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Specifications in this catalog are subject to change without prior notice.

# FEATURES AND SOLUTIONS

In today's progressive manufacturing and distribution environments, designing conveyor systems can be a difficult challenge. Complex problems often need to be solved. Now there is an innovative and advanced engineering solution that meets the demands of a new age in production automation and flexibility. The Power Moller® is a self-contained motorized roller that opens new horizons in handling system design. Its low profile and ease of installation make it the perfect choice when production efficiency and space savings are required.

### Working Concept

The turning force of the motor is transmitted through the shock absorber to the planetary gearing. The planetary gearing drives the inner gear which is affixed to the roller tube. The tube will rotate because the output shaft is held stationary by the conveyor frame.

### "One Touch" Spring Loaded Shaft - Easy Installation

The Power Moller® spring-loaded shaft enables the unit to be quickly installed or removed without disassembling the conveyor frame

### Space Saving

Motor and gearbox integral with roller tube

### Safe, Simple and Clean

Totally sealed construction with no exposed chains or sprockets

### Quiet and Smooth Operation

No pneumatics. Enables low vibration transfer

### Maintenance Free

Lifetime lubrication ensures long life and maintenance free operation

### Built-in Shock Absorber

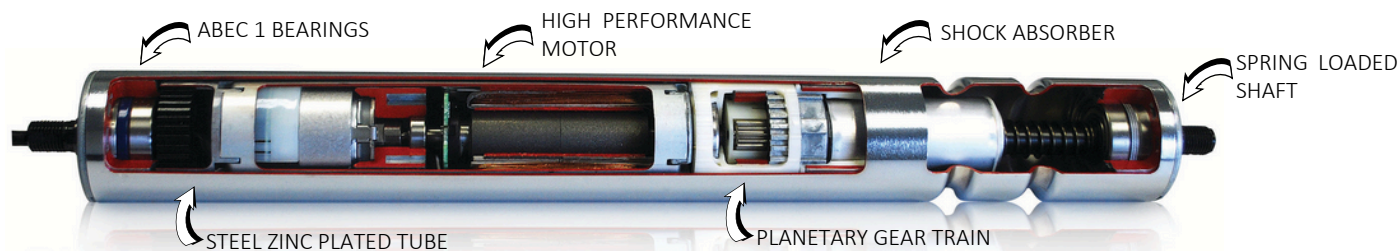
Protects the gearbox from a sudden stop, impact, or acceleration in the line

### Easy Wiring

Supplied mounting brackets secure the motor shaft to the frame and provides easy and convenient wiring

### Reversible

Easy control of forward, reverse and stop functions



## PART NUMBER EXAMPLE

### PM486FE-60-747-D-024-"MOTOR"-"SHAFT"-"CABLE"-"END CAP"-"TUBE"-"MOUNTING BRACKET"

Power Moller Model	Speed Code	Tube Length	24V DC	Roller Option*	Non-Standard Shaft Option*	Non-Standard Cable Option*	Non-Standard End Cap Option*	Groove Options*	Mounting Bracket Options
Diameter: 48.6 mm (1.91")	60 m/min	747 mm		<u>Brake:</u> "BR"	"JQ" "JG"	<u>9 Pin:</u> "C050" - 500 mm "C060" - 600 mm "C100" - 1000 mm "C200" - 2000 mm "C300" - 3000 mm	<u>Poly V End Cap:</u> "VG" "GV" <u>V-Belt Pulley End Cap:</u> "VP" "PV" <u>Round Belt Pulley End Cap:</u> "RP" "PR"	<u>Single Groove:</u> "P1"  <u>Double Groove:</u> "P2"	Mounting brackets are included with roller unless KF is indicated.  <u>KF indicates no mounting brackets included. Mounting brackets can be purchased separately.</u>  * JQ, JT shafts include toothed nut and washer in place of mounting bracket. PM635 include mounting brackets. KF is not an option.
				<u>Waterproof:</u> "WA"	"JT"				
				<u>Drip-Proof:</u> "DR"	"JD"				
				<u>Low Temp:</u> "LT"	"JX" "JR"	<u>10 Pin:</u> "Z060" - 600 mm "Z100" - 1000 mm "Z200" - 2000 mm "Z300" - 3000 mm			
				<u>Brake &amp; Drip-Proof:</u> "BD"					

\*All Itoh Denki motorized conveyor rollers are custom made to order. Option availability varies between models and some options can not be used in conjunction with others. Please contact an Itoh Denki Sales Representative for assistance in part number configuration.

# SELECTING A POWER MOLLER

## Material

- **What is in contact with the motorized roller?**
  - Metal, plastic, wood, urethane, natural rubber, corrugated cardboard, other material

## Product weight

- **What will be the maximum weight?**

## Desired transportation speed

- **How fast do you want to move the article? Feet/minute (FPM)**

## Diameter of the roller

- **What diameter are you looking for?**
  - Common Itoh Denki roller diameters: 1.26" (32.0 mm), 1.91" (48.6 mm), 2.25" (57.0 mm), 2.38" (60.5 mm) and 2.50" (63.5 mm)

(Convert English units to metric units, 1 inch = 25.4 mm)

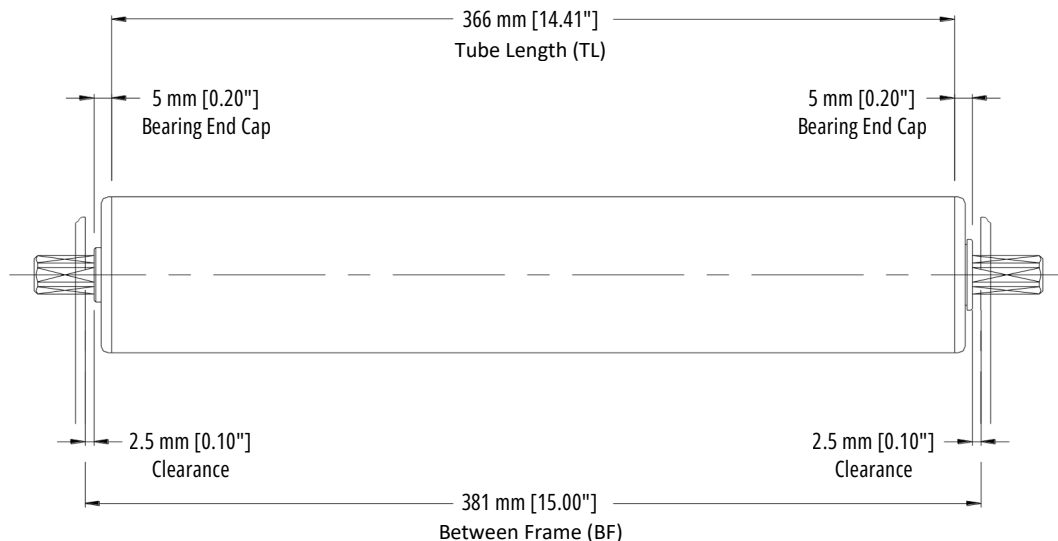
## HOW TO SPECIFY THE LENGTH OF A POWER MOLLER® (Between Frame dimension - BF)

In determining the correct length of the Power Moller® required, you should first obtain the between frame (BF) width of the conveyor you will be mounting the Power Moller® in. If this dimension is in inches, you should convert the dimension to millimeters, as all Power Moller® tube lengths (TL) are in metric units. From this dimension, subtract 15 mm for bearing end caps (EC) and clearances to achieve the correct tube length. Subtract 20mm when using PM635 series rollers.

**Example:** BF measures 15 inches. Converting to millimeters 15" X 25.4 mm / in. = 381 mm. Deducting 15 mm for bearing EC and clearances, 381 mm - 15 mm = 366 mm. TL will be 366 mm long. When in doubt, contact an Itoh Denki representative to help you in selecting the correct Power Moller® for your application.

\* Please refer to specific product page and diagram for proper EC deduction when determining roller length.

$$TL \text{ (Tube Length)} = BF \text{ (Between Frame)} - EC \text{ (Endcap deduction)}$$



## Options

- **Does the application call for any special options?**
  - Lagging (Natural rubber, Nitrile Rubber, Neoprene, Urethane)
  - Dustproof, Waterproof, Brake, Other
  - KF - Brackets not ordered with roller

**Tangential Force (TF)**

- Tangential force is the force in lbs. that is needed to move the item on the conveyor.
  - The force tangent to the roller’s surface.
  - Tangential force (TF) can be found by the following formula:

**Formula 1**

$TF = \mu \times W$

TF = Required tangential force

W = Weight of article to be transferred

$\mu$  = Coefficient of rolling friction in accordance with the material composition of the bottom of the article to be transferred. (See Table 1)

To determine the number of Power Moller® units required for transfer, compare required tangential force (TF) and the tangential force of one Power Moller® unit (f)

**Example**

Material	Cardboard
Weight	70 pounds
Voltage	24V DC
Speed	170 FPM
Diameter	1.91” (48.6 mm)
Between Frame	16 inches
Options	None

**• Tangential force required (Formula 1)**

Given W = 70 lbs.

Cardboard coefficient  $\mu = 0.11$

$TF = \mu \times W$

$TF = 0.11 \times 70 \text{ lbs.}$

TF = 7.7 lbs. required to move this article

PM486FE-60 TF = 24.7 lbs. > 7.7 lbs. (See Performance Data, page 9)

**• Match/Best fit diameter**

Diameter given 1.91” (48.6 mm)

Model – PM486

**• Select the speed**

Speed code is an approximate meter-per-minute figure and varies by model

Reference FPM values; See speed table for PM486FE, page 9

Given 170 FPM, Speed code 60 offers 197 FPM

**Model number with speed code – PM486FE-60**

**• Maximum load limit**

See maximum static load limit table, page 48

PM486 series

300-400 mm tube length

Maximum load limit of 121 lbs. per roller

70 lbs. load < 121 lbs. – Okay

**• Power Mollers® are DC voltage**

Model number with voltage – PM486FE-60-391-D-024

**• Options**

Double grooved tube standard (50 mm/32 mm) for O-ring drive

Model number with options – PM486FE-60-391-D-024-P2

**Table I - Coefficient of Rolling Friction ( $\mu$ )**

Product Material

Tube Material	Metal	Plastic	Wood	Urethane	Natural Rubber	Corrugated Cardboard
Steel	0.01 - 0.03	0.02 - 0.04	0.02 - 0.05	0.02 - 0.05	0.03 - 0.05	0.07 - 0.11
Urethane Lagging	0.02 - 0.05	0.02 - 0.05	0.02 - 0.05	0.02 - 0.05	0.03 - 0.05	0.07 - 0.11
Natural Rubber Lagging	0.03 - 0.05	0.03 - 0.05	0.03 - 0.05	0.03 - 0.05	0.03 - 0.05	0.07 - 0.11

The above values are based on industry standards of products with a smooth, uniform bottom surface in contact with the roller.

# PM320HS

## DC Motor Driven Roller

**Diameter:** 1.26" (32.0 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- Crowned, seamless tube
- 7/16" hex shaft standard
- ABEC 1 bearings
- Standard 150 mm cable lead
- Stainless steel exterior for wash down applications (IP-65)\*
- Low-profile, compact design
- Stable speed against varying loads
- No hall effect sensors
- Reversible
- Ideal for small belt applications

\*For additional information, please go to pg. 47

### Available Endcaps and Tube Options:



Round Belt Pulley (PR)



Crowned Tube (Standard)



Straight Tube (PL)

For additional information on options please go to pg. 50

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

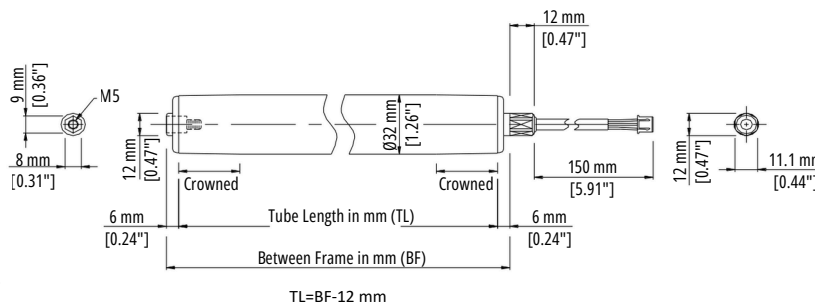
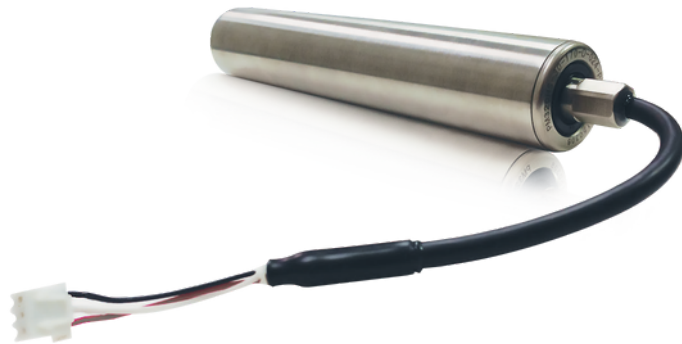
- Motor is protected from overheating

### Environment

- Ambient temperature 32~104°F (0~40°C)
- No corrosive gases
- Vibration < 0.5G



This is a non-spring loaded shaft roller



TL=BF-12 mm



### Standard Hex Shaft Mounting Brackets

- Z-071-D (Hex flat up)
- Z-081-D (Hex point up)

### Opposite Cable Side Bracket

AM-32HS-M5

**1 Standard and 1 Opposite Cable mounting bracket needed for this roller**

See page 43 for bracket diagram

### PM320HS Extension Cables

- AACB18-1000 (1000 mm)
- AACB18-2000 (2000 mm)

### CB-018N2 - 8 Speed Settings

Speed Code	DIP Switch Setting			No-Load Speed (FPM)	Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A)		
	SW1-4	SW1-5	SW1-6				Starting	No-Load	Rated
	CN2-5	CN2-4	CN2-3						
30	off	off	off	19	18.5	11.7	2.00	0.10	0.60
	off	off	on	33	18.5	11.7	2.00	0.18	0.64
	off	on	off	43	18.5	11.7	2.00	0.23	0.66
	off	on	on	52	18.5	11.7	2.00	0.28	0.69
	on	off	off	62	18.5	11.7	2.00	0.34	0.72
	on	off	on	72	18.5	11.7	2.00	0.39	0.75
	on	on	off	81	18.5	11.7	2.00	0.44	0.77
	on	on	on	95	18.5	11.7	2.00	0.50	0.80

### Minimum/Maximum Tube Lengths



170 mm (6.69")



570 mm (22.44")

### Tube Length Considerations:

- Standard/no options: BF - 12 mm = TL
- PR (round belt pulley): BF - 25 mm = TL

# PM486FE

## DC Motor Driven Roller

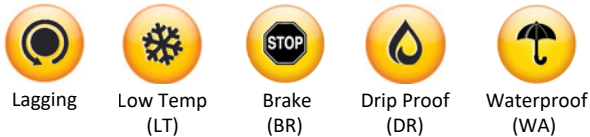
**Diameter:** 1.91" (48.6 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 7/16" plain hex shaft standard (also available in threaded hex/wrench shoulder)
- ABEC 1 bearings
- DOM, zinc plated, carbon steel tube
- One shaft mounting, cable end
- Variable speed
- Dynamic brake
- Standard 300 mm (11.81") power cable
- Standard 9 pin connector
- Brake option: 10 pin connector

### Available Options



For additional information on options please go to pgs. 47-48

### Available Endcaps and Tube Options:



Straight Tube (Standard) Double Groove (P2) Poly V End Cap (VG) Round Belt Pulley (RP)

For additional information on options please go to pg. 50

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



Spring loaded shaft roller



### Standard Hex Shaft Mounting Brackets

MBB-071 (Hex flat up)  
MBB-081 (Hex point up)

### Low Profile Hex Shaft Mounting Brackets

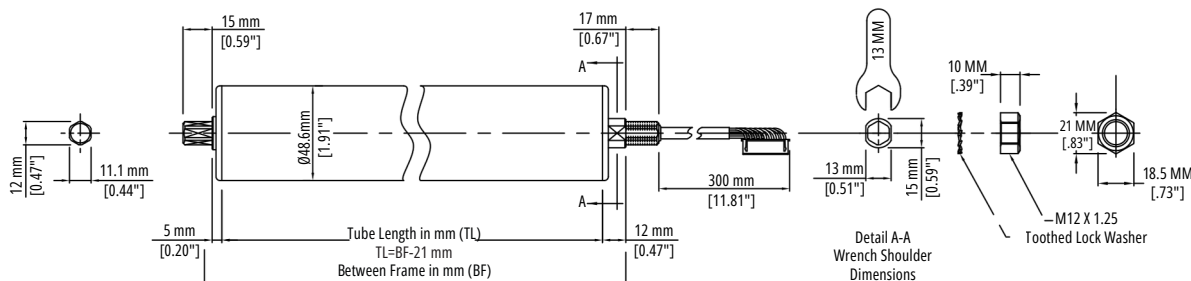
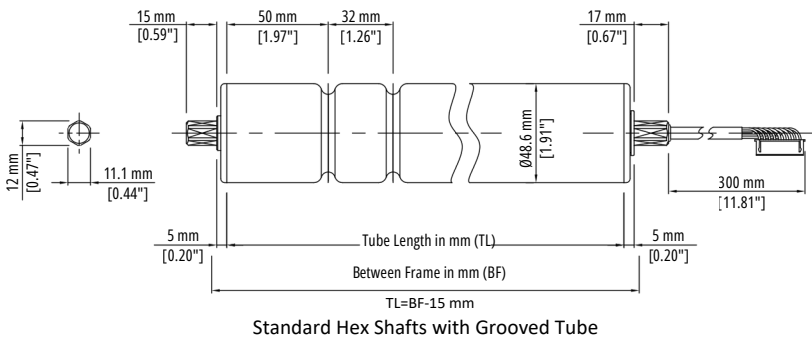
MBC-071 (Hex flat up)  
MBC-081 (Hex point up)

### Waterproof Option Mounting Brackets

Z-071-D (Hex flat up)  
Z-081-D (Hex point up)

### 1 mounting bracket needed for this roller

See page 42-43 for bracket diagrams



### JQ Shaft Standard Mounting Hardware

Toothed lock washer and nut  
Nuts to be tightened to 22.1lb • ft ± 10%

CB-016S7 - 20 Speed Settings								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW1-5 on SW 5 9 High	SW1-5 off SW 5 0 Low*			Starting	No-Load	Rated
3	5	24	7	95.0	90.8	3.6	0.3	1.6
	8	34	7	98.5	94.2	4.0	0.4	2.1
	10	48	7	95.0	90.8	4.0	0.5	2.4
	17	55	7	77.4	74.0	4.0	0.8	2.8
2	20	85	25	30.3	29.0	3.6	0.3	1.6
	30	121	25	31.5	30.1	4.0	0.4	2.1
	45	159	25	30.3	29.0	4.0	0.5	2.4
	60	197	25	24.7	23.7	4.0	0.8	2.8
1	100	431	88	10.1	9.6	4.0	0.4	2.1
	140	566	88	9.7	9.3	4.0	0.5	2.4
	210	700	88	7.9	7.6	4.0	0.8	2.8

\*Low speed will differ if using HB-510 driver card.  
Contact Itoh Denki engineering for more information.

### Applicable Driver Cards For PM486FE

See page 28 for CB-016S7 diagram



See page 32 for HB-510 diagram



See page 35 for IB-E03B diagram  
\*Controls 2 Power Mollers



\* Z cable option or 9/10 pin extension cables needed to use IB-E03B card for non-brake PM486FE models\*

### Minimum Tube Lengths

GEAR STAGES			
	1	2	3
	244 mm	267 mm	290 mm
	9.61"	10.51"	11.42"
	293 mm	316 mm	339 mm
	11.54"	12.44"	13.35"
	302 mm	325 mm	348 mm
	11.89"	12.80"	13.70"
	357 mm	381 mm	404 mm
	14.06"	15.00"	15.91"

### Tube Length (TL) Considerations:

- Standard tube/grooved/brake/waterproof: BF - 15 mm = TL
- JQ (threaded hex shaft): BF - 21 mm = TL
- VG (poly V end cap) : BF - 41 mm = TL
- RP (round belt pulley) : BF - 35 mm = TL
- P1 single groove tube standard (50 mm)
  - if non-standard groove is needed, the part number call out would be **P1-OS**, and the non-standard groove would need to be called out. (EX. P1-OS (53))
- P2 double groove tube standard (50 mm/32 mm)
  - if non-standard grooves are needed, the part number call out would be **P2-OS**, and the non-standard groove would need to be called out. (EX. P2-OS (35/22))
- All shaft configurations available with grooved tube or straight tube

# PM486FS

## DC Motor Driven Roller

**Diameter:** 1.91" (48.6 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 7/16" plain hex shaft standard
- ABEC 1 bearings
- DOM, zinc plated, carbon steel tube
- Dual shaft mounting
- Dynamic brake
- Torque transmitted through output tube
- Standard 300 mm (11.81") power cable
- Standard 9 pin connector
- Brake option: 10 pin connector

### Available Options:



Lagging



Brake  
(BR)



Drip Proof  
(DR)



Waterproof  
(WA)

For additional information on options please go to pgs. 47-48

### Available Tube Options:



Straight Tube  
(standard)



Double Groove  
(P2)

For additional information on groove options please go to pg. 50

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

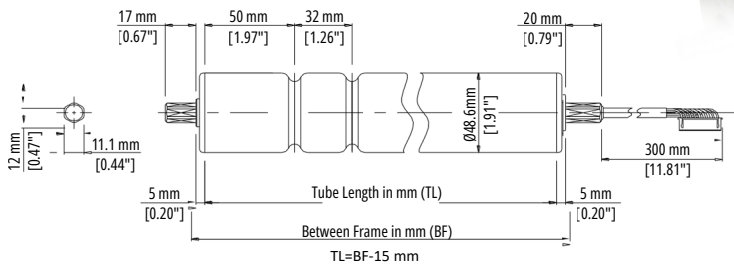
- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

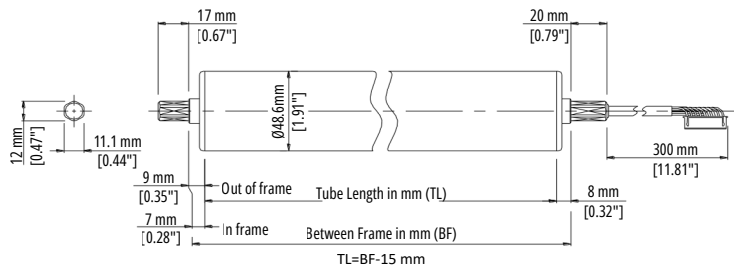
- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



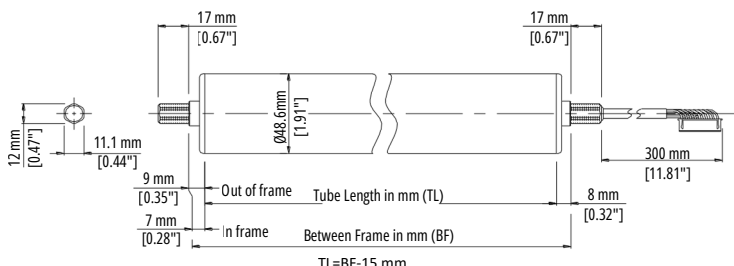
Available as spring loaded or non-spring loaded shaft



Standard Hex Shafts with Grooved Tube



JR - (Yoke Style) Hex Shafts / Straight Tube



JT - (Threaded) Hex Shafts / Straight Tube

### Standard Hex Shaft Mounting Brackets

- MBB-071 (Hex flat up)
- MBB-081 (Hex point up)

### Low Profile Hex Shaft Mounting Brackets

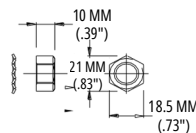
- MBC-071 (Hex flat up)
- MBC-081 (Hex point up)

### Waterproof Option Mounting Brackets

- Z-071-D (Hex flat up)
- Z-081-D (Hex point up)

### 2 mounting brackets needed for this roller

See pages 42-43 for bracket diagrams



### JT Shaft Standard Mounting Hardware

FSY-01/FSY-02 Toothed lock washer and nut  
Nuts to be tightened to 22.1 lb • ft ± 10%

CB-016S7 - 20 Speed Settings								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW1-5 on SW 5 9 High	SW1-5 off SW 5 0 Low*			Starting	No-Load	Rated
3	5	25	7	92.8	88.8	3.6	0.3	1.6
	8	35	7	96.3	92.1	4.0	0.4	2.1
	10	46	7	92.8	88.8	4.0	0.5	2.4
	15	57	7	79.1	75.6	4.0	0.6	2.8
2	20	93	27	27.9	26.7	3.6	0.3	1.6
	30	132	27	29.0	27.7	4.0	0.4	2.1
	45	173	27	27.9	26.7	4.0	0.5	2.4
	55	214	27	23.8	22.8	4.0	0.6	2.8

\*Low speed will differ if using HB-510 driver card.  
Contact Itoh Denki engineering for more information.

### Applicable Driver Cards For PM486FS

See page 28 for CB-016S7 diagram



See page 32 for HB-510 diagram



See page 35 for IB-E03B diagram

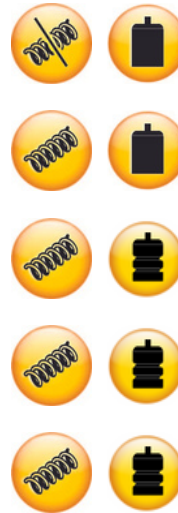
\*Controls 2 Power Mollers



\* Z cable option or 9/10 pin extension cables needed to use IB-E03B card for non-brake PM486FS models\*

### Minimum Tube Lengths

GEAR STAGES	
2	3
254 mm 10.00"	277 mm 10.91"
305 mm 12.01"	328 mm 12.91"
305 mm 12.01"	328 mm 12.91"
369 mm 14.53"	392 mm 15.43"
315 mm 12.40"	338 mm 13.31"



### Tube Length (TL) Considerations:

- Standard tube/grooved/brake/waterproof: BF - 15 mm = TL
- JT (threaded hex) shafts add 10 mm to minimum tube length
- P1 single groove tube standard (50 mm)
  - if non-standard groove is needed, the part number call out would be **P1-OS**, and the non-standard groove would need to be called out. (EX. P1-OS (53))
- P2 double groove tube standard (50 mm/32 mm)
  - if non-standard grooves are needed, the part number call out would be **P2-OS**, and the non-standard grooves would need to be called out. (EX. P2-OS (35/22))
- All shaft configurations available with grooved tube or straight tube

# PM486FP

## DC Motor Driven Roller

**Diameter:** 1.91" (48.6 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 7/16" threaded hex shafts standard
- ABEC 1 bearings
- DOM, zinc plated, carbon steel tube
- Dual shaft mounting
- Dynamic brake
- Torque transmitted through output tube
- For high torque/high demand applications
- Standard 300 mm (11.81") power cable
- Standard 9 pin connector
- Brake option: 10 pin connector

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



Spring loaded shaft roller

### Available Options



Lagging



Low Temp (LT)



Brake (BR)



Drip Proof (DR)



Waterproof (WA)



Sprocket (OS\*)  
(\*40A18 only)

For additional information on options please go to pgs. 47-48

### Available Endcaps and Tube Options:



Straight Tube (Standard)



Double Groove (P2)

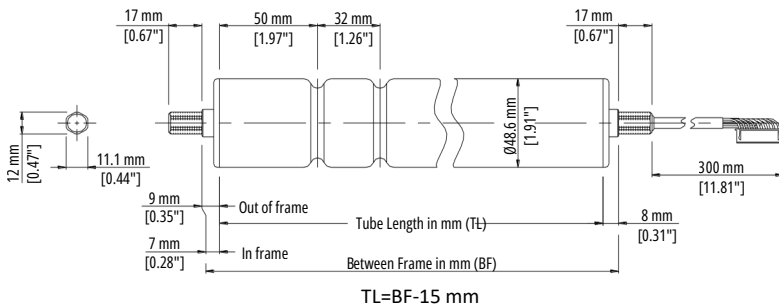
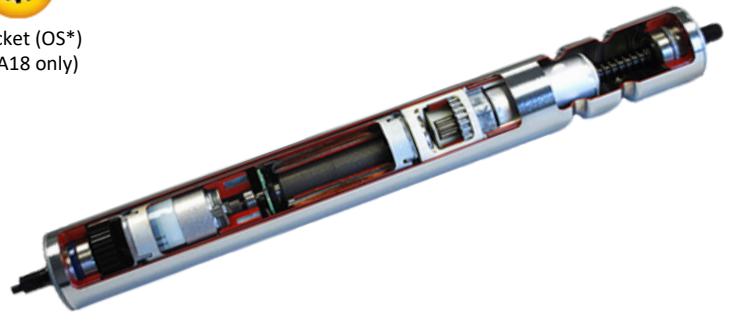


Poly V End Cap (GV)

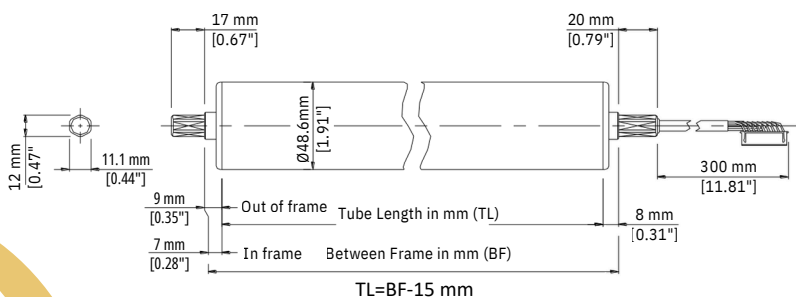


Round Belt Pulley (PR)

For additional information on options please go to pg. 50



Standard Threaded Hex Shafts with Grooved Tube



JR - (Yoke Style) Hex Shafts/Straight Tube

### Standard Threaded Hex Shaft Mounting Brackets

- P-0C1 (Hex point up)
- P-0B1 (Hex flat up)

\*Nuts are to be tightened to 22.1 lb • ft ± 10%

### Standard (JR) Yoke Style Hex Shaft Mounting Brackets

- MBB-071 (Hex flat up)
- MBB-081 (Hex point up)

### Low Profile (JR) Yoke Style Hex Shaft Mounting Brackets

- MBC-071 (Hex flat up)
- MBC-081 (Hex point up)

### Waterproof (JH) Option Mounting Brackets

- Z-071-D (Hex flat up)
- Z-081-D (Hex point up)

**2 mounting brackets needed for this roller**  
See page 42-43 for bracket diagrams

CB-016S7 - 20 Speed Settings								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW1-5 on SW 5 9 High	SW1-5 off SW 5 0 Low*			Starting	No-Load	Rated
3	5	26	7	149.4	142.9	4.0	0.4	2.0
	8	37	7	141.9	135.7	4.0	0.5	2.7
	10	48	7	119.5	114.3	4.0	0.7	3.2
	15	57	7	104.6	100.0	4.0	0.9	3.5
2	20	98	27	45.0	43.0	3.6	0.4	2.0
	30	138	27	42.7	40.9	4.0	0.5	2.7
	45	182	27	36.0	34.4	4.0	0.7	3.2
	55	214	27	31.5	30.1	4.0	0.9	3.5
1	100	448	121	11.2	10.7	4.0	0.4	2.0
	140	628	121	10.7	10.2	4.0	0.5	2.7
	190	829	121	9.0	8.6	4.0	0.7	3.2
	255	974	121	7.9	7.5	4.0	0.9	3.5

\*Low speed will differ if using HB-510 driver card.  
Contact Itoh Denki engineering for more information.

### Applicable Driver Cards For PM486FP

See page 28 for CB-016S7 diagram



See page 32 for HB-510 diagram



See page 35 for IB-E03B diagram

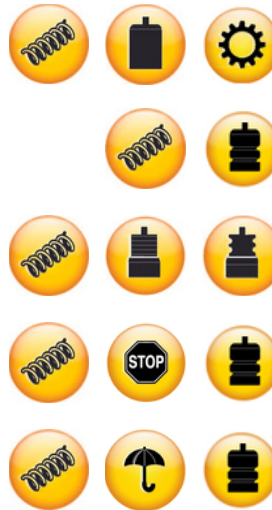
\*Controls 2 Power Mollers



\* Z cable option or 9/10 pin extension cables needed to use IB-E03B card for non-brake PM486FP models\*

### Minimum Tube Lengths

GEAR STAGES		
1	2	3
322 mm	345 mm	368 mm
12.68"	13.58"	14.49"
322 mm	345 mm	368 mm
12.68"	13.58"	14.49"
322 mm	345 mm	368 mm
12.68"	13.58"	14.49"
386 mm	409 mm	432 mm
15.20"	16.10"	17.01"
330 mm	353 mm	376 mm
12.99"	13.90"	14.80"



### Tube Length (TL) Considerations:

- Standard tube/grooved/brake/waterproof: BF - 15 mm = TL
- GV (poly V end cap): BF - 41 mm = TL
- PR (round belt pulley): BF - 35 mm = TL
- P1 single groove tube standard (50 mm)
  - if non-standard groove is needed, the part number call out would be **P1-OS**, and the non-standard groove would need to be called out. (EX. P1-OS (53))
- P2 double groove tube standard (50 mm/32 mm)
  - if non-standard grooves are needed, the part number call out would be **P2-OS**, and the non-standard grooves would need to be called out. (EX. P2-OS (35/22))
- All shaft configurations available with grooved tube or straight tube

# PM486FH

## DC Motor Driven Roller

**Diameter:** 1.91" (48.6 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 7/16" plain hex shafts standard
- ABEC 1 bearings
- DOM, zinc plated, carbon steel tube
- Dual shaft mounting
- Dynamic brake
- For high torque/high demand applications
- Torque transmitted through output tube
- For high speed applications
- Standard 300 mm (11.81") power cable
- 12 pin connector

### Available Options



Lagging



Waterproof  
(WA)



Low Temp  
(LT)

For additional information on options please go to pgs. 47-48

### Available Endcaps and Tube Options:



Straight Tube  
(Standard)



Double Groove  
(P2)



Poly V End Cap  
(GV)

For additional information on options please go to pg. 50

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



Spring loaded shaft roller



### Standard Hex Shaft Mounting Brackets

MBB-071 (Hex flat up)  
MBB-081 (Hex point up)

### Low Profile Hex Shaft Mounting Brackets

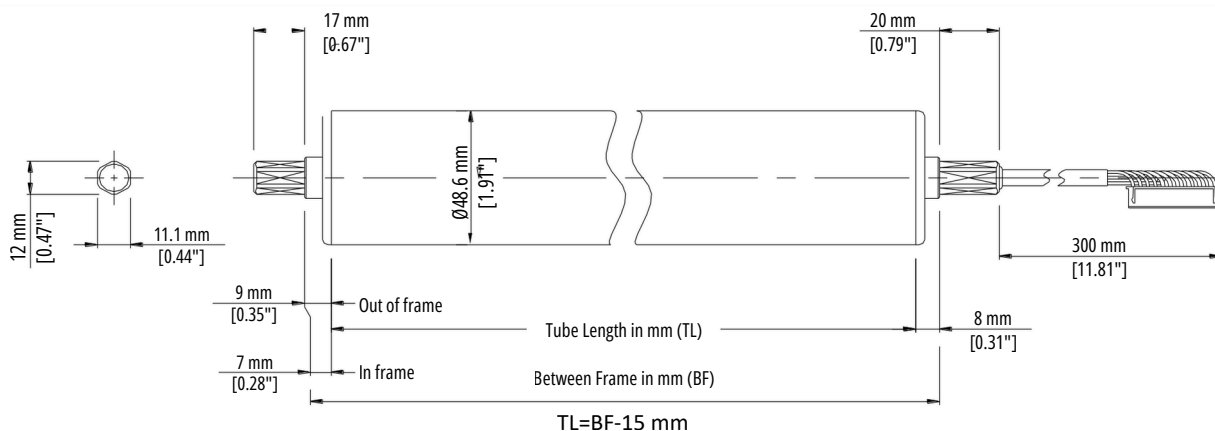
MBC-071 (Hex flat up)  
MBC-081 (Hex point up)

### Waterproof Option Mounting Brackets

Z-071-D (Hex flat up)  
Z-081-D (Hex point up)

### 2 mounting brackets needed for this roller

See page 42-43 for bracket diagrams



CBK-109F - 20 Speed Settings								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW1-5 on SW 5 9 High	SW1-5 off SW 5 0 Low			Starting	No-Load	Rated
2	20	89	27	53.4	51.3	7.0	0.3	2.6
	30	133	27	55.9	53.1	7.0	0.4	3.3
	45	187	27	49.3	46.9	7.0	0.7	3.6
	55	214	27	45.1	43.4	7.0	1.0	3.7
1	100	405	122	13.3	12.4	7.0	0.3	2.6
	140	607	122	14.0	13.3	7.0	0.4	3.3
	190	852	122	12.3	11.5	7.0	0.7	3.6
	255	974	122	11.3	10.6	7.0	1.0	3.7

### Applicable Driver Cards For PM486FH

See page 29 for CBK-109F diagram



See page 36 for IB-E04F diagram  
\*Controls 2 Power Mollers



### Minimum Tube Lengths

GEAR STAGES	
1	2
322 mm 12.68"	345 mm 13.58"
322 mm 12.68"	345 mm 13.58"
322 mm 12.68"	345 mm 13.58"



### Tube Length (TL) Considerations:

- Standard tube/grooved/waterproof: BF - 15 mm = TL
- GV (poly V end cap) : BF - 41 mm = TL
- P1 single groove tube standard (50 mm)
  - if non-standard groove is needed, the part number call out would be **P1-OS**, and the non-standard groove would need to be called out. (EX. P1-OS (53))
- P2 double groove tube standard (50 mm/32 mm)
  - if non-standard grooves are needed, the part number call out would be **P2-OS**, and the non-standard grooves would need to be called out. (EX. P2-OS (35/22))
- All shaft configurations available with grooved tube or straight tube

# PM486XE/XP

## DC Motor Driven Roller

**Diameter:** 1.91" (48.6 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 7/16" plain hex shafts standard
- ABEC 1 bearings
- DOM, zinc plated, carbon steel tube
- Internal driver card simplifies wiring direct to roller
- Stable speed function
- Variable speed with external voltage input
- One shaft mounting, cable end
- High torque (XP model)
- Standard 300 mm (11.81") power cable\*

\*C030 needs to be specified in part number for standard cable length

### Available Options



Lagging

For additional information on options please go to pg. 47

### Available Endcaps and Tube Options:



Straight Tube  
(Standard)



Double Groove  
(P2)

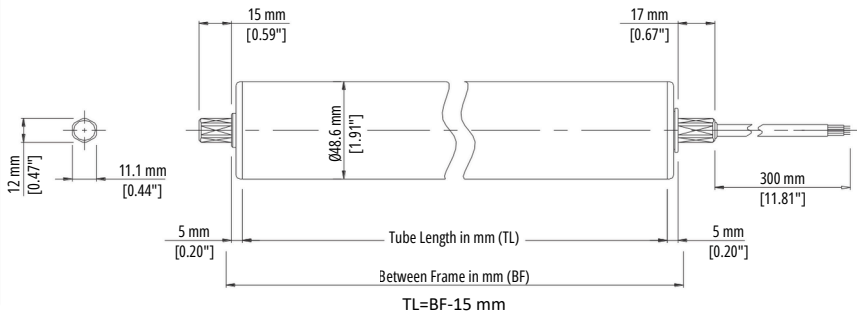


Poly V End Cap  
(VG)

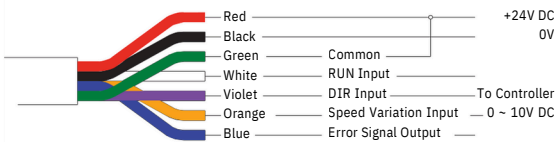


V-belt Pulley  
(VP)

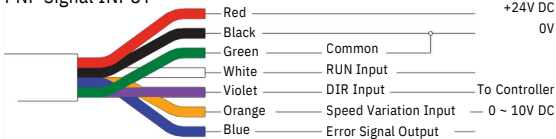
For additional information on options please go to pg. 50



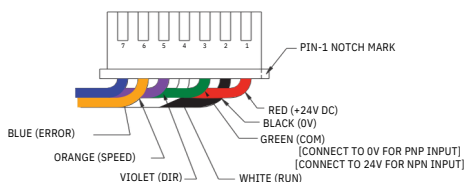
#### NPN Signal OUTPUT



#### PNP Signal INPUT



Standard 7 pin JST connector (XHP-7)  
For use with terminal block A-B70/A-B80



### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1.5s OFF
- Do not exceed 150% of no-load speed

### Protection

- Motor is protected from overheating
- Undervoltage error
- Back EMF error

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



Spring loaded shaft roller



PM486XE with standard  
7 pin JST connector

### Standard Hex Shaft Mounting Brackets

- MBB-071 (Hex flat up)
- MBB-081 (Hex point up)

### Low Profile Hex Shaft Mounting Brackets

- MBC-071 (Hex flat up)
- MBC-081 (Hex point up)

**1 mounting bracket needed for this roller**

See page 42-43 for bracket diagrams

**When ordering, error output signal type must be specified:**

NN - NPN error output

NP - PNP error output

Ex: PM486XE/XP-60-366-D-024-NN

1st letter = input

2nd letter = output

NP = NPN input; PNP output

**Standard 10 Speed Settings for PM486XE**







Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW2 9 High	SW2 0 Low			Starting	No-Load	Rated
3	17	55	7	60.3	57.5	2.0	0.3	1.7
2	30	93	12	41.2	39.4			
	60	197	25	19.6	18.6			
1	100	332	41	13.3	12.7			

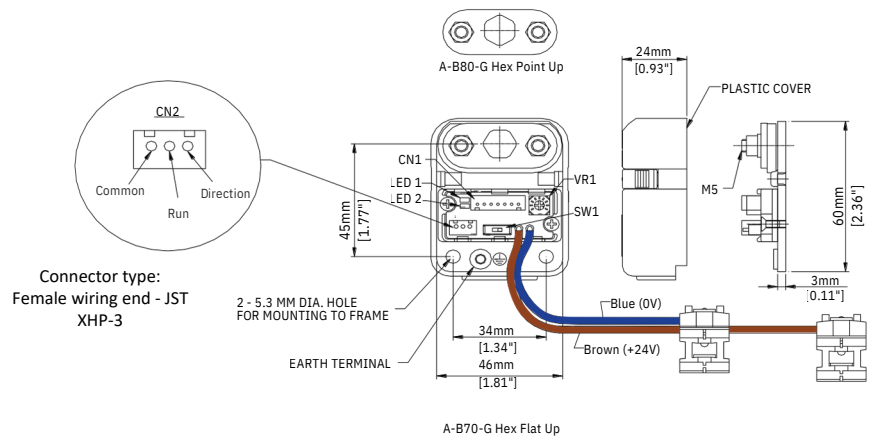
**Standard 10 Speed Settings for PM486XP**

Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW2 9 High	SW2 0 Low			Starting	No-Load	Rated
3	17	55	7	78.1	74.6	4.0	0.4	2.0
2	30	93	12	53.3	51.0	4.0	0.4	2.0
	60	197	25	25.2	24.2	4.0	0.4	2.0
1	100	332	41	17.3	16.5	4.0	0.4	2.0

To view wiring diagrams and for more information, please visit [www.itohdenki.com](http://www.itohdenki.com)

### Minimum Tube Lengths

		GEAR STAGES		
		1	2	3
		282 mm	310 mm	332 mm
		11.10"	12.20"	13.07"
		334 mm	362 mm	385 mm
		13.15"	14.25"	15.16"
		282 mm	310 mm	332 mm
		11.10"	12.20"	13.07"



### Tube Length (TL) Considerations:

- Standard tube/grooved: BF - 15 mm = TL
- VP (V- belt pulley): BF - 35 mm = TL
- VG (poly V end cap) : BF - 41 mm = TL
- P1 single groove tube standard (50 mm)
  - if non-standard groove is needed, the part number call out would be **P1-OS**, and the non-standard groove would need to be called out. (EX. P1-OS (53))
- P2 double groove tube standard (50 mm/32 mm)
  - if non-standard grooves are needed, the part number call out would be **P2-OS**, and the non-standard grooves would need to be called out. (EX. P2-OS (35/22))
- All shaft configurations available with grooved tube or straight tube

### A-B70-G and A-B80-G I/O Terminal Block:

- I/O terminal on mounting bracket
- Built in 10kΩ resistor for speed variation
- Speed adjustable from 12.5% to 100%
- Reverse direction slide switch
- Green LED indication for 24V DC power
- Red LED indication for motor error
- 24V DC is supplied using cable splice connectors
- RUN and DIR inputs from any 24V DC switching source
- C007 (70 mm) power cable option is required for use with this terminal block
- ECF03003 connector wire is required for functionality and must be purchased separately

# PM570FE

## DC Motor Driven Roller

**Diameter:** 2.24" (57.0 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 7/16" plain hex shafts standard
- ABEC 1 bearings
- DOM, zinc plated, carbon steel tube
- One shaft mounting, cable end
- Variable speed
- Dynamic brake
- Standard 300 mm (11.81") power cable
- Standard 9 pin connector
- Brake option: 10 pin connector

### Available Options



Lagging



Brake  
(BR)



Waterproof  
(WA)

For additional information on options please go to pgs. 47-48

### Available Endcaps and Tube Options:



Straight Tube  
(Standard)



Double Groove  
(P2)



Poly V End Cap  
(VG)



V-belt Pulley  
(VP)

For additional information on options please go to pg. 50

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

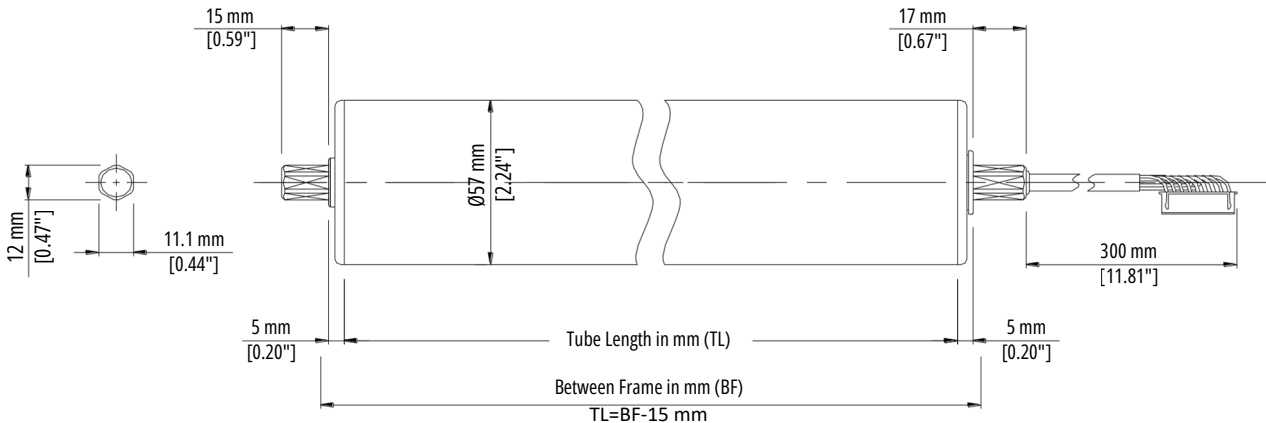
- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



Available as spring loaded or non-spring loaded shaft



### Standard Hex Shaft Mounting Brackets

MBB-071 (Hex flat up)

MBB-081 (Hex point up)

### Low Profile Hex Shaft Mounting Brackets

MBC-071 (Hex flat up)

MBC-081 (Hex point up)

### Waterproof Option Mounting Brackets

Z-071-D (Hex flat up)

Z-081-D (Hex point up)

**1 mounting bracket needed for this roller**

See pages 42-43 for bracket diagrams

CB-016S7 - 20 Speed Settings								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW1-5 on SW 5 9 High	SW1-5 off SW 5 0 Low*			Starting	No-Load	Rated
3	5	28	9	81.0	90.8	3.6	0.3	1.6
	8	40	9	84.0	94.2	4.0	0.4	2.1
	10	52	9	81.0	90.8	4.0	0.5	2.4
	17	65	9	66.0	74.0	4.0	0.8	2.8
2	20	100	31	25.8	29.0	3.6	0.3	1.6
	30	142	31	26.9	30.1	4.0	0.4	2.1
	45	187	31	25.8	29.0	4.0	0.5	2.4
	60	231	31	21.1	23.7	4.0	0.8	2.8
1	70	356	109	8.3	9.3	3.6	0.3	1.6
	100	506	109	8.6	9.6	4.0	0.4	2.1
	140	633	109	8.3	9.3	4.0	0.5	2.4
	210	821	109	6.7	7.6	4.0	0.8	2.8

\*Low speed will differ if using HB-510 driver card.  
Contact Itoh Denki engineering for more information.

### Applicable Driver Cards For PM570FE

See page 28 for CB-016S7 diagram



See page 32 for HB-510N diagram



See page 35 for IB-E03B diagram

\*Controls 2 Power Mollers



\* Z cable option or 9/10 pin extension cables needed to use IB-E03B card for non-brake PM570FE models\*

### Minimum Tube Lengths

GEAR STAGES		
1	2	3
252 mm	276 mm	300 mm
9.92"	10.86"	11.81"
252 mm	276 mm	300 mm
9.92"	10.86"	11.81"
305 mm	329 mm	350 mm
12.00"	12.95"	13.78"
252 mm	276 mm	300 mm
9.92"	10.86"	11.81"
370 mm	394 mm	415 mm
14.57"	15.51"	16.34"



### Tube Length (TL) Considerations:

- Standard tube/grooved/brake/waterproof: BF - 15 mm = TL
- VP (V- belt pulley): BF - 35 mm = TL
- VG (Poly V end cap): BF - 41 mm = TL
- P1 single groove tube standard (65 mm)
  - if non-standard groove is needed, the part number call out would be **P1-OS**, and the non-standard groove would need to be called out. (EX. P1-OS (53))
- P2 double groove tube standard (65 mm/30 mm)
  - if non-standard grooves are needed, the part number call out would be **P2-OS**, and the non-standard grooves would need to be called out. (EX. P2-OS (35/22))
- All shaft configurations available with grooved tube or straight tube

# PM570KT

## DC Motor Driven Roller

**Diameter:** 2.24" (57.0 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- ABEC 1 bearings
- 13.5 mm (0.53") hex shaft standard
- High torque
- Dual shaft mounting
- AL700 splined aluminum tube option available for Intralox patented MDR sprocket\*
- Class E insulation
- Standard 1000 mm (39.4") power cable
- 12 pin connector

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1 OFF
- Do not exceed 150% of no-load speed

### Protection

- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



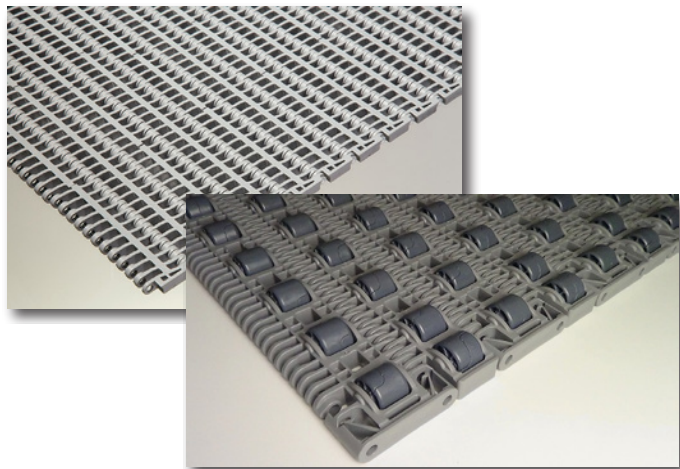
Spring loaded shaft roller



Our Power Moller™ 24 motorized drive roller has been modified with a splined aluminum tube profile, which is fitted with Intralox's patented MDR sprocket, that allows the roller to drive the belt.



Intralox patented MDR sprocket



Modular Plastic Belting by Intralox

HBK-608F Performance Data using PM570KT								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW2 9 High	SW2 0 Low			Starting	No-Load	Rated
3	15	53	13	202.4	236.8	6.9	0.6	3.0
	28	114	14	93.8	111.7	7.0	0.7	3.8

### Applicable Driver Cards For PM570KT

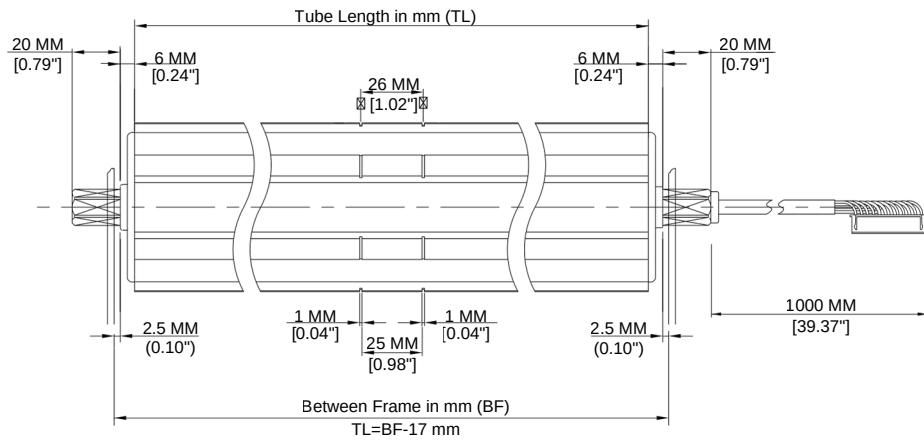
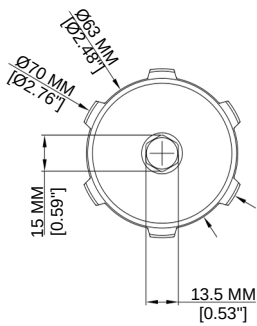
See page 34 for HBK-608F diagram



See page 36 for IB-E04F diagram  
\*Controls 2 Power Mollers



See page 29 for CBK-109F diagram



#### Minimum Tube Length

**< MIN >** 360 mm (14.17")

\*Max. tube length for AL700 option 1200 mm (47.24")

#### Standard Hex Shaft Mounting Brackets - Point Up

- MBK-0K1 (Cable end)
- MBK-0K1-7 (Spring loaded end)

**1 each of the above mounting brackets needed for this roller**

See page 43 for bracket diagrams

# PM605FE

## DC Motor Driven Roller

**Diameter:** 2.38" (60.5 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 7/16" plain hex shafts standard
- ABEC 1 bearings
- DOM, zinc plated, carbon steel tube
- One shaft mounting, cable side
- Variable speed
- Dynamic brake
- Standard 300 mm (11.81") power cable
- Standard 9 pin connector
- Brake option: 10 pin connector

### Available Options



Lagging



Brake  
(BR)



Waterproof  
(WA)

For additional information on options please go to pgs. 47-48

### Available Endcaps and Tube Options:



Straight Tube  
(Standard)



Crowned  
Tube (PC)

For additional information on options please go to pg. 50

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



Available as spring loaded or non-spring loaded shaft



### Standard Hex Shaft Mounting Brackets

- MBB-071 (Hex flat up)
- MBB-081 (Hex point up)

### Low Profile Hex Shaft Mounting Brackets

- MBC-071 (Hex flat up)
- MBC-081 (Hex point up)

### Waterproof Option Mounting Brackets

- Z-071-D (Hex flat up)
- Z-081-D (Hex point up)

**1 mounting bracket needed for this roller**

See page 42-43 for bracket diagrams

CB-016S7 - 20 Speed Settings								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW1-5 on SW 5 9 High	SW1-5 off SW 5 0 Low*			Starting	No-Load	Rated
3	5	30	9	76.3	90.8	3.6	0.3	1.6
	8	42	9	79.1	94.2	4.0	0.4	2.1
	10	56	9	76.3	90.8	4.0	0.5	2.4
	17	69	9	62.2	74.0	4.0	0.8	2.8
2	20	106	31	24.3	29.0	3.6	0.3	1.6
	30	151	31	25.3	30.1	4.0	0.4	2.1
	45	198	31	24.3	29.0	4.0	0.5	2.4
	60	245	31	19.8	23.7	4.0	0.8	2.8
1	70	377	109	7.8	9.3	3.6	0.3	1.6
	100	537	109	8.1	9.6	4.0	0.4	2.1
	140	704	109	7.8	9.3	4.0	0.5	2.4
	210	871	109	6.3	7.6	4.0	0.8	2.8

\*Low speed will differ if using HB-510 driver card.  
Contact Itoh Denki engineering for more information.

**Applicable Driver Cards For PM605FE**

See page 28 for CB-016S7 diagram










See page 32 for HB-510 diagram



See page 35 for IB-E03B diagram  
\*Controls 2 Power Mollers



**Minimum Tube Lengths**

GEAR STAGES			
	1	2	3
  	252 mm	276 mm	300 mm
	9.92"	10.86"	11.81"
 	370 mm	394 mm	415 mm
	14.57"	15.51"	16.34"
 	252 mm	276 mm	300 mm
	9.92"	10.86"	11.81"

**Tube Length (TL) Considerations:**

- Standard tube/brake/waterproof: BF - 15 mm = TL
- Check with your Itoh Denki representative for WA speeds available

\* Z cable option or 9/10 pin extension cables needed to use IB-E03B card for non-brake PM605FE models\*

# PM635FS

## DC Motor Driven Roller

**Diameter:** 2.50" (63.5 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 11/16" threaded hex shafts standard
- ABEC 1 bearings
- DOM, carbon steel tube
- Heavy duty pallet handling
- One shaft mounting, cable side
- Dynamic brake
- Standard 300 mm (11.81") power cable
- Standard 9 pin connector

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



Available as spring loaded shaft

### Available Options:



Sprockets (OS)\*\*

Available sprocket types: 40A21, 50A17, 50A18, 60A15, or 60A16



Waterproof (WA)

Available with 6 and 20 speed code options

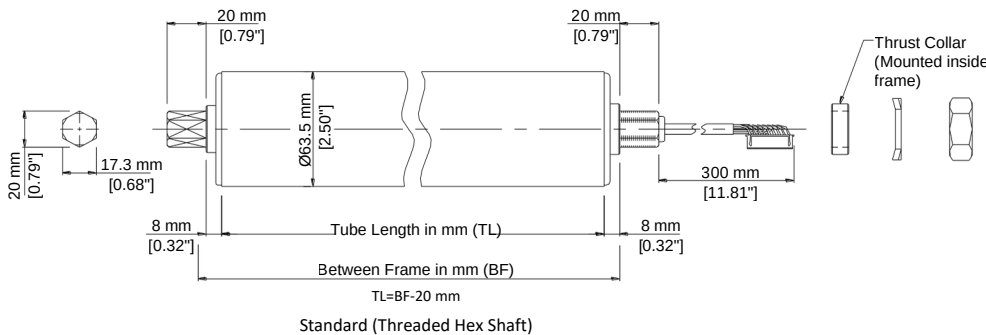


Low Temp (LT)

Available with 6 and 20 speed code options



For additional information on options please go to pgs. 47-48



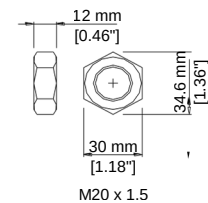
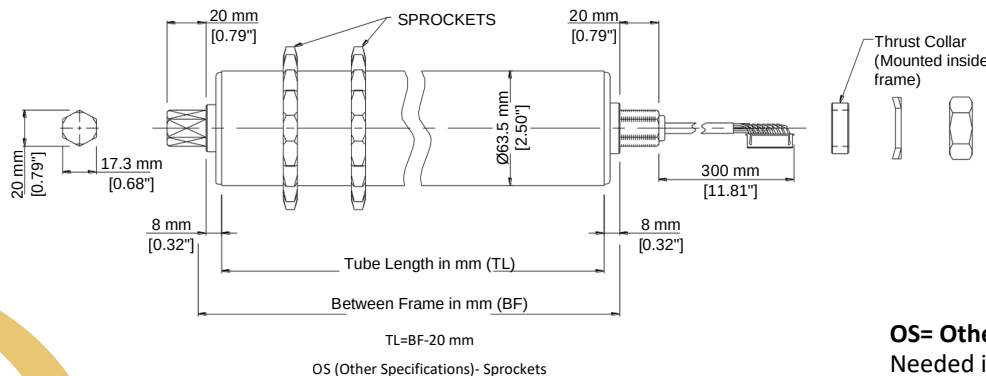
### Standard Threaded Hex Shaft Mounting Brackets\*

P-OE1 (Hex point up)  
P-OD1 (Hex flat up)

\*Thrust collar nuts are to be tightened to 110.6 lb • ft ± 10%

**1 mounting bracket needed for this roller**  
See page 42-43 for bracket diagrams

\*brackets included with roller purchase\*



### OS= Other Specifications\*\*

Needed in PM635 part number in order to call out the sprocket type, the amount of sprockets needed, and their locations.

CB-016S7 - 20 Speed Settings								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW1-5 on SW 5 9 High	SW1-5 off SW 5 0 Low*			Starting	No-Load	Rated
3	6	34	9	114.3	142.9	4.0	0.4	2.0
	10	48	9	108.6	135.7	4.0	0.5	2.7
	15	63	9	91.5	114.3	4.0	0.7	3.2
	20	74	9	80.0	100.0	4.0	0.9	3.5
2	25	129	35	34.4	43.0	4.0	0.4	2.0
	60	238	35	27.5	34.4	4.0	0.7	3.2

\*Low speed will differ if using HB-510 driver card.  
Contact Itoh Denki engineering for more information.

**Available End Cap and Tube Options:**



Poly V End Cap (VG)

For additional information on options please go to pg. 50

**Applicable Driver Cards For PM635FS**

See page 28 for CB-016S7 diagram



See page 32 for HB-510 diagram



See page 35 for IB-E03B diagram  
\*Controls 2 Power Mollers



\* Z cable option or 9/10 pin extension cables needed to use IB-E03B card for non-brake PM635FS models\*

**Minimum Tube Lengths**

GEAR STAGES	
2	3
387 mm 15.24"	410 mm 16.14"
387 mm 15.24"	410 mm 16.14"
387 mm 15.24"	410 mm 16.14"



**Tube Length (TL) Considerations:**

- Standard roller/no options: BF - 20 mm = TL
- VG (Poly V end cap): BF - 66 mm = TL
- OS (Sprockets): BF - 20 mm = TL
- Contact an Itoh Denki representative to review your specific application

# PM635KE

## DC Motor Driven Roller

**Diameter:** 2.50" (63.5 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 11/16" threaded hex shafts standard
- ABEC 1 bearings
- DOM, carbon steel tube
- Heavy duty pallet handling
- 10 amp motor driven roller
- Standard 1000 mm (39.37") power cable
- One shaft mounting, cable side
- Standard 3 pin/7 pin split connector

### Available Option



Sprockets (OS)\*\*

Available sprocket types: 40A21, 50A17, 50A18, 60A15, or 60A16

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

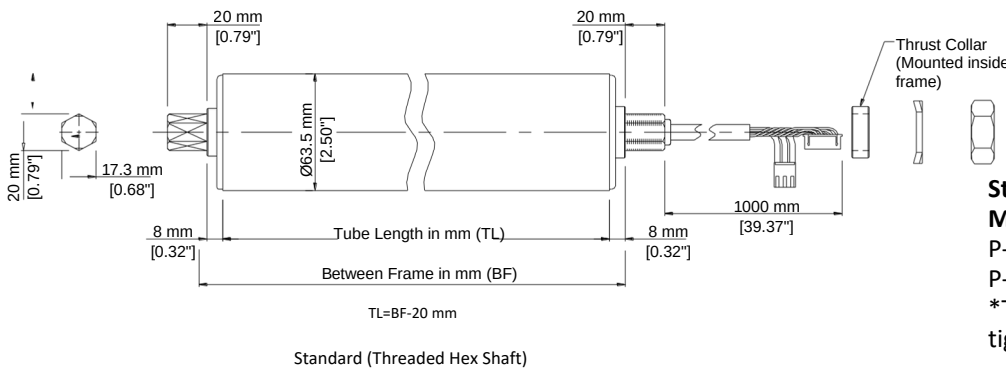
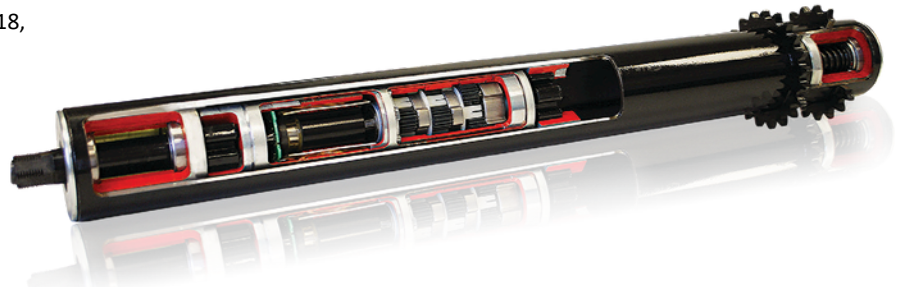
- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



This is a spring loaded shaft roller



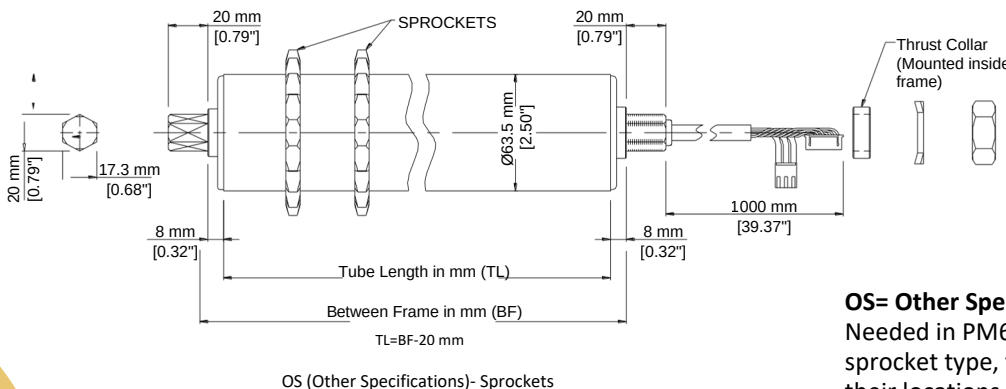
### Standard Threaded Hex Shaft Mounting Brackets\*

- P-OE1 (Hex point up)
- P-OD1 (Hex flat up)

\*Thrust collar nuts are to be tightened to 110.6 lb • ft ± 10%

**1 mounting bracket needed for this roller**  
See page 42-43 for bracket diagrams

\* brackets included with roller purchase



### OS= Other Specifications\*\*

Needed in PM635 part number in order to call out the sprocket type, the amount of sprockets needed, and their locations.

CBM-103F - 10 Speed Settings for PM635KE								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW2 9 High	SW2 0 Low			Starting	No-Load	Rated
3	16	53	7	228.6	285.9	10.0	0.7	2.8
2	60	200	25	63.3	78.8	10.0	0.8	2.8
1	230	758	95	17.5	22.1	10.0	0.9	2.8

**Applicable Driver Card For PM635KE**

See page 30 for CBM-103F diagram



\* Only driver card compatible with PM635KE model\*




**Available End Cap and Tube Options:**



Poly V End Cap (VG)

For additional information on options please go to pg. 50

**Minimum Tube Lengths**

GEAR STAGES			
	1	2	3
	360 mm 14.17"	380 mm 14.96"	400 mm 15.75"
	360 mm 14.17"	380 mm 14.96"	400 mm 15.75"
	360 mm 14.17"	380 mm 14.96"	400 mm 15.75"

**Tube Length (TL) Considerations:**

- Standard/no options: BF - 20 mm = TL
- VG (Poly V end cap) : BF - 66 mm = TL
- OS (Sprockets): BF - 20 mm = TL
- Contact an Itoh Denki representative to review your specific application

# PM635KT

## DC Motor Driven Roller

**Diameter:** 2.50" (63.5 mm)

**Voltage:** 24V DC

### Standard Features

- Brushless DC motor provides long life
- 11/16" threaded hex shafts standard
- ABEC 1 bearings
- DOM, carbon steel tube
- Heavy duty pallet handling
- 7 amp motor driven roller
- Standard 1000 mm (39.37") power cable
- One shaft mounting, cable side
- Standard 12 pin connector
- Brake option: 13 pin connector

### Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

### Protection

- Thermal overload 221°F (105°C) in the motor when used with an Itoh Denki controller

### Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G



This is a spring loaded shaft roller

### Available Options



Sprockets (OS)\*\*

Available sprocket types: 40A21, 50A17, 50A18, 60A15, or 60A16

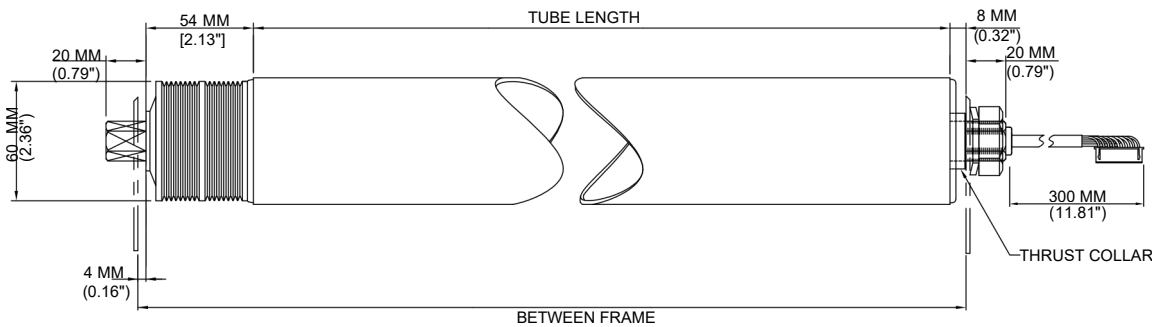


Brake (BR)

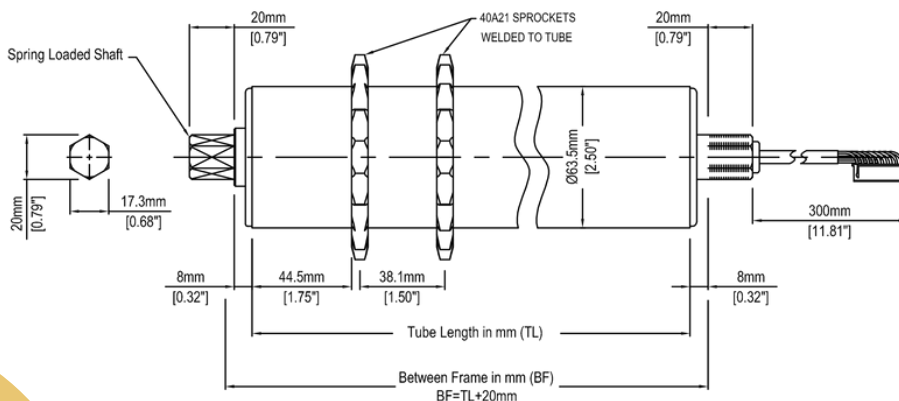
Available with 16, 28, and 60 speed code options



For additional information on options please go to pgs. 47-48



**Straight tube with Poly V end cap (VG)**



**OS (other specifications) - Sprockets**

### Standard Threaded Hex Shaft Mounting Brackets\*

P-OE1 (Hex point up)

P-OD1 (Hex flat up)

\*Thrust collar nuts are to be tightened to 110.6 lb • ft ± 10%

### 1 mounting bracket needed for this roller

See page 42-43 for bracket diagrams

\* brackets included with roller purchase

### OS= Other Specifications\*\*

Needed in PM635 part number in order to call out the sprocket type, the amount of sprockets needed, and their locations.

CBK 109F - 20 Speed settings for PM635KT								
Gear Stage	Speed Code	No-Load Speed (FPM)		Tangential Force (lb) Starting	Torque (lb-in) Starting	Current (A) At highest speed		
		SW2 9 High	SW2 0 Low			Starting	No-Load	Rated
3	16	60	8	181.6	227.4	7.0	0.7	2.9
	28	120	15	86.7	103.7	7.0	0.8	3.6
2	60	225	28	50.3	62.8	7.0	0.8	2.9
1	230	855	107	13.9	17.7	7.0	0.9	2.9

### Applicable Driver Cards For PM635KT

See page 29 for CBK-109F diagram



See page 36 for IB-E04F diagram  
\*Controls 2 Power Mollers






### Available End Cap and Tube Options:



Poly V End Cap (VG)

For additional information on options please go to pg. 50

### Minimum Tube Lengths

GEAR STAGES			
	1	2	3
	360 mm	380 mm	400 mm
	14.17"	14.96"	15.75"
	360 mm	380 mm	400 mm
	14.17"	14.96"	15.75"
	360 mm	380 mm	400 mm
	14.17"	14.96"	15.75"

### Tube Length (TL) Considerations:

- Standard/no options: BF - 20 mm = TL
- VG (Poly V end cap) : BF - 66 mm = TL
- OS (Sprockets): BF - 20 mm = TL
- Contact an Itoh Denki representative to review your specific application

# CB-016S7

Driver Card- 9 pin connector

**Applicable Models:** PM486FE, PM486FP, PM486FS, PM570FE, PM605FE, PM635FS

PNP output - CB-016P7; NPN output CB-016N7

Must specify when ordering

## Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

## Protection

- Thermal overload 185°F (85°C) on PCB
- 5A fuse to power supply
- Diode for protection from incorrect wiring

## Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G

## Features

- Simple operation
- 3 LEDs to identify type of error and number of occurrences
- Dynamic brake control
- Stable speed function to ensure articles of different weights travel at the same rate
- Variable speed control by 1 DIP switch combined with 1 rotary switch or by external voltage input for up to 20 speeds
- Direction control by onboard DIP switch or external signal input
- Adjustable acceleration and deceleration time (0 to 2.5s)
- Switch for manual or automatic recovery of thermal overload device
- Forcibly stops the motor if motor lock or thermal overload error lasts for 4 seconds or more
- Snap on cover for easy NPN/PNP switching without removing the card off the frame
- Available for rollers with built-in brakes, **CB-016BS7-UL** (10 pin connector)
- Available for rollers in low temp. environments, **CB-016S7-LT**
- Includes mounting hardware and wiring connectors

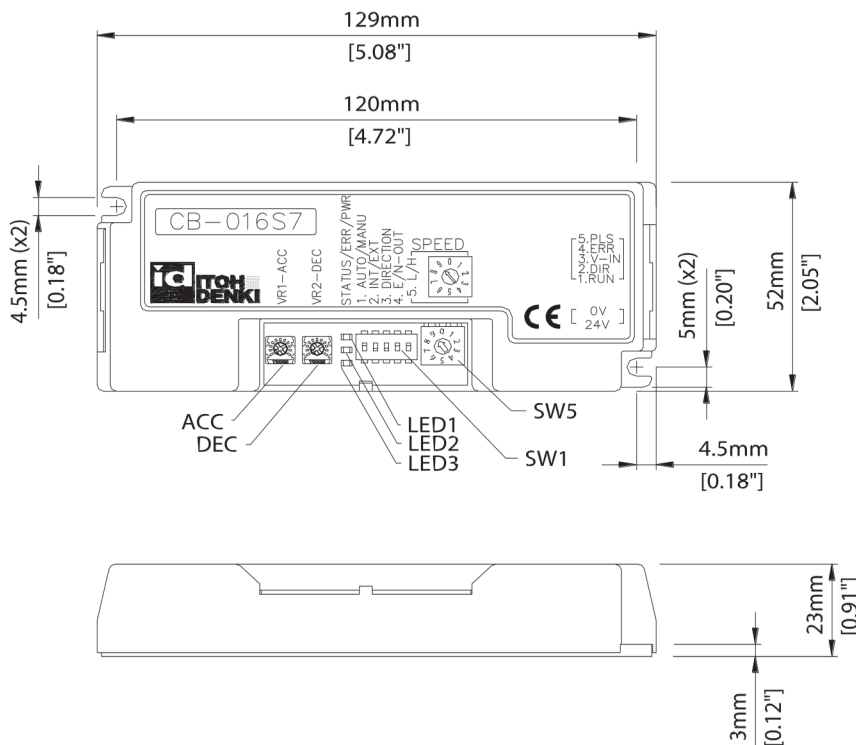
## Available Options



Low Temp  
(LT)



Brake (BR)



**Connectors for power and control are:**

Power: WAGO #734-102 (Included)

Control: WAGO #733-105 (Included)

# CBK-109F

Driver Card- 12 pin connector

**Applicable Models:** PM486FH, PM570KT, PM635KT

PNP output - CBK-109FP; NPN output CBK-109FN

Must specify when ordering

## Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

## Protection

- Thermal overload 185°F (85°C) on PCB
- 10A fuse to power supply
- Diode for protection from incorrect wiring

## Environment

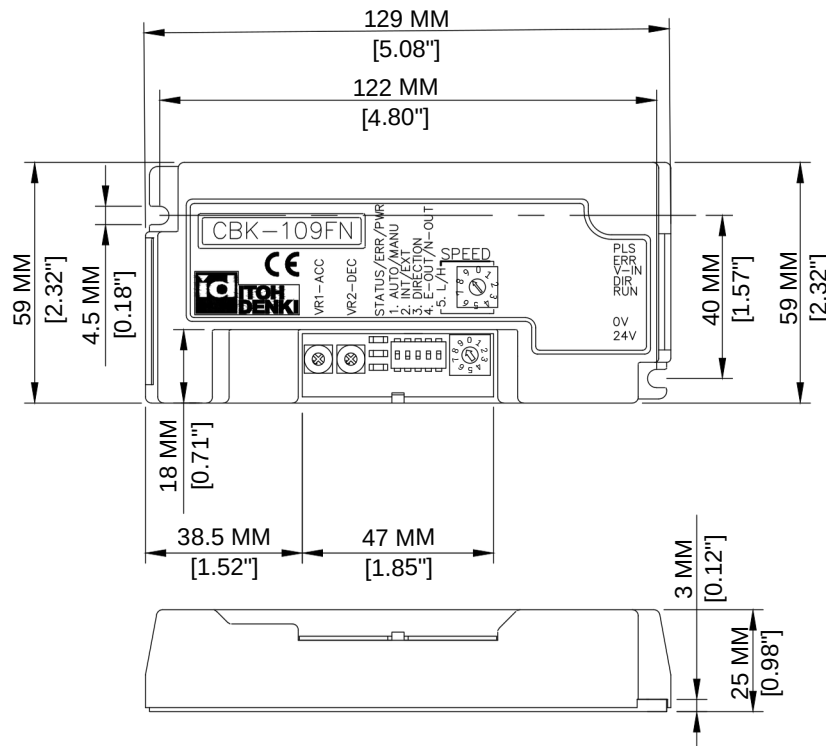
- Ambient temperature 32~104° F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G

## Features

- Simple operation
- Designed for use with the high torque PM486FH, PM570KT, and PM635KT (up to 7A)
- 3 LEDs to identify type of error and number of occurrences
- Dynamic brake
- Stable speed function to ensure articles of different weights travel at the same rate
- Variable speed control by 1 DIP switch combined with 1 rotary switch or by external voltage input for up to 20 speeds
- Direction control by onboard DIP switch or external signal input
- Adjustable acceleration and deceleration time (0 to 2.5s)
- Switch for manual or automatic recovery of thermal overload device
- Forcibly stops the motor if motor lock or thermal overload error lasts for 4 seconds or more
- Available for rollers with built-in brakes, CBK-109B (13 pin connector)
- Includes mounting hardware and wiring connectors



CBK-109F



**Connectors for power and control are:**

Power: WAGO #734-102 (Included)

Control: WAGO #733-105 (Included)

# CBM-103F

Driver Card- Split 3 pin/7 pin connector

**Applicable Models: PM635KE**

PNP output - CBM-103FP; NPN output CBM-103FN

Must specify when ordering

## Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

## Protection

- Thermal overload 203°F (95°C) on PCB
- 18A fuse to power supply

## Environment

- Ambient temperature 32~104° F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G

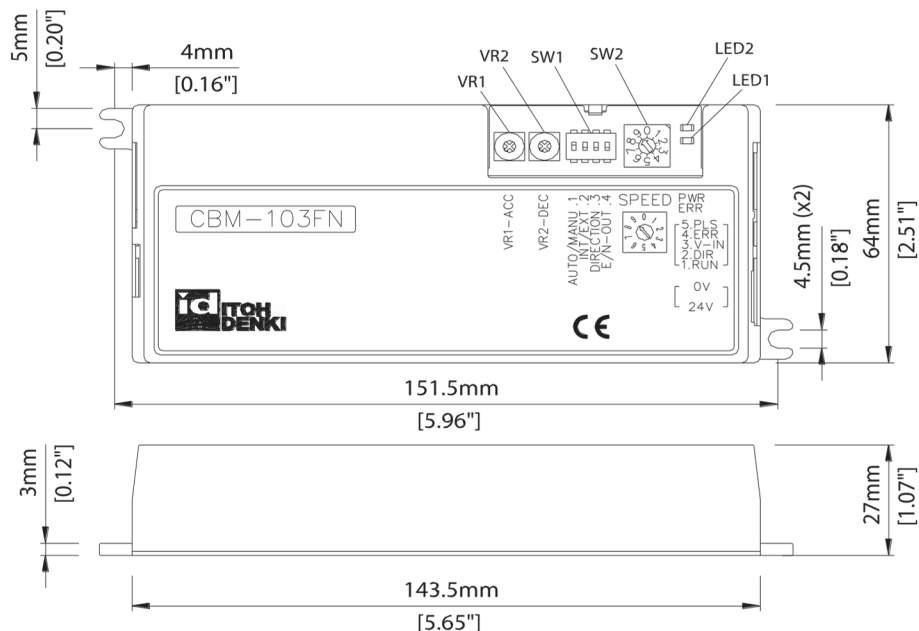
## Features

- Simple operation
- Designed for use with the high torque PM635KE (up to 10A)
- 2 LEDs to identify type of error and number of occurrences
- Dynamic brake control
- Stable speed function to ensure articles of different weights travel at the same rate
- Variable speed control with rotary switch for 10 fixed speed settings or by external voltage input for up to 16 speeds
- Direction control by onboard DIP switch or external signal input
- Adjustable acceleration and deceleration time (0 to 2.5s)
- Switch for manual or automatic recovery of thermal overload device
- Forcibly stops the motor if there is a motor lock, back EMF, or thermal overload occurs
- Output is selectable through a dip switch
- Includes mounting hardware and wiring connectors

## Connectors for power and control are:

Power: WAGO #231-302/026-000 (Included)

Control: WAGO #733-105 (Included)



# CBM-105F

Driver Card- 9 pin connector

**Applicable Models:** PM486FE, PM486FP, PM486FS, PM570FE, PM605FE, PM635FS

PNP output - CBM-105FP; NPN output CBM-105FN

Must specify when ordering

## Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

## Protection

- Thermal overload 158°F (70°C) on PCB
- 5A fuse to power supply
- Diode for protection from incorrect wiring

## Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G

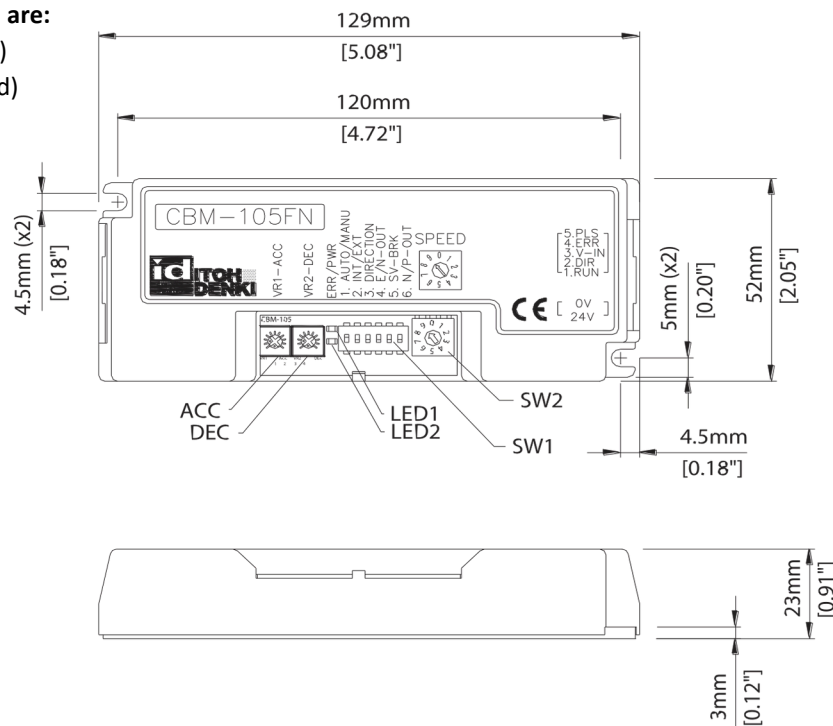
## Features

- Simple operation
- 2 LEDs to identify type of error and number of occurrences
- Stable speed function to ensure articles of different weights travel at the same rate
- Error output signal for self diagnosis
- Dynamic brake and servo brake control
- Variable speed by rotary switch or external voltage input
- Direction control by DIP switch or external signal input
- Adjustable acceleration and deceleration time (0-2.5s)
- Switch for automatic or manual recovery of back EMF error and thermal overload device
- Forcibly stops the motor if there is a motor lock, back EMF, or thermal overload occurs
- Output is selectable through a dip switch
- Includes mounting hardware and wiring connector

**Connectors for power and control are:**

Power: WAGO #734-102 (Included)

Control: WAGO #733-105 (Included)



CBM-105F

# HB-510

ZPA Hybrid Driver Card- 9 pin connector

**Applicable Models:** PM486FE, PM486FP, PM486FS, PM570FE, PM605FE, PM635FS

PNP output - HB-510P; NPN output - HB-510N  
Must specify when ordering

## Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

## Protection

- Thermal overload 185°F (85°C) on PCB
- 5A fuse to power supply
- Diode for protection from incorrect wiring

## Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G

## Features

- 3 LEDs to identify type of error and number of occurrences
- Dynamic brake control
- Stable speed function to ensure articles of different weights travel at the same rate
- Variable speed control by rotary switch or by external voltage input for up to 10 speeds
- Direction control by onboard DIP switch or external signal input
- Logic for general zero pressure accumulation (ZPA) control is built in
- Direct connection for photo eye to power it and receive its output signal
- Easy connection between adjacent HB-510's with communication cable to simplify wiring
- Flexible Zone Recognition (patented) to handle long articles which simultaneously block multiple sensors
- Available for rollers with built-in brakes, HB-510B (10 pin connector)
- Available for rollers in low temp. environments, HB-510(P)(N)-LT
- Includes mounting hardware and wiring connectors

## Connectors for power and control are:

Power: WAGO #734-102 (Included)

Sensor: WAGO #733-103 (Included)

Optional External Control: WAGO #733-105 (Not Included)

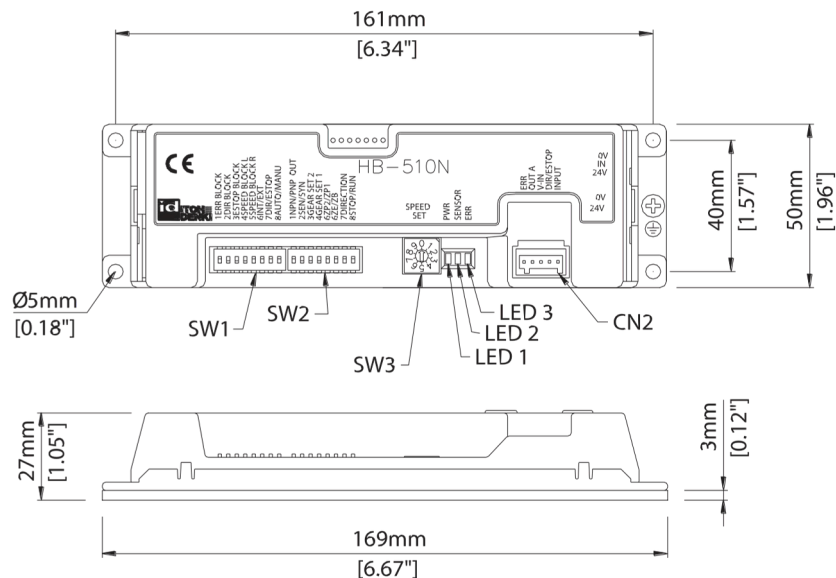
## Available Options



Low Temp



Brake



# HBM-604B-UL

2 Zone ZPA Hybrid Driver Card- 10 pin connector

**Applicable Models:** PM486FE, PM486FP, PM486FS, PM570FE, PM605FE, PM635FS

PNP output - HBM-604BP-UL; NPN output - HBM-604BN-UL  
Must specify when ordering

## Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

## Protection

- Thermal overload 185°F (85°C) on PCB
- Two 7A fuses for each motor
- Input power protected against reversed polarity

## Environment

- Ambient temperature 32~104° F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G

## Features

- Controls up to 2 Power Mollers (brake and non-brake models)
- 2 available sensor connections that power and receive the output from sensor
- Dynamic brake control
- Stable speed function to ensure articles of different weights travel at the same rate
- Variable speed control by rotary switch
- Motor direction control by onboard DIP switch
- Logic for general Zero Pressure Accumulation (ZPA) control is built in
- Flexible Zone Recognition to handle long articles which simultaneously block multiple sensors
- Easy connection between adjacent HBM-604B-ULs with communication cable to simplify wiring
- HBM-604B-UL can handshake signals to Itoh Denki IB-E03B driver cards

## Connectors for power and control are:

Power: WAGO #231-302/ 026-000 (Included)

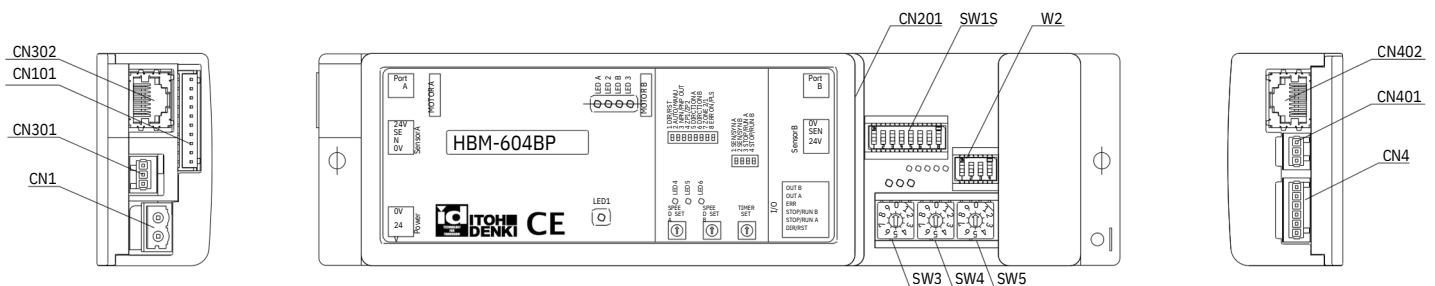
Sensor: WAGO # 733-103 (Included)

Optional External Control: WAGO #733-106 (Not Included)

\* Non brake model rollers must use 10-pin motor connector



HBM-604B-UL



# HBK-608F

2 Zone ZPA Hybrid Driver Card- 12 pin connector

**Applicable Models:** PM486FH, PM570KT, PM635KT

PNP output - HBK-608FP; NPN output - HBK-608FN  
Must specify when ordering

## Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

## Protection

- Thermal overload 185°F (85°C) on PCB
- 2 10A fuses for each motor
- Protection from incorrect wiring (reverse polarity)

## Environment

- Ambient temperature 32~104°F (0~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 0.5G

## Features

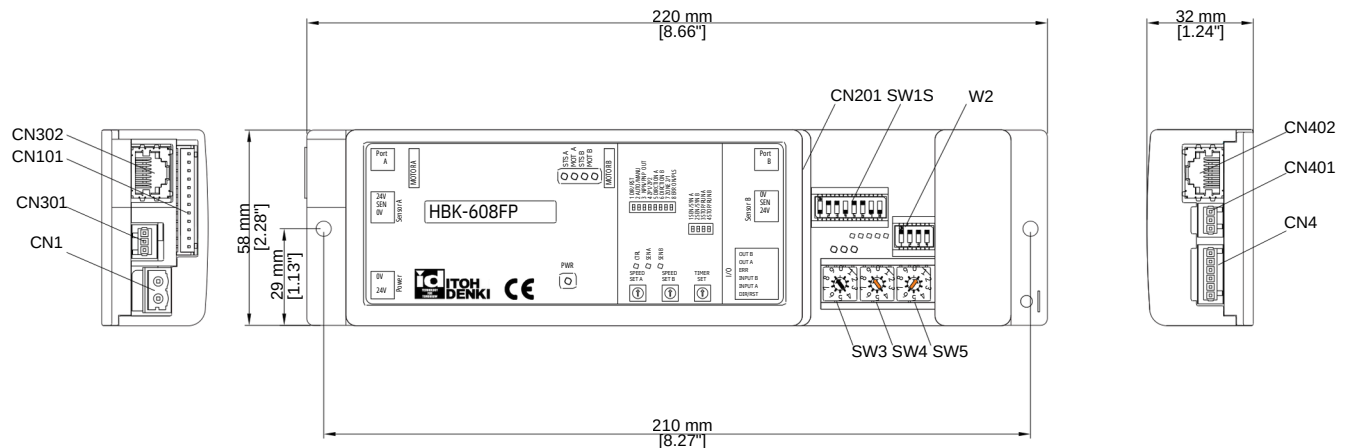
- Controls up to 2 Power Mollers
- 2 available sensor connections that power and receive the output from sensor
- Variable speed control by rotary switch
- Direction control by onboard DIP switch or external signal input
- Logic for general Zero Pressure Accumulation (ZPA) control is built-in
- Flexible Zone Recognition to handle long articles which simultaneously block multiple sensors
- Easy connection between adjacent HBK-608Fs with communication cable to simplify wiring
- HBK-608F can handshake signals to Itoh Denki IB-E04F driver cards

## Connectors for power and control are:

Power: WAGO #231-302/026-000 (Included)

Sensor: WAGO #733-103 (Included)

Optional External Control: WAGO #733-106 (Not Included)



# IB-E03B

2 Zone Controller- 10 pin connector

**Applicable Models:** PM486FE, PM486FP, PM486FS, PM570FE, PM605FE, PM635FS

PNP output - IB-E03BP; NPN output - IB-E03BN

Must specify when ordering

## Operation

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

## Protection

- Thermal overload 185°F (85°C) on PCB
- 7 A fuse for each motor
- Diode for protection from incorrect wiring

## Environment

- Ambient temperature -4~104°F (-20~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 1.0G

## Features

- Controls up to 2 Power Mollers™ (brake and non brake models)\*
- Direct connection for 2 photo-sensors that power and receive the output signal
- I/O device with 3 discrete inputs and 5 discrete outputs
- Operates using local logic or upper level PLC control logic
- Built-in Device Level Ring (DLR) technology maintains continuous communication
- Life cycle monitoring feature displays remaining useful motor life
- 2 port Ethernet switch simplifies network design
- LED status / error indicators
- Motor pulse counting through local logic
- **EtherNet/IP™** Conformance Tested
- UL and cUL recognized component
- Rockwell Automation AOP (Add-On Profile) available for seamless integration
- Wire side connectors are available from various sources. They are not provided as standard.



**EtherNet/IP™**

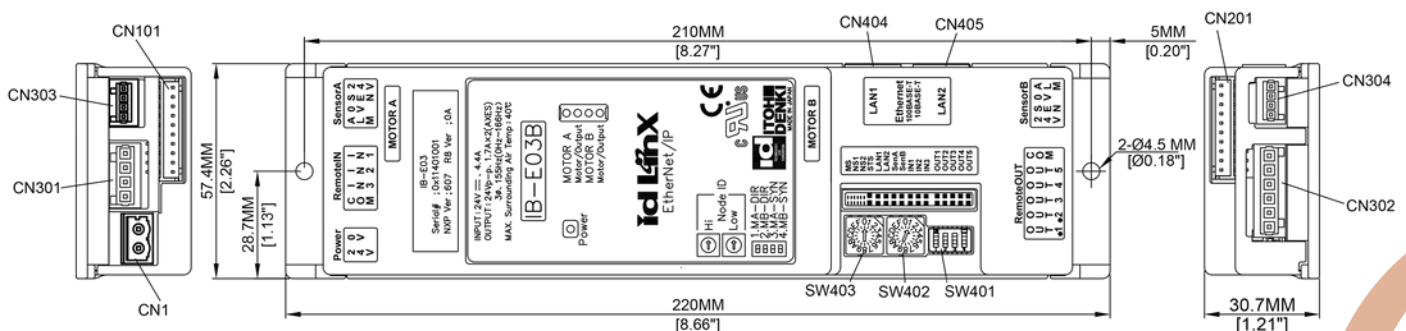
IB-E03B

**\*IB-E Basic Connector Kit required for functionality of IB-E03B driver card.**

**IB-E I/O Connector Kit optional for I/O connectivity. Kits sold separately\***

IB-E Basic Connector Kit (Required)		
Description	WAGO	Qty. Required
Power	231-302 / 026-000	1
Photo Eye Sensor	733-104	2
WAGO Tool	733-191	1
WAGO Tool	231-231	1

IB-E I/O Connector Kit (Optional)		
Description	WAGO	Qty. Required
External Input	734-204	1
Signal Output	734-206	1
WAGO Tool	734-231	1



# IB-E04F

2 Zone Controller- 12 pin connector

**Applicable Models:** PM486FH, PM570KT, PM635KT

PNP output - IB-E04FP; NPN output - IB-E04FN

Must specify when ordering

**Operation**

- Continuous or intermittent duty
- Minimum cycle: 1s ON; 1s OFF
- Do not exceed 150% of no-load speed

**Protection**

- Thermal overload 185°F (85°C) on PCB
- 10 A fuse for each motor
- Diode for protection from incorrect wiring

**Environment**

- Ambient temperature -4~104°F (-20~40°C)
- < 90% relative humidity (no condensation)
- No corrosive gases
- Vibration < 1.0G

**Features**

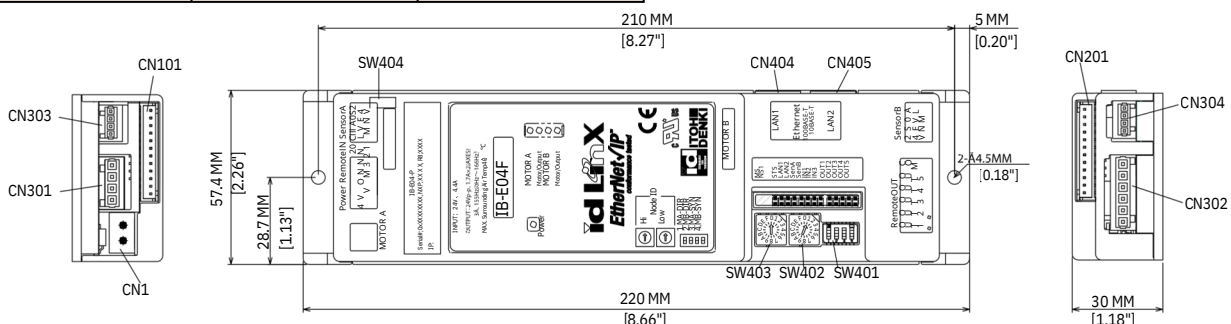
- Controls up to 2 Power Mollers™
- Direct connection for 2 photo-sensors that power and receive the output signal
- I/O device with 3 discrete inputs and 5 discrete outputs
- Operates using local logic or upper level PLC control logic
- Built-in Device Level Ring (DLR) technology maintains continuous communication
- Life cycle monitoring feature displays remaining useful motor life
- 2 port Ethernet switch simplifies network design
- LED status / error indicators
- Motor pulse counting through local logic
- **EtherNet/IP** Conformance Tested
- UL and cUL recognized component
- Rockwell Automation AOP (Add-On Profile) available for seamless integration
- Wire side connectors are available from various sources. They are not provided as standard.
- Corrosion resistant, high temperature option available: IB-E04F-CR-HT.1\*  
\*The IB-E04F-CR-HT.1 has a different footprint than the IB-E04F



**\*IB-E Basic Connector Kit required for functionality of IB-E04F driver card**  
**IB-E I/O Connector Kit optional for I/O connectivity. Kits sold separately\***

IB-E Basic Connector Kit (Required)		
Description	WAGO	Qty. Required
Power	231-302 / 026-000	1
Photo Eye Sensor	733-104	2
WAGO Tool	733-191	1
WAGO Tool	231-231	1

IB-E I/O Connector Kit (Optional)		
Description	WAGO	Qty. Required
External Input	734-204	1
Signal Output	734-206	1
WAGO Tool	734-231	1







# IB-E CONNECTOR KITS

Applicable Models: IB-E03B, IB-E04F, IB-E04F-CR-HT.1




IB-E Basic connector kit (required); IB-E I/O connector kit (optional)

- The basic connector kit is needed for the IB-E cards to function.

	Description	WAGO Part #	Qty. Needed	Image
IB-E Basic Kit	Power	231-302 / 026-000	1	
	Photo Eye	733-104	2	
	WAGO Tool (733)	733-191	1*	
	WAGO Tool (231)	231-231	1*	

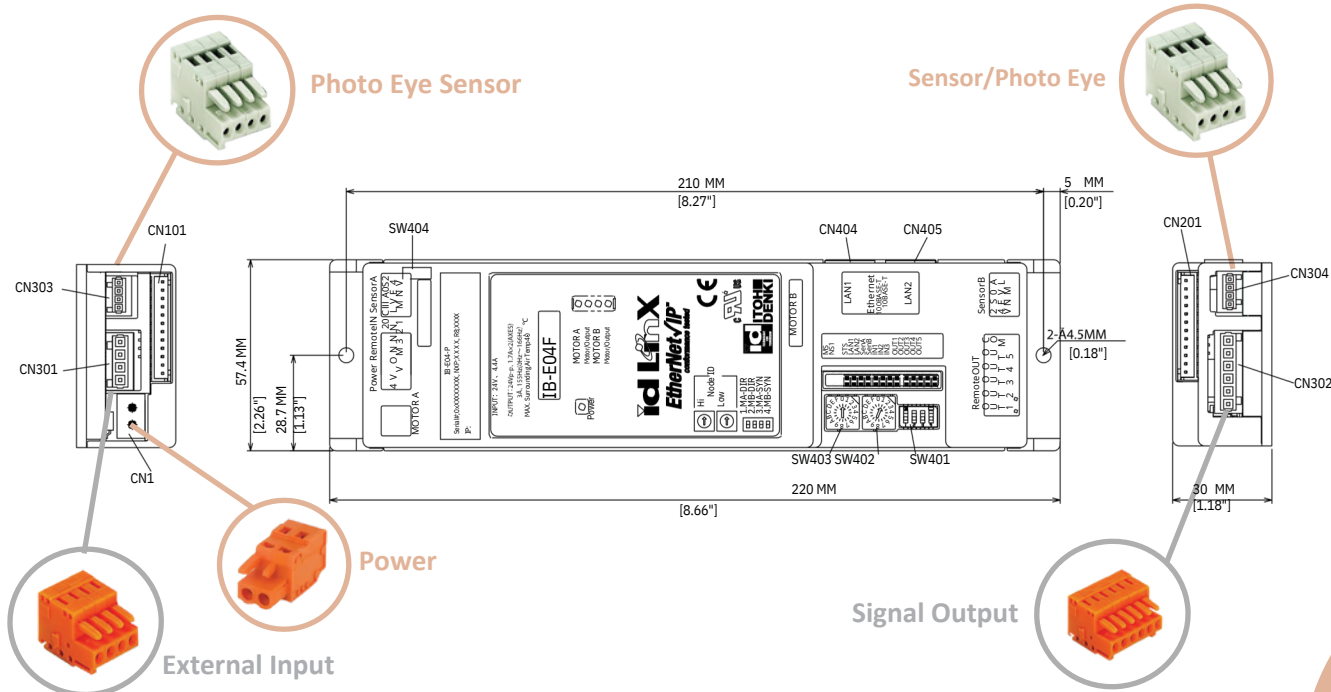
\*Wago tools are not provided per kit number ordered but additional tools are available for purchase

 Indicates IB-E Basic Kit WAGO connectors on drawing

	Description	WAGO Part #	Qty. Needed	Image
IB-E I/O Kit	External Input	734-204	1	
	Signal Output	734-206	1	
	WAGO Tool (734)	734-231	1*	

\*Wago tools are not provided per kit number ordered but additional tools are available for purchase

 Indicates IB-E I/O Kit WAGO connectors on drawing



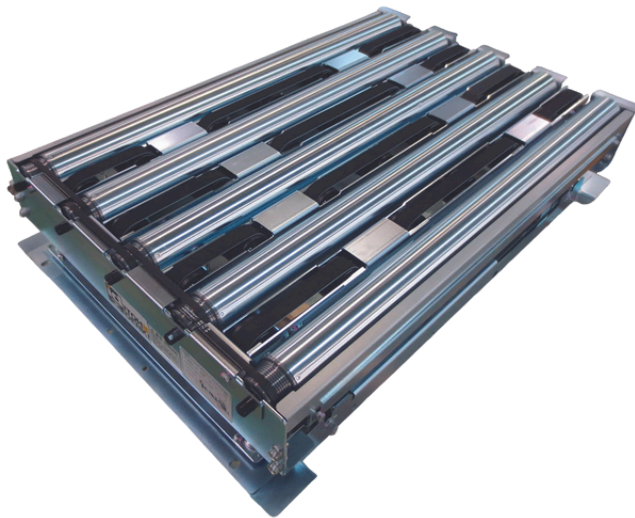
# F-RAT-S300

## Flat Right Angle Transfer

### Features

- 24V DC
- Drop-in installation into existing conveyor frames
- 90 degree transfer that allows for forward, backward, left and right directional movement
- Patented Itoh Denki Lift-Lower technology - rollers and belts change position to meet the product
- Simplified transfer using 3 MDRs, eliminating pneumatics
- Controlled with Itoh Denki's IB-E03B or CB-016S7 driver cards\*
- Minimum package size: 300 mm (11.8") x 300 mm (11.8")
- Module height: 170 mm (6.69")
- Transfer capacity: 2500 c/hr (based on 13.8" x 15.4", 66 lb. package)
- Choose between a PNP (P) or NPN (N) sensor output

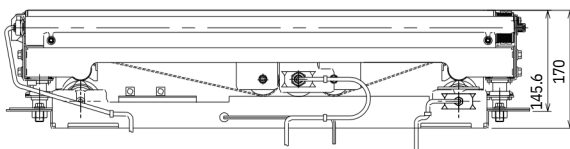
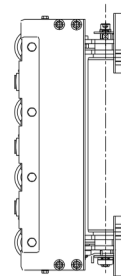
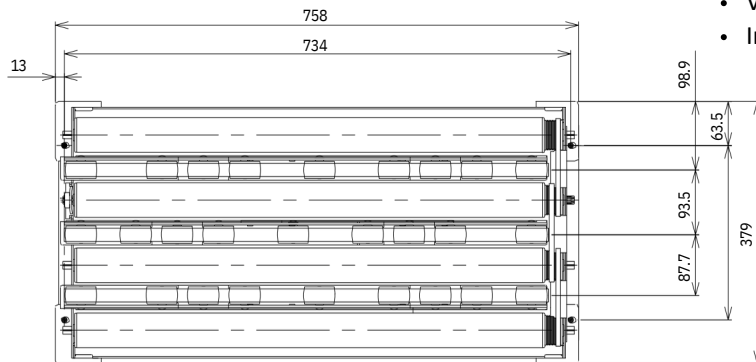
Model Number	F-RAT-S300 Size	Maximum Package Size
Size A	W 379 mm (14.9") X L 758 mm (29.8")	W 300 mm (11.8") x L 650 mm (25.6")
Size B	W 497 mm (19.6") X L 758 mm (29.8")	W 400 mm (15.7") x L 650 mm (25.6")
Size C	W 597 mm (23.5") X L 758 mm (29.8")	W 500 mm (19.7") x L 650 mm (25.6")
Size D	W 697 mm (27.4") X L 758 mm (29.8")	W 600 mm (23.6") x L 650 mm (25.6")



Speed Code	Maximum Load Weight	
	Size A	Size B,C,D
17 (56 FPM)	37.5 kg ( 82.5 lbs)	50 kg (110 lbs)
60 (197 FPM)	37.5 kg (82.5 lbs)	50 kg (110 lbs)
90 (295 FPM)	10 kg (22 lbs)	10 kg (22 lbs)

### Basic Specifications

- Roller diameter: 50 mm
- Size BF width (W) transfer direction: 15", 20", 24", 28"
- Length (L) spine direction: 30"
- Height: 170 mm (6.69")
- Line speed: 56, 197, or 295 FPM
- Transfer clearance: 10 mm (0.39")
- Power voltage: 24V DC
- Ambient temperature: 32~104°F (0~40°C)
- Humidity: below 90% RH (no condensation)
- Atmosphere: no corrosive gas
- Vibration: below 0.5G
- Installation: indoor



### Driver Card Options:

- (2) IB-E03B\*  
or
- (3) CB-016S7\*  
needed per F-RAT-S300.

\*Depending upon the sensor output selected, the driver card number will change. If PNP is selected then IB-E03BP or CB-016P7 will be needed. If NPN is selected then IB-E03BN or CB-016N7 will be needed.

# F-RAT-NX75

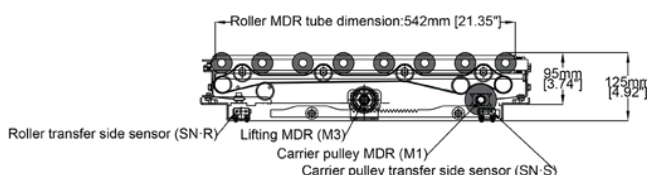
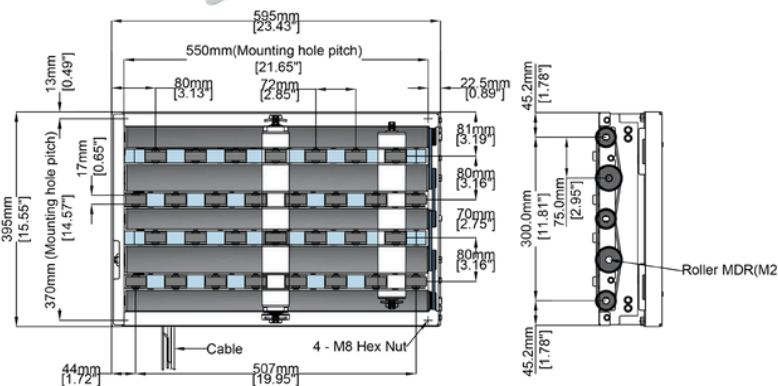
## Flat Right Angle Transfer

### Features

- 24V DC
- Drop-in installation into existing conveyor frames
- 90 degree transfer that allows for forward, backward, left and right directional movement
- Simplified transfer using 3 MDRs, eliminating pneumatics.
- Controlled with Itoh Denki's IB-E series or CB series driver cards\*
- Minimum package size: 225 mm (8.8") x 225 mm (8.8")
- Module height: 125 mm (4.9")
- Transfer capacity: 2250 c/hr (based on 13.8" x 15.4", 66 lb. package)

Speed Code	Maximum Load Weight (All Sizes)
17 (56 FPM)	50 kg (110 lbs)
60 (197 FPM)	50 kg (110 lbs)

Model Number	F-RAT-NX75 Size	Maximum Package Size
6040	W 395 mm (15.6") X L 595 mm (23.4")	W 295 mm (11.6") X L 495 mm (19.5")
6050	W 495 mm (19.5") X L 595 mm (23.4")	W 395 mm (15.6") X L 495 mm (19.5")
6060	W 595 mm (23.4") X L 595 mm (23.4")	W 495 mm (19.5") X L 495 mm (19.5")
6070	W 695 mm (27.4") X L 595 mm (23.4")	W 595 mm (23.4") X L 495 mm (19.5")
6080	W 795 mm (31.3") X L 595 mm (23.4")	W 695 mm (27.4") X L 495 mm (19.5")
7540	W 395 mm (15.6") X L 745 mm (29.3")	W 295 mm (11.6") X L 645 mm (25.4")
7550	W 495 mm (19.5") X L 745 mm (29.3")	W 395 mm (15.6") X L 645 mm (25.4")
7560	W 595 mm (23.4") X L 745 mm (29.3")	W 495 mm (19.5") X L 645 mm (25.4")
7570	W 695 mm (27.4") X L 745 mm (29.3")	W 595 mm (23.4") X L 645 mm (25.4")
7580	W 795 mm (31.3") X L 745 mm (29.3")	W 695 mm (27.4") X L 645 mm (25.4")
9040	W 395 mm (15.6") X L 895 mm (35.2")	W 295 mm (11.6") X L 795 mm (31.3")
9050	W 495 mm (19.5") X L 895 mm (35.2")	W 395 mm (15.6") X L 795 mm (31.3")
9060	W 595 mm (23.4") X L 895 mm (35.2")	W 495 mm (19.5") X L 795 mm (31.3")
9070	W 695 mm (27.4") X L 895 mm (35.2")	W 595 mm (23.4") X L 795 mm (31.3")
9080	W 795 mm (31.3") X L 895 mm (35.2")	W 695 mm (27.4") X L 795 mm (31.3")



### Basic Specifications

- Roller diameter: (2) 48.6 mm and (1) 57.0 mm
- Length (L) spine direction: 23.4", 31.3" or 35.2"
- Height: 125 mm (4.9")
- Line speed: 56 or 197 FPM
- Transfer clearance: 7 mm (0.2")
- Power voltage: 24V DC
- Ambient temperature: 32~104°F (0~40°C)
- Humidity: below 90% RH (no condensation)
- Atmosphere: no corrosive gas
- Vibration: below 0.5G
- Installation: indoor

### Driver Card Options:

- (1) IB-E03B and (1) IB-E04F  
or
- (2) CB-016BS7-UL and (1) CBK-109F  
needed per F-RAT-NX75

\*Depending upon the sensor output selected, the driver card number will change. If PNP is selected then IB-E03BP and IB-E04FP or CB-016BP7-UL and CBK-109FP will be needed. If NPN is selected then IB-E03BN and IB-E04FN or CB-016BN7-UL and CBK-109FN will be needed.

# MABS2

## Multi-Angle Ball Sorter

### Features

- 24V DC
- Drop-in installation into existing conveyor frames
- Can transfer packages at any specified angle, including 30, 45, and 90 degrees
- Simplified transfer using 2 MDRs, eliminating pneumatics
- Scalable - place multiple MABS2 units next to each other to create a larger transfer surface
- Controlled with Itoh Denki IB-E04F (for Rockwell Network communication) or IB-E06F-UL-M1 driver cards\*
- Module height: 175 mm (6.89")
- Transfer capacity: 4300 c/hr

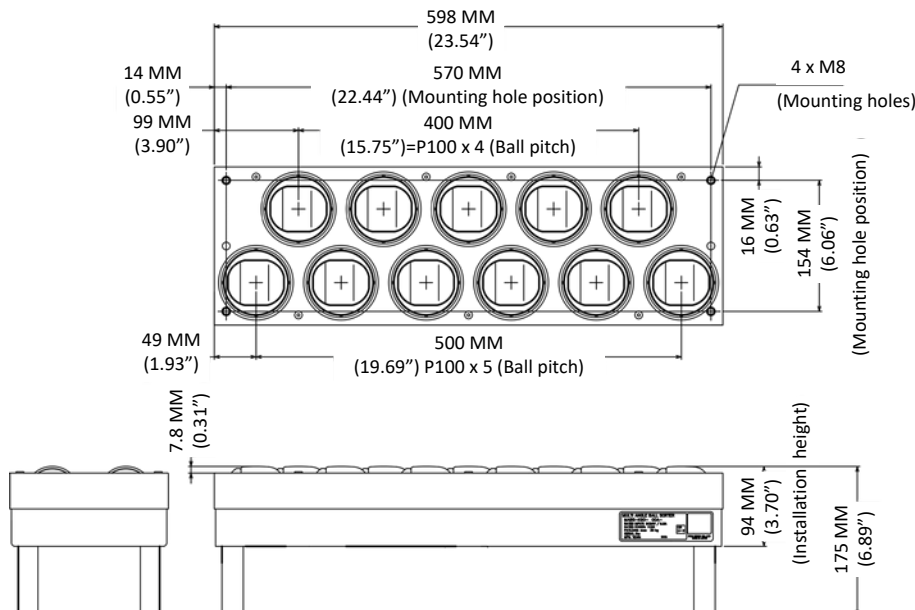
Speed Code	Maximum Load Weight	
	All Sizes (1 unit)	All sizes (8 units)
90 (295 FPM)	30 kg (66 lbs)	239 kg (528 lbs)

Model Number	MABS2 Size	Maximum Package Size
400	W 398 mm (15.7") X L 186 mm (7.3")	W 300 mm (11.8") X L 650 mm (25.59")
500	W 498 mm (19.6") X L 186 mm (7.3")	W 400 mm (15.8") X L 650 mm (25.59")
600	W 598 mm (23.5") X L 186 mm (7.3")	W 500 mm (19.7") X L 650 mm (25.59")
700	W 698 mm (27.5") X L 186 mm (7.3")	W 600 mm (23.6") X L 650 mm (25.59")
800	W 798 mm (31.4") X L 186 mm (7.3")	W 700 mm (27.6") X L 650 mm (25.59")



### Basic Specifications

- Roller diameter: (2) 57.0 mm
- Length (L) spine direction: 186 mm (7.3")
- Height: 175 mm (6.9")
- Line speed: 295 FPM
- Power voltage: 24V DC
- Ambient temperature: 32~104°F (0~40°C)
- Humidity: below 90% RH (no condensation)
- Atmosphere: no corrosive gas
- Vibration: below 0.5G
- Installation: indoor



### Driver Card Options:

- (1) IB-E04F\*
  - or
  - (1) IB-E06F-UL-M1\*
- needed per MABS2

\*Depending upon the sensor output selected, the driver card number will change. If PNP is selected then IB-E04FP or IB-E06FP-UL-M1 will be needed. If NPN is selected then IB-E04FN or IB-E06FN-UL-M1 will be needed.

# SOG2

## Slide Open Gate

### Features

- 24V DC
- 2 motors
- Simplified transfer and gate operation using MDR
- Allows for convenient access to your conveyor line with a push of a button
- Manual activation available in case of a power outage
- Controlled with Itoh Denki IB-E03B and HBS-202-F-MD1 driver cards\*
- Compatible with Rockwell Automation controls for increased customization
- Minimum package size: 8.9" (225 mm) x 8.9" (225 mm)

Model Number	SOG2 Width (BF)	Maximum Package Size
W366	15" (381 mm)	10.5" (266 mm) x 10.5" (266 mm)
W391	16" (406 mm)	11.5" (291 mm) x 11.5" (291 mm)
W442	18" (457 mm)	13.5" (342 mm) x 13.5" (342 mm)
W493	20" (508 mm)	15.5" (393 mm) x 15.5" (393 mm)
W544	22" (559 mm)	17.5" (444 mm) x 17.5" (444 mm)
W595	24" (610 mm)	19.5" (495 mm) x 19.5" (495 mm)
W696	28" (711 mm)	23.5" (596 mm) x 23.5" (596 mm)
W747	30" (762 mm)	25.5" (647 mm) x 25.5" (647 mm)

Speed Code	Maximum Load Weight (All Sizes)
60 (200 FPM)	30 kg (66 lbs)

Model Number	SOG2 Height
H0	24" - 26" TOR
H1	27" - 31" TOR
H2	31" - 36" TOR



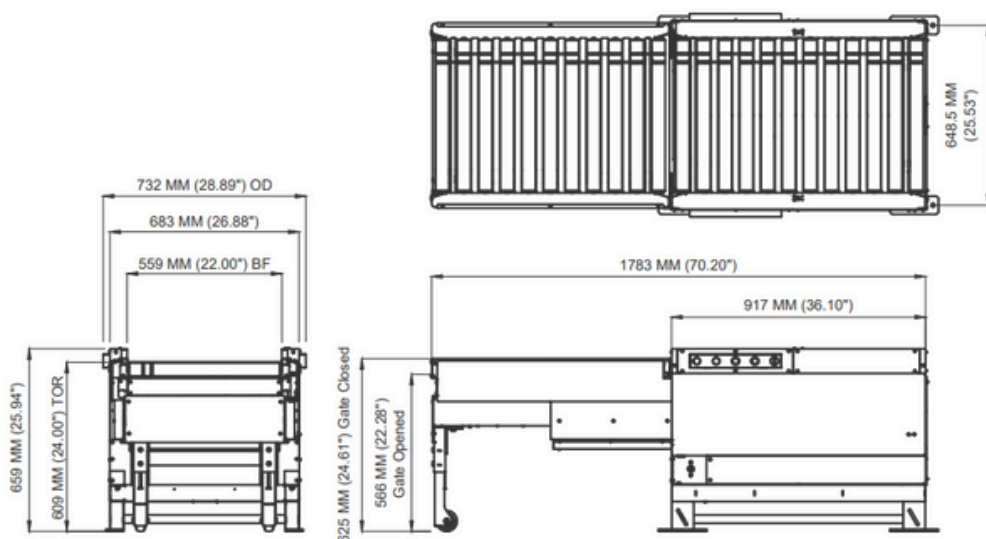
### Basic Specifications

- Roller diameter: (2) 48.6 mm
- Line speed: 200 FPM
- Power voltage: 24V DC
- Ambient temperature: 32~104°F (0~40°C)
- Humidity: below 90% RH (no condensation)
- Atmosphere: no corrosive gas
- Vibration: below 0.5G
- Installation: indoor

### Driver Card Option:

- (1) IB-E03B and (1) HBS-202-F-MD1\* needed per SOG2

\*Depending upon the sensor output selected, the driver card number will change. If PNP is selected, then IB-E03BP and HBS-202-FP-MD1 will be needed. If NPN is selected, then IB-E03BN and HBS-202-FN-MD1 will be needed.

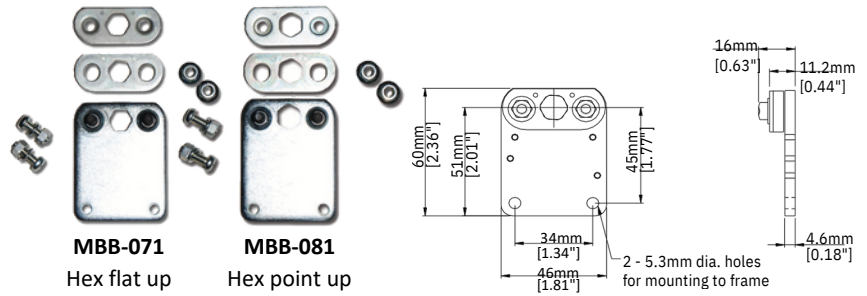


# MOUNTING BRACKETS

## MBB-071 (hex flat up) / MBB-081 (hex point up)

Applicable models: All FE models, PM486FS, PM486FH, PM486FP (JR-yoke shaft), PM486XE/XP

- The shaft hole of the middle plate is rotated a few degrees, which grips the shaft securely once the top plate and nuts are tightened to the correct torque.
- Nuts must be torqued to 2.2 lb • ft (3 Nm)
- 1 required for FE models and PM486XE/XP
- Requires 2 for each PM486FS, PM486FH, and PM486FP (yoke shaft)
- Supplied with M5 x 15 pan head Phillips mounting bolts and hardware

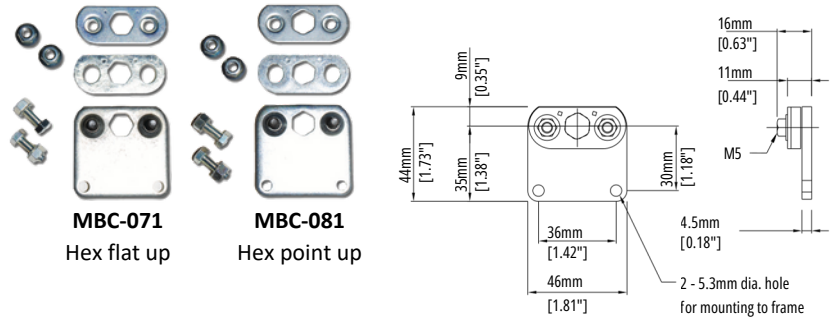


## MBC-071 (hex flat up) / MBC-081 (hex point up)

Applicable models: All FE models, PM486FS, PM486FH, PM486FP (JR-yoke shaft), PM486XE/XP

Optional low profile bracket

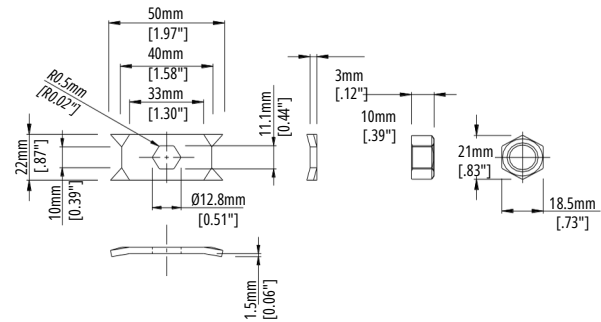
- The shaft hole of the middle plate is rotated a few degrees, which grips the shaft securely once the top plate and nuts are tightened to the correct torque.
- Nuts must be torqued to 2.2 lb • ft (3 Nm)
- 1 required for FE models and PM486XE/XP
- Requires 2 for each PM486FS, PM486FH and PM486FP (yoke shaft)
- Supplied with M5 x 15 pan head Phillips mounting bolts and hardware



## P-0B1 (hex flat up) / P-0C1 (hex point up)

Applicable models: PM486FP

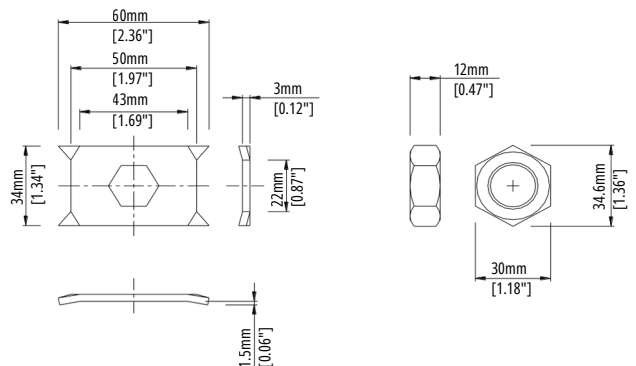
- Low profile and designed for maximum holding of threaded hex shafts
- Supplied with nut (M12 x 1.25)
- Requires 2 for each PM486FP
- Nuts must be torqued to 22.1 lb • ft (30Nm)



## P-0D1 (hex flat up) / P-0E1 (hex point up)

Applicable models: PM635FS, PM635KE, PM635KT

- Low profile and designed for maximum holding of threaded hex shafts
- Supplied with nut (M20 x 1.25)
- Requires 1 for each PM635
- Nuts must be torqued to 110.6 lb • ft (149.5Nm)



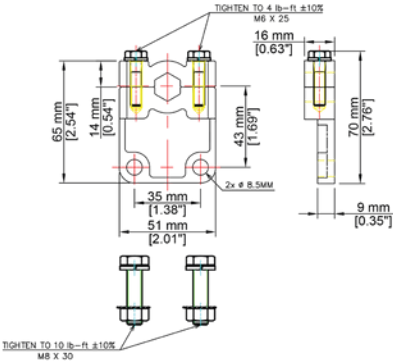
## FSY-01/FSY-02

- JQ, JT shaft standard mounting hardware
- Supplied with nut (M12 x 1.25)
- Toothed lock washer and nut
- Nuts must be torqued to 22.1 lb • ft (30Nm)

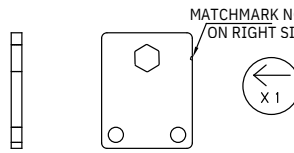


## MBK-0K1 (Cable end) & MBK-0K1-7 (Spring loaded end)

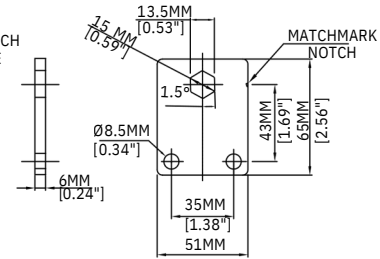
Applicable model: PM570KT



**MBK-0K1**  
Cable end



Use 1 bracket with matchmark facing out.

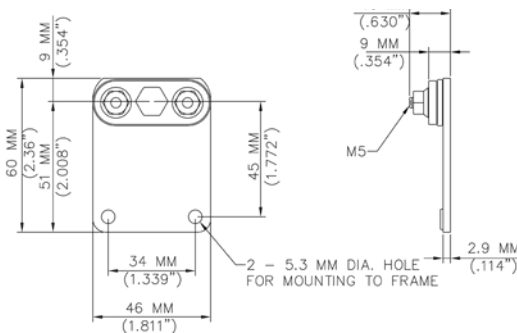


**MBK-0K1-7**  
Spring loaded end

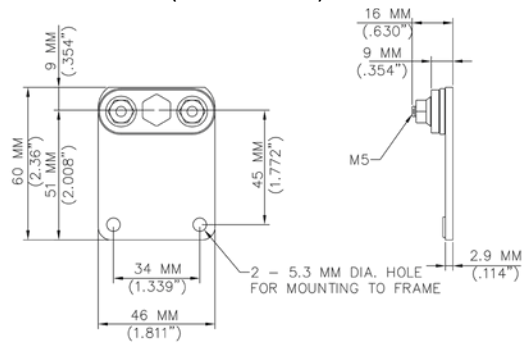
## Z-071-D (hex flat up)/ Z-081-D (hex point up)

Applicable models: All FE models, PM320HS, PM486FS, PM486FH, PM486FP (with JH shaft)

- Stainless steel mounting bracket for washdown applications
- 1 required for FE models and 2 required for PM486FS, PM486FH and PM486FP (with JH shaft)



**Z-071-D**  
Hex flat up

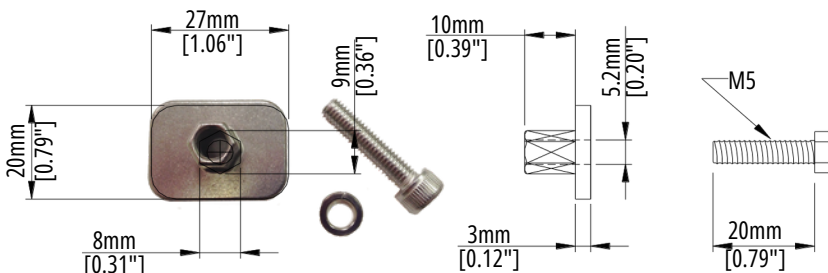


**Z-081-D**  
Hex point up

## AM-32HS-M5

Applicable models: PM320HS

- Opposite stainless cable side bracket.
- Used in combination with Z-071-D (hex flat up) or Z-081-D (hex point up)



# MOLDED EXTENSION CABLES

## Cables available in the following standard lengths:

600 mm (23.62"), 1200 mm (47.24"), and 2700\* mm (106.30") \*\*

Allows for easy hook up between Power Moller roller cable and driver card. Use the molded extension cables to add length to your existing cable, or to allow a 9 pin roller to be compatible with a 10 pin card.

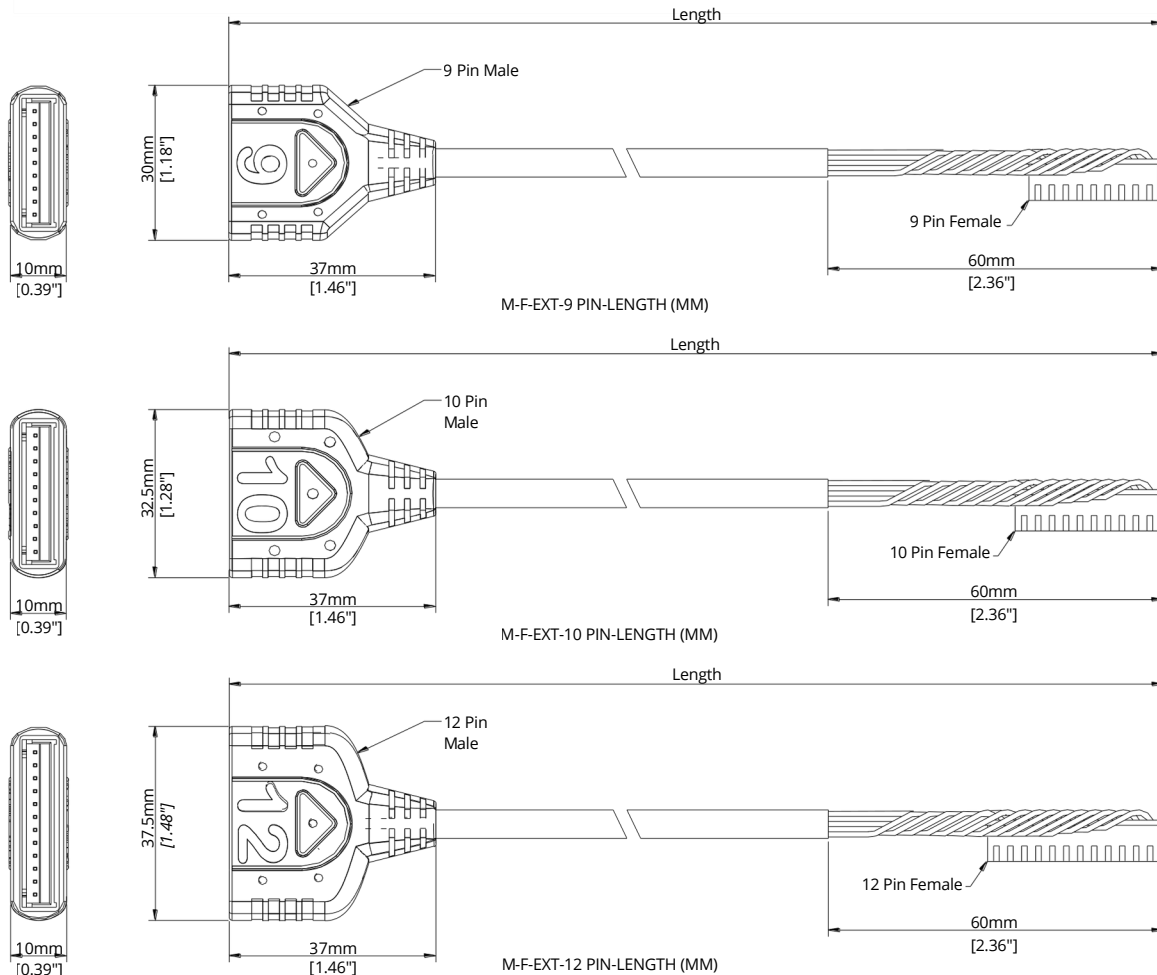
## Available in the following configurations:

- 9 pin male to 9 pin female
- 9 pin male to 10 pin female
- 10 pin male to 10 pin female
- 12 pin male to 12 pin female

## Example Model Numbers:

<b>M-F</b>	<b>EXT</b>	<b>9 PIN</b>	<b>600</b>
Male Female	Extension Cable	Number of Pins	Cable Length

<b>M-F</b>	<b>EXT</b>	<b>9/10 PIN</b>	<b>1200</b>
Male Female	Extension Cable	Number of Pins	Cable Length



\* 2700 mm option not available in 12 pin cable, a 2000 mm will need to be ordered in its place

\*\*Maximum distance from roller to card is 3000 mm (118.11"), Ambient temperature -22~140°F (-30~60°C)

# TECHNICAL INFORMATION

## LEVEL OF CONVEYING SURFACE

If the bottom surface of the load is not flat or the conveyor rollers are not level, the Power Moller® may rotate freely and the load may not be transferred or may tend to drift. It is especially important when transferring relatively heavy loads that the static load limit of the Power Moller® is not exceeded.

Transferring light loads (less than 5kg) may be impeded by the resistance of idler rollers. Check to be sure that the idlers spin freely.

Due to packing (binding) bands, bulging of the bottom of the load, etc., the load may lean to one side during transfer. The use of rubber lagging on each end of the Power Moller® would facilitate a straight transfer of the load.

When the diameters of the roller tube and the shafts of the Power Moller® are the same as that of idler rollers, the existing shaft holes in the conveyor frame can be used without any modification. If these dimensions are not the same, the level of the Power Moller® must be adjusted by hanging the height of the shaft holes in the frame so that the load will be evenly applied to all the rollers.

## INERTIA AND INTERMITTENT OPERATION

As a result of motor inertia, the Power Moller® will not instantly stop rotating after the power is disconnected. Inertia values differ in accordance with motor type, speed, operation time as well as weight of the load.

## CHANGE IN TRANSPORTING SPEED

The peripheral velocity (transportation speed) of the Power Moller® is dependent upon the weight and material composition of the load as well as the ambient temperature. Please contact your Itoh Denki representative for additional technical information.

Care should be taken to avoid exposing the Power Moller® to excessive shock as a result of drastic load speed changes within a line or between adjoining lines. Depending on the weight and speed of the load, typically no harm is done by load speed changes within 50% of nominal Power Moller® speed. Slave driving idlers and load weights can have an effect on the speed of the Power Moller®.

## LOCKING

Because a special outer rotor is used for the Power Moller's motor, the coil will not burn out when the Power Moller® is locked under conductance for a short period of time. Repeated locking will raise the temperature of the motor coil and result in gradual deterioration of the insulation and eventually cause the motor to burn out. It's unnecessary to turn off the power when the Power Moller® is locked under conductance for a few seconds. However, if locking longer than 10 seconds is required, it is necessary to turn off the power or use the accumulation type.

Driver cards for brushless DC motors have built in motor lock protection; disabling motor drive shortly after a stall occurs. However, repeated locking will subject the motor windings to high current and eventually damage the winding insulation.

## CONTACT TIME / CYCLE TIME / DUTY CYCLE

Due to temperature rise of the coil winding, the minimum contact time during intermittent operation is approximately as specified below:

Type		Minimum Contact Time
Standard	PM486, PM570, PM605, PM635	1 second ON / 1 second OFF
	PM486XE/XP	1 second ON / 1.5 second OFF

Duty Cycle= Time on / (Time on + Time off)

### Example

Duty Cycle = 20 seconds on / (20 seconds on + 20 seconds off). Duty Cycle = 0.5 OR 50%

**Static Load**

Type	Outside Diameter of Tube		Wall Thickness of Tube			Tube Lengths - mm (in)										Thrust Load
	mm	in	mm	in	GA	200 (7.8)	250 (9.8)	300 (11.8)	400 (15.7)	500 (19.7)	600 (23.6)	700 (27.6)	800 (31.5)	900 (35.4)	1000 (39.4)	
	Maximum Static Load Per Power Moller™ - kg (lbs)															
PM486	48.6	1.91	1.4	0.05	17	65 (143)	65 (143)	65 (143)	55 (121)	45 (99)	35 (77)	30 (66)	25 (55)	20 (44)	20 (44)	30 (66)
PM570	57.0	2.25	1.6	0.06	16	120 (266)	100 (220)	100 (220)	100 (220)	80 (176)	80 (176)	60 (132)	60 (132)	50 (110)	50 (110)	
PM605	60.5	2.38	3.2	0.13	11	190 (419)	160 (353)	160 (353)	160 (353)	130 (287)	130 (287)	100 (220)	100 (220)	80 (176)	80 (176)	
PM635	63.5	2.50	3	0.12	11	Any length - 306.8 kg (675 lbs)										

**IMPACT LOADING**

In applications where the article being transferred is dropped onto the Power Moller®, reduce static load limits in the above table by 50% to compensate for the increased forces generated from impact. As the load limit will vary considerably in accordance with the intensity of impact, allow a substantial margin of safety.

For belted zone applications, please refer to belted zone guide or consult an Itoh Denki representative

# OPTIONS

\*All Itoh Denki motorized conveyor rollers are custom made to order. Option availability varies between models and some options can not be used in conjunction with others. Please contact an Itoh Denki Sales Representative for assistance in part number configuration.



## LAGGING - Natural Rubber (NR), Urethane (UR), Nitrile Rubber (NB), Neoprene (CR)

Prevents light loads from slipping and protects the surface of loads during transfer. Lagging is molded onto tube to assure permanent adhesion. Options include:

Material	Use	Color	Hardness	Option Code 48.6 mm dia.	Option Code 57.0 mm dia.	Option Code 60.5 mm dia.
Natural Rubber	General	black	60-65 durometer	<b>NR546A</b> - lagging on entire tube <b>NR546B</b> - lagging on each end of tube <b>NR546C</b> - custom lagging	<b>NR630A</b> - lagging on entire tube <b>NR630B</b> - lagging on each end of tube <b>NR630C</b> - custom lagging	<b>NR700A</b> - lagging on entire tube <b>NR700B</b> - lagging on each end of tube <b>NR700C</b> - custom lagging
Urethane	Abrasion Resistant	gray	90 durometer	<b>UR546A</b> - lagging on entire tube <b>UR546B</b> - lagging on each end of tube <b>UR546C</b> - custom lagging	<b>UR630A</b> - lagging on entire tube <b>UR630B</b> - lagging on each end of tube <b>UR630C</b> - custom lagging	<b>UR700A</b> - lagging on entire tube <b>UR700B</b> - lagging on each end of tube <b>UR700C</b> - custom lagging
Nitrile Rubber	Oil Resistant	black	60-65 durometer	<b>NB546A</b> - lagging on entire tube <b>NB546B</b> - lagging on each end of tube <b>NB546C</b> - custom lagging	<b>NB630A</b> - lagging on entire tube <b>NB630B</b> - lagging on each end of tube <b>NB630C</b> - custom lagging	<b>NB700A</b> - lagging on entire tube <b>NB700B</b> - lagging on each end of tube <b>NB700C</b> - custom lagging
Neoprene	Heat Resistant	black	60-65 durometer	<b>CR546A</b> - lagging on entire tube <b>CR546B</b> - lagging on each end of tube <b>CR546C</b> - custom lagging	<b>CR630A</b> - lagging on entire tube <b>CR630B</b> - lagging on each end of tube <b>CR630C</b> - custom lagging	<b>CR700A</b> - lagging on entire tube <b>CR700B</b> - lagging on each end of tube <b>CR700C</b> - custom lagging

## CLEAN ROOM

Designed for the handling line that requires a high degree of cleanliness, such as electronics and pharmaceuticals industries, etc.

Power Moller® Clean Room Classifications			
Model	Class 10,000	Class 1,000	Class 100
FS	Yes, no option needed	Yes, DR with SS tube, SS shaft	Yes, with WA
FE	Yes, no option needed	Yes, DR with SS tube, SS shaft	Yes, with WA
FP	Yes, no option needed	Yes, DR with SS tube, SS shaft	N/A

**WATERPROOF - WA**

Designed for the food and beverage industry, outdoor lines or lines subject to water spray (washdown). Output and attaching shafts, end caps and tubes are made of stainless steel to resist corrosion. Waterproof specification IP-65, IEC 529.

- Direct water spray to shafts in washdown application may reduce life of the roller.
- Waterproof option may affect speed and torque.
- Standard 1000 mm cable

**LOW TEMP ROLLER - LT**

Operates in temperatures down to -30°C (-22°F). Includes low temperature grease, air removal inside tube, rust-proof internal circuitry, reinforced gearbox and low temperature mechanical operation.

**DRIP PROOF - DR**

Designed for conveyor lines in high moisture areas. Rubber seals and o-rings protect internals.

- Meets or exceeds IP-55 specifications.

**BUILT-IN BRAKE - BR**

In automated conveyor lines, it is sometimes necessary to minimize coasting of the article being transferred. In these cases, the built in electro-magnetic brake should be used.

- When not powered, the built-in electro magnet uses spring force to lock the motor and prevent the tube rotation. The motor is released when the brake is powered (energized). Ordinarily, the power to the brake and motor is controlled simultaneously.

Effective Mechanical Brake				
Standard Brake DC Model	Diameter		Tangential Force (lbs)	Pinout
	(mm)	(in)		
PM486FE-5, 8, 10, 17	48.6	1.91	144.3	10 pin connector
PM486FE-20, 30, 45, 60	48.6	1.91	35.4	10 pin connector
PM486FS-5, 8, 10, 15	48.6	1.91	141.6	10 pin connector
PM486FS-20, 30, 45, 55	48.6	1.91	32.7	10 pin connector
PM486FP-5, 8, 10, 15	48.6	1.91	141.6	10 pin connector
PM486FP-20, 30, 45, 55	48.6	1.91	32.7	10 pin connector
PM635KT-16	63.5	2.5	149.5	13 pin connector
PM635KT-28	63.5	2.5	73.5	13 pin connector
PM635KT-60	63.5	2.5	35.5	13 pin connector

**CABLE OPTIONS**

- Non standard cable options are available if a longer cable is needed.\*
- “C” denotes a cable with the standard pin connector for the roller model. “Z” denotes a cable with one additional pinout, allowing our standard 9 pin rollers to be used with 10 pin driver cards. “Z” **cannot** be used with a roller that has a brake (BR) callout.

\*cable options may not be available on certain models or in combination with other options

For standard 9 pin models using 9 pin cards	
Cable Call Out	Description
C050	9 pin connector 500 mm cable
C060	9 pin connector 600 mm cable
C100	9 pin connector 1000 mm cable
C150	9 pin connector 1500 mm cable
C200	9 pin connector 2000 mm cable
C300	9 pin connector 3000 mm cable

For BR (10 pin) models using 10 pin cards	
Cable Call Out	Description
C050	10 pin connector 500 mm cable
C060	10 pin connector 600 mm cable
C100	10 pin connector 1000 mm cable
C150	10 pin connector 1500 mm cable
C200	10 pin connector 2000 mm cable
C300	10 pin connector 3000 mm cable

For 9 pin models (no BR) using 10 pin cards	
Cable Call Out	Description
Z060	10 pin connector 600 mm cable
Z100	10 pin connector 1000 mm cable
Z150	10 pin connector 1500 mm cable
Z200	10 pin connector 2000 mm cable
Z300	10 pin connector 3000 mm cable

For standard 12 pin models using 12 pin cards	
Cable Call Out	Description
C050	12 pin connector 500 mm cable
C060	12 pin connector 600 mm cable
C100	12 pin connector 1000 mm cable
C150	12 pin connector 1500 mm cable
C200	12 pin connector 2000 mm cable
C300	12 pin connector 3000 mm cable

**OTHER SPECIFICATIONS - OS**

Represents various options that can be added to a roller’s configuration including but not limited to:

- **Sprockets**- OS can be used to represent the quantity, type and location of sprockets on PM635FS, PM635KT, PM635KE and PM486FP rollers.
- **Welded keystock**- OS can be used to call out a 1/4", or 1/4" X 1/8" welded keystock on PM635FS, PM635KT, PM635KE and PM486FP rollers.
- **Non-standard groove locations**- OS can be used to call out non-standard groove locations for rollers with P1 or P2 designations. If the groove locations needed are not listed below, then the OS would need to appear after the P1 or P2 in the part number and the groove locations would need to be specified.
  - P1- standard groove at 50 mm for PM486FE, PM486FP, PM486FS, PM486FH, PM486XE/XP
  - P1- standard groove at 65 mm for PM570FE
  - P2- standard grooves at 50/32 mm for PM486FE, PM486FP, PM486FS, PM486FH, PM486XE/XP
  - P2- standard grooves at 65/30 mm for PM570FE

**MOUNTING BRACKET NOT INCLUDED - KF**

If the KF is at the end of your part number, the roller's price will not include brackets and they will need to be ordered separately.

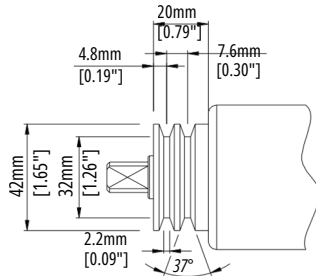
# BELT PULLEY AND GROOVES

\*Drawings shown on this page are based on a 48.6 mm roller model. End cap diameter will be proportional to the diameter of the roller ordered.



## V-BELT PULLEY (VP)/(PV)

Applicable models (VP): PM486XE, PM486XP, PM570FE

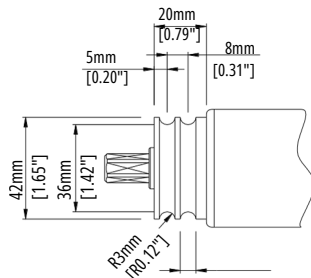


- Special end cap designed to accommodate small V-Belts
- Provides maximum clearance between Power Moller® and idler roller power transmission belts
- Spring loaded shaft is standard for all tube lengths
- Between Frame - 35 mm = Tube Length\*



## ROUND BELT PULLEY (RP)/(PR)

Applicable models (RP): PM486FE  
Applicable models (PR): PM320HS, PM486FP

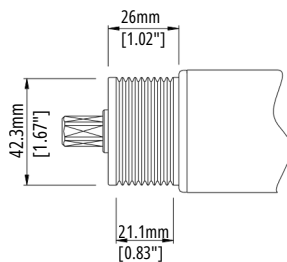


- Special end cap designed to accommodate round belts
- Provides maximum clearance between Power Moller® and idler roller power transmission belts
- Spring loaded shaft is standard for all tube lengths
- Between Frame - 35 mm = Tube Length\*



## POLY V END CAP (VG)/(GV)

Applicable models (VG): PM486FE, PM486XE, PM486XP, PM570FE, PM635FS, PM635KE, PM635KT  
Applicable models (GV): PM486FP, PM486FH

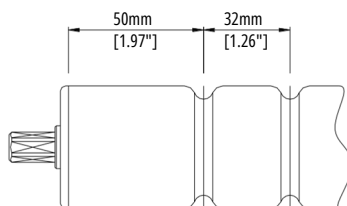


- Special end cap designed to accommodate poly V belts
- High efficiency power transmission
- Provides maximum clearance between Power Moller® and idler roller power transmission belts
- Spring loaded shaft is standard for all tube lengths
- Between Frame - 41 mm = Tube Length for PM486 series\*
- Between Frame - 66 mm = Tube Length for PM635 series



## DOUBLE GROOVED TUBE (P2)

Applicable models: ALL PM486, PM570FE



- Simple and effective power transfer design
- Groove locations are measured from the end of the tube to the center of the first groove. The second groove is measured from the center of the first groove to the center of the second
- Used with 3/16" O-rings
- Standard locations for a PM486 are 50/32 mm\*\*
- Standard locations for a PM570 are 65/30 mm\*\*

\*If using JQ shaft option, subtract an additional 6 mm  
\*\*Other groove locations are available upon request. Non-standard groove locations need a OS designation in their part number after the P2 and the locations need to be specified.

# INSTALLATION PRECAUTIONS

Important, please read before installation

Precaution	Action	Reason
Power supply	If the power supply is not sized appropriately for the number of cards/rollers it provides power to, then a low voltage condition may occur.	<ul style="list-style-type: none"> <li>• If the voltage drops below 15V DC and remains low for 1s, then the low voltage error will appear.</li> <li>• If the voltage drops below 15V DC five times in 0.5s, then the low voltage error will appear.</li> <li>• If the voltage drops below 15V DC less than five times in 0.5s or does not remain low for 1s, the roller may stutter – quickly turning off then on.</li> </ul>
Multiple power supplies	0V line of all power supplies on the same conveyor line (powering the card/rollers, & controls) need to be physically linked together	This completes the signal path from one section of the conveyor (powered by a power supply) to the adjacent section of conveyor (powered by another power supply) and allows for proper communication through the cable and external interfaces.
Voltage drop across the power bus	Use suitable gauge wire in relation to distance and current draw to prevent voltage drop. Operating DC voltage is 24V ±10%	When running long distances from a DC power supply, the voltage drop during motor operation across the power bus may be significant (may drop below 15V). If there is a large enough drop in voltage, the roller(s) may behave in a strange manner. In order to prevent this, a larger gauge wire must be used.
Grounding	Ensure the control card is securely grounded to the conveyor frame. The conveyor frame should also be at the same potential reference as earth ground. Standard grounding practices should be followed.	Static discharge may interfere and damage internal components.
Electrical	24V DC ±10% 4A maximum current limiter (motor lock is 4A) Diode protection for miswiring Sensor power short circuit protection 5A fuse for power supply protection	Improper power will damage the card. The motor/ card should not be subject to locked conditions repeatedly. Internal fuse is not replaceable. If the fuse has blown, more serious damage has occurred within the card/motor
Environment	Ambient temperature is 32~104°F Ambient humidity is < 90% RH Atmosphere has no corrosive gas Vibration is < 0.5G - Indoor use only	Extreme environmental variables may cause poor or no performance and damage the card.
Over-Speeding	Over-speeding of the roller's no-load speed by more than 50% may cause damage.	Back EMF will be generated.
Speed Variation	Speed tolerance ± 3%-10% depending on model.	

# QUALITY POLICY/WARRANTY

## Quality Policy

Based on Technology and Integrity,  
IDU will focus on continual improvements by  
establishing quality objectives which are communicated  
to IDU staff, thereby providing quality products that meet the  
customers' requirements, improving their prosperity.

## Warranty

Itoh Denki warrants its Power Mollers to be free from defects in material and workmanship under normal and proper use for a period of one year starting from the date stamped on the Power Moller.

Itoh Denki's only obligation shall be to repair or replace defective equipment which does not conform to the warranty. Itoh Denki shall not be liable for any injury, loss, or damage, direct or consequential, arising out of or the inability to use, the equipment. Before using, Buyer and/or the ultimate User shall determine the suitability of the product for its intended use and User assumes all risks and liability in connection therewith.

The foregoing may not be changed except by an agreement signed by an authorized Itoh Denki representative.

The articles that are replaced pursuant to the terms of this warranty shall be retained by Itoh Denki and the User is responsible for any freight cost relating to repair or replacement.

The foregoing warranty is exclusive and in lieu of all other warranties of quality, whether written, oral or implied (including any other warranty of merchantability or fitness for purpose).

The following are exclusions from warranty:

- If usage, adaptation, or installation are not in accordance with our installation and operating instructions.
- If the product has been opened, dismantled, or returned with clear evidence of abuse or other damage.
- If our written specifications are not properly applied by the buyer when selecting the equipment.
- If our equipment has been used to perform functions other than the functions it was designed to handle.
- If electrical accessories and other components have been used in disregard of the basic wiring diagram for which they were designed.

All costs related to installation and reinstallation of the Itoh equipment covered by this are not the responsibility of Itoh Denki. Itoh Denki will not be responsible for any consequential damages during the installation procedures.

If the Buyer resells any Itoh Denki products to another Buyer or End-user, it shall include all of the terms and provisions of this warranty in such a resale. Itoh Denki's responsibility to any such Third Party shall be no greater than Itoh Denki's responsibility under the warranty to the original Buyer.