated Angular Acceleration	rad/s^2	10400	10660	9850
Instantaneous Peak Torque	N·m (oz·in)	0.41 (58.4)	0.56 (79.4)	0.93 (132)
Instantaneous Peak Current	A	3.4	4.2	6.0
Instantaneous Max. Speed	r/min	3500	3500	3000
Moment of Inertia J_M (=$GD^2_M/4$)	kg·m^2 (oz·in·s^2)	1.54×10^{-6} (2.18×10^{-3})	1.97×10^{-6} (2.79×10^{-3})	2.84×10^{-6} (4.03×10^{-3})
Armature Winding Resistance	Ω	7.0	5.5	4.1
Armature Inductance	mH	6.7	6.3	5.4
Induced Voltage constant	V/1000 (r/min)	12.9	14.3	16.6
Torque Constant	N·m/A (oz·in/A)	0.123 (17.5)	0.136 (19.4)	0.158 (22.5)
Friction Torque	N·m (oz·in)	0.0078 (1.1)	0.011 (1.53)	0.016 (2.22)
Viscous Damping Coefficien	N·m/ (r/min) (oz·in/ (r/min))	3.04×10^{-8} (4.31×10^{-4})	4.31×10^{-6} (6.12×10^{-4})	6.76×10^{-8} (9.59×10^{-4})
Inertia Time Constant	ms	7.1	5.8	4.6
Inductive Time Constant	ms	0.96	1.1	1.3
Approx. Mass	g (oz)	575 (20.3)	690 (24.3)	885 (31.2)

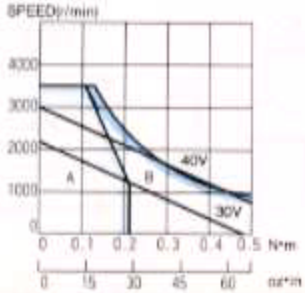
- **Time Rating:** Continuous
- **Withstand Voltage:** 500VAC/1 min
- **Ambient Conditions**
  - **Location:** Indoor
  - **Temperature:** − 10 to + 40℃
  - **Humidity:** 80% RH Max.
- **Direction of Rotation:** When (+) voltage is supplied to terminals with red cap, it rotates counterclockwise (CCW) from the drive end.
- **Allowable Thrust Load:** 19.6N (4.4lb) or below
- **Allowable Radial Load:** 15mm (0.60in) from the surface, 49N (11lb) or below

■SPEED-TORQUE CHARACTERISTICS

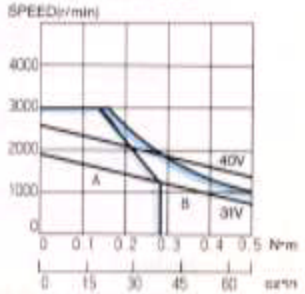
- UGFMED-C9SA20E



- UGFMED-C9EA20E



- UGFMED-C9MA20E



A: Area of safe continuous duty without air cooling.
B: Area of intermittent duty.

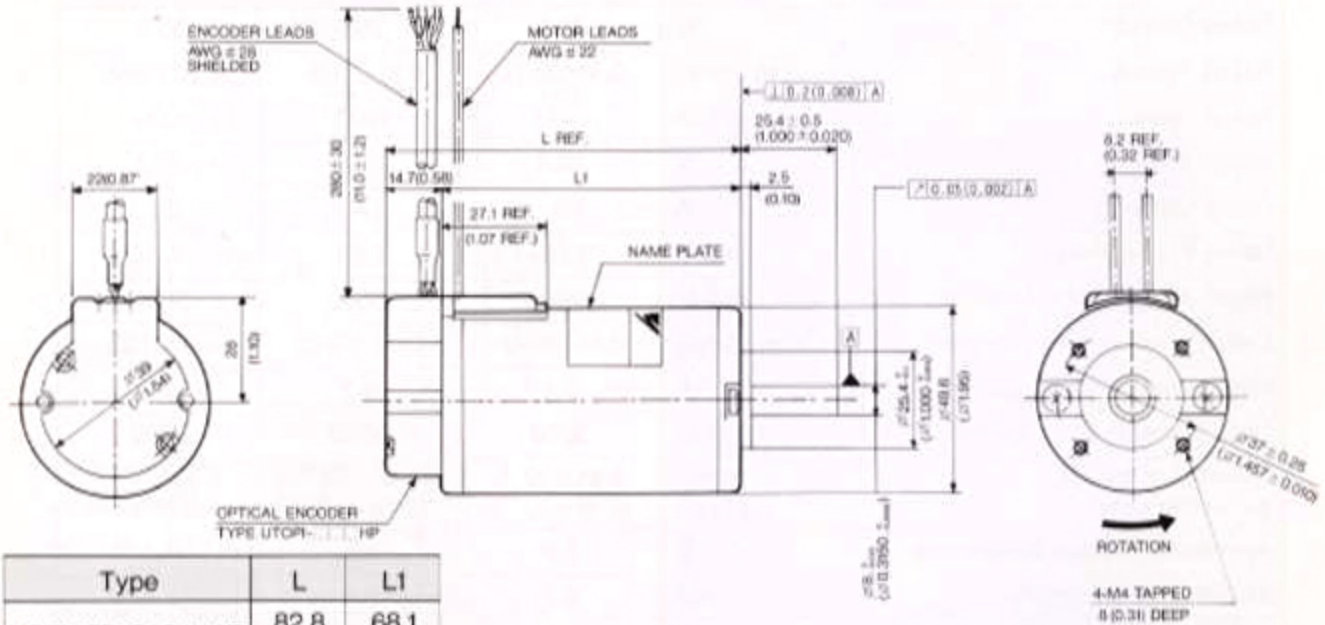
Environmental conditions:
Temperature 25℃ Humidity 80% max.

Note: Motor mounted on 100×100×3 (mm)(4×4×0.12(in)) heat sink. Curve data for an armature temp. of 100℃

WITH LOW COST ENCODER "HP" TYPE

144 to 400 pulses/rev

■DIMENSIONS in mm(inches)



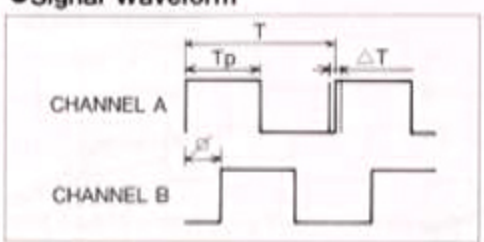
Type	L	L1
UGFMED-C9SA20E	82.8 (3.26)	68.1 (2.68)
UGFMED-C9EA20E	92.8 (3.65)	78.1 (3.08)
UGFMED-C9MA20E	112.8 (4.44)	98.1 (3.86)

■OPTICAL ENCODER CHARACTERISTIC TABLES

Type	P/rev
UTOPI-014HP	144
UTOPI-015HP	150
UTOPI-020HP	200
UTOPI-028HP	288
UTOPI-036HP	360
UTOPI-040HP	400

Input Power Requirement	+5VDC ±5% 40mA Max.
Waveform	Square Wave, 2 Channel
Output Circuit	TTL Compatible
Flutter	360° ±9° (5%p-p Max.) △T/T×100%
Pulse Duty Cycle	180° ±30° (50±8.3%) Tp/T×100%
Phase Offset	90° ±36° (25±10%) ∅/T×100%
Frequency Range	20kHz

●Signal Waveform



●Encoder Lead

Input	+5VDC	RED
	0V	BLACK
Output	Channel A	WHITE
	Channel B	GREEN
	Shield	——

Notes :

1. The relation of A and B channels to the motor rotating direction must correctly be set. If not so, overtravel may occur.
2. Avoid vibration or shock on the encoder or its output shaft.
3. Do not perform the insulation test or measure the insulation resistance.

MINERTIA MOTOR F SERIES

SMALL SIZE DC SERVOMOTORS

TYPE UGFMED-B1 20E, -B5 20E,-C9 A20E

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