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# PowerTilt 4.5 Service and Repair Manual

PT-4.5



**Introduction**

# Product Introduction

This manual contains instructions for the repair, disassembly and reassembly of the PowerTilt Model PT-4.5 only. For complete product, installation, service and safety information, refer to the PowerTilt Instruction, Service and Repair Manual for the PT, PTA and PTB Series.

For additional information on maintaining, servicing or repairing the PT-4.5, please contact Parker Hannifin Corporation:

E-Mail: [cylsaleshelac@support.parker.com](mailto:cylsaleshelac@support.parker.com)

Web: [www.parker.com/helac](http://www.parker.com/helac)

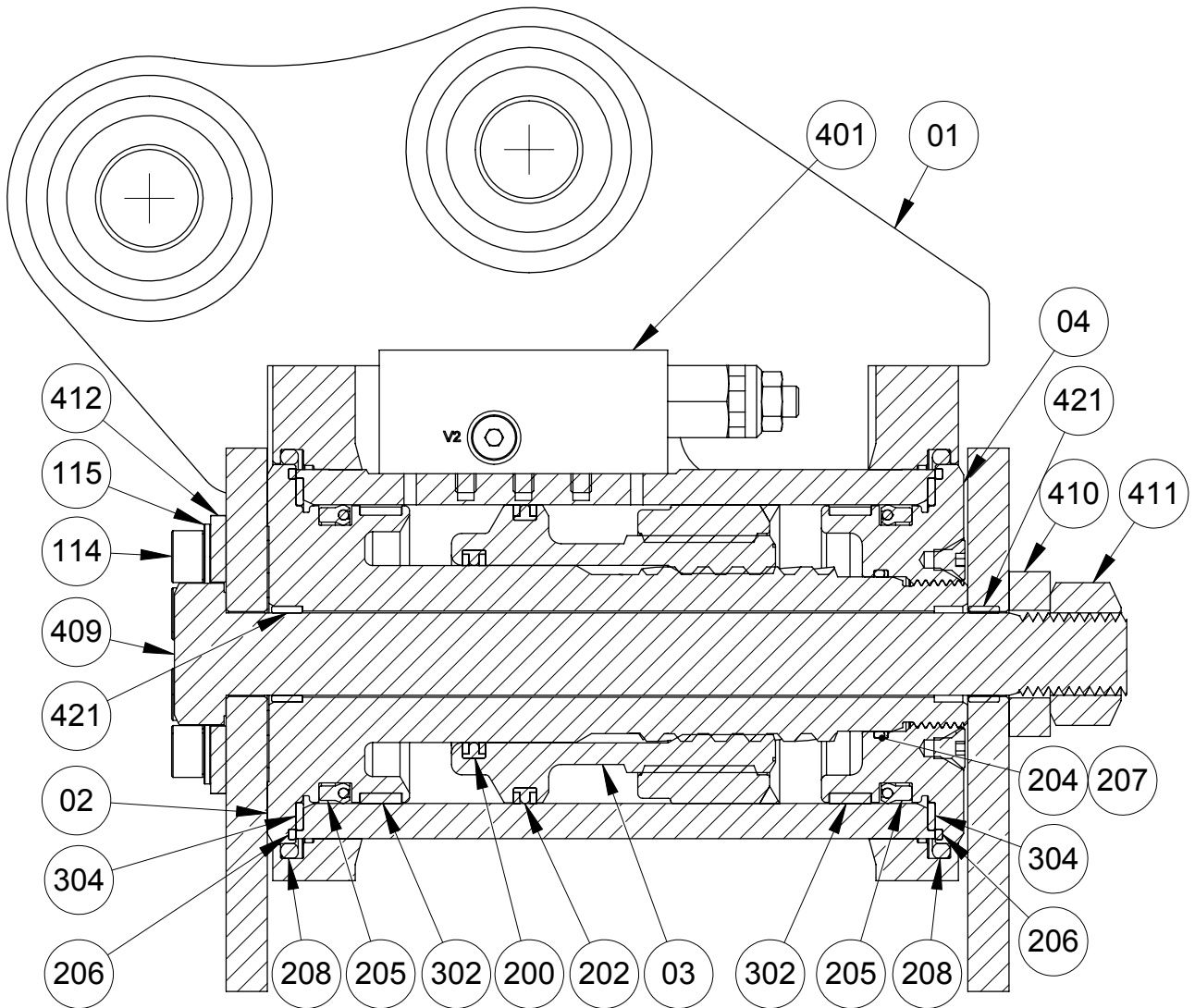
## PT-4.5 Specifications

Max Machine Weight	Approximate PowerTilt Weight*	Total Tilt	Driving Torque	Holding Torque	Required Oil Flow	Circuit Pressure Range
kg	kg		Nm @ 210 bar	Nm @ 210 bar	l/min	
1800	35	180° **	930	2470	2-4	150-250 bar

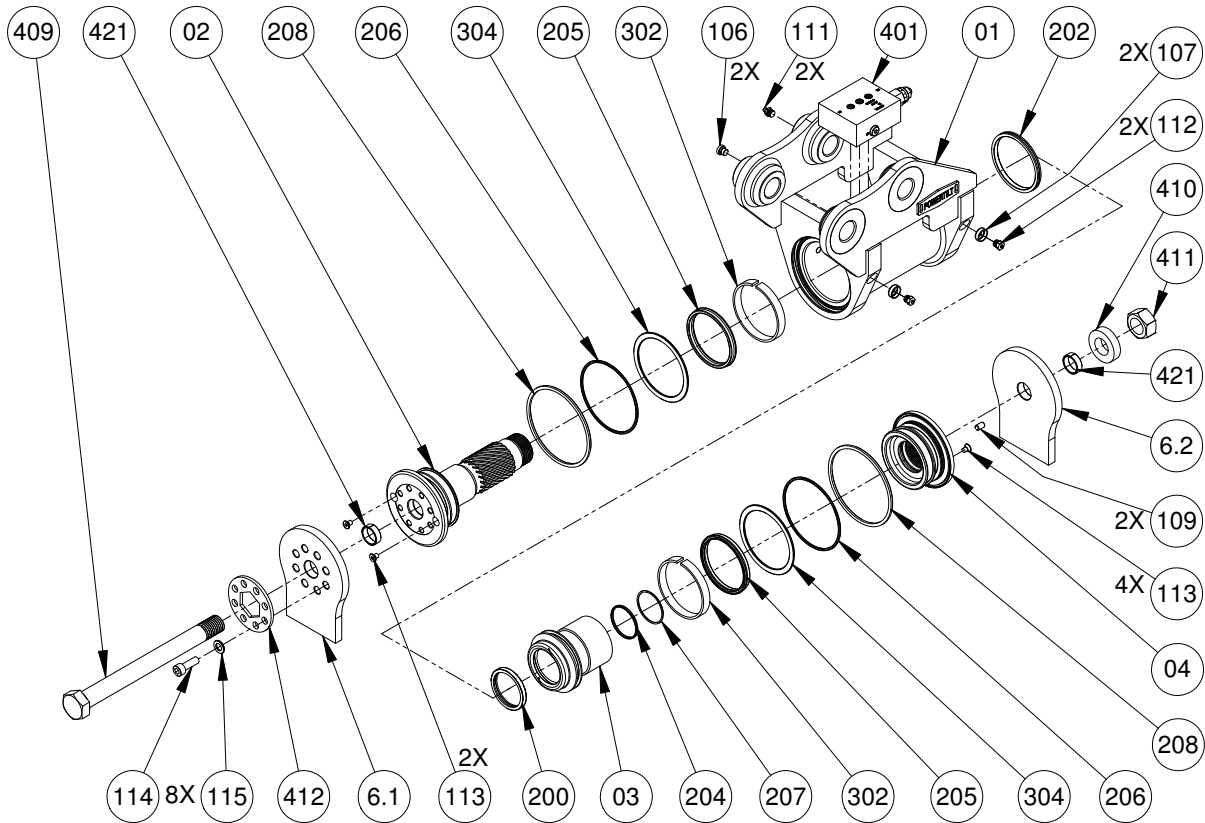
\* Weights may vary depending on model size. Approximate weights for PTA and PTB Series do not include mounting brackets or couplers.

\*\*Actual rotation may vary slightly.

# PT-4.5 Assembly Drawing



# PT-4.5 Exploded View



# Parts List - PT-4.5

## Parts

Part Number	Item #	Description	Qty
68560	01	Housing - PTA 180 degree (no side plates or bosses)	1
Obsolete	01	Housing - PTA 110 degree (no side plates or bosses)	1
27707	02	Shaft 180 Degree (8 bolt)	1
Obsolete	02	Shaft 110 Degree (10 Bolt)	1
26802	03	Piston Sleeve 180 Degree	1
Obsolete	03	Piston Sleeve 110 Degree	1
26801	04	End Cap	1
69800-H	6.1 / 6.2	Foot Kit (Standard)	1
977022	106	Port Plug (BSPP G 1/8 )	2
74897	107	**Grease Relief Valve Cover	2
27713	109	**Service and Lock Pin kit	1
936002	111	**Grease Fitting (Balcrank, 5000 Lincoln, 1/8-27 NPT)	2
938001	112	**Grease Relief Valve ( 50500, 1/8-27 NPT, Alemite 400-650 PSI)	2
958008-H	113	Set Screw (HSFHCS; 1/4"-20 x .375, Grade 8)	6
9551012	114	Torque Foot Screw (SHCS; M10-1.5-030 Grd 12.9)	8
9664001	115	Washer (M10 hardened flat washer)	10
S71503	401	Cross Port Relief Valve Assy w/ PO Checks (includes valve manifold with cartridges and items below)	1
		O-ring ( 2-012, 90 durometer Buna N)	2
		Screws (socket head 1/4"-20 - 1.50" Grd 8)	3
70811	409, 410, 411	Tie Rod Bolt Assembly	1
70681	412	Lock Plate	1
931070	421	Bushing	2

\*\*Items included in seal kit

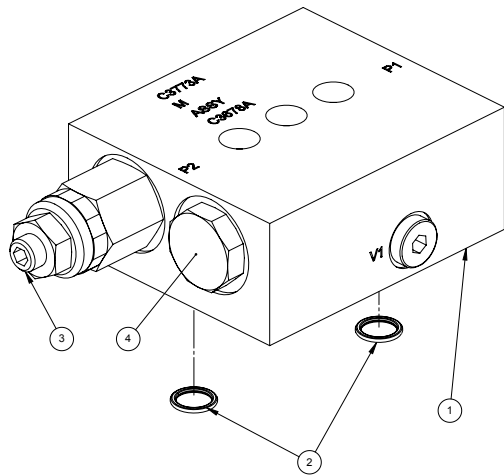
## Seal and Bearing Kits

Part Number	Item #	Description	Qty
<b>S26803-1</b>		<b>Seal Kit (parts listed below included)</b>	
	107	Grease Relief Valve Cover	2
	109	Service and lock pin kit	1
	111	Grease Fitting	2
	112	Grease Relief Valve	2
	200	Seal	1
	202	Seal	1
	204	O-Ring	1
	205	Seal	2
	206	O-Ring	2
	207	Back-up Ring	1
208	O-Ring	2	
<b>S26807-1</b>		<b>Bearing Kit (parts listed below included)</b>	
	302	Bearing	2
	304	Thrust Washer	2

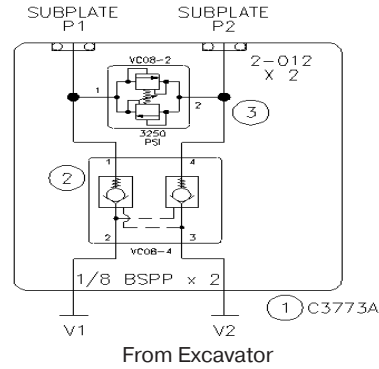
## TT-4.5 Serial Numbers that used 110 Degree Shaft and Piston Sleeve

Between Beginning #	And Ending #	Beginning Year Made	End Year Made
198856	329045	2001	2006
T210751	T210758	2002	2002
All other serial numbers use the 180 degree shaft and piston sleeve			

# Cross Port Relief Valve



Item	Description	Quantity
1	Manifold Body	1
2	O-Ring	2
3	Dual Relief	1
4	Dual PO Check	1



## DISASSEMBLY


# Disassembly



**WARNING**

**To avoid personal injury and machinery damage:**

Read the Service and Repair Manual for proper installation, maintenance and repair procedures.



**CAUTION**

**Spraying fluids:**

Contents under pressure. Wear approved eye protection. Use caution when removing port plugs and fittings.



**CAUTION**

**To avoid injury or damage to product:**

Secure product to work bench.

**NOTICE**

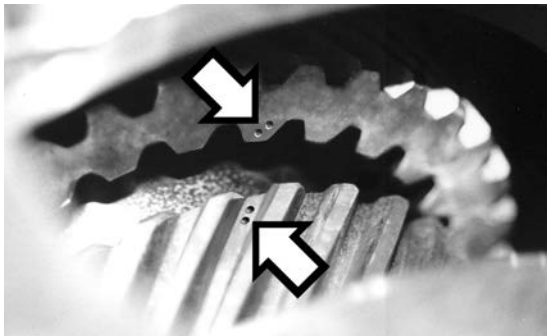
**To avoid contamination to machined parts:**

Make sure work area is clean.

**NOTICE** All numbers that appear in parenthesis ( ) in the following sections are referring to items on Page 3.

1. First remove the tie rod, washer and nut assembly (409, 410, 411, 412), cap screws (114) and washers (115) to remove the lower coupler, bucket, attachments and/or other assemblies.
2. Next remove the port plugs (106) and drain the oil. Inspect the oil for signs of contamination, i.e. water, metal shavings.
3. During the end cap removal process, begin with removing the set screws (113) that cover the end cap lock pins (109). Using a 4 mm drill bit, drill a hole in the center of each lock pin to a depth of approximately 9.5 mm. Remove the lock pins using a screw extracting tool. Insert two appropriately sized screws and service pins in the grease ports. Unthread the end cap (4) by turning it counterclockwise using a pry bar. Remove the end cap and set aside for inspection.
4. Rotate the shaft (2) and piston sleeve (3) so both components are flush with the ring gear inside the housing (1). Do not remove the

# Disassembly



shaft; it must remain in the housing so that gear timing marks can be located in Step 5.

5. Locate the timing marks on the piston sleeve (3) gearing and shaft (2). Every PowerTilt has two sets of small punched timing marks that indicate timing between the gear sets. One set indicates the timing between the shaft (2) and the piston sleeve (3) as seen in the photo above (the shaft timing marks may be located in the root or “V” of the gearing). The second set indicates timing between the piston sleeve and the housing (1) as seen in the photo below.



6. Prior to removing the shaft (2), use a felt marker to highlight the punched timing marks between the shaft and piston sleeve (3) as seen in the photo below to simplify timing when the PowerTilt is reassembled. Rotate the shaft (2) counterclockwise until it disengages from the piston sleeve (3) and can be removed. Gently



tap the end of the shaft with a plastic mallet and mandrel if needed.

7. As in Step 6 above, before removing the piston sleeve (3), mark the housing (1) ring gear in relation to the piston sleeve outside diameter gear with a marker as seen in the photo below. Be sure to gently push the piston sleeve (3) out of the housing (1) until the gear teeth just come out of engagement with the housing gear teeth. Then remove the



piston sleeve (3). Use a plastic mallet and mandrel if necessary. Avoid scratching or denting the inside of the housing bore.

8. Remove all seals, bearings and thrust washers from the end cap (4), shaft (2), piston sleeve (3) and housing (1). Note their order and orientation to aid assembly.

**NOTICE**

It is not necessary to remove the valve block and cartridge unless leakage is suspected.

# Assembly

**NOTICE** Replace all seals, bearings and thrust washers (304) as required.

1. Before installation, coat the seals and machined surfaces with a high quality hydraulic oil.
2. Coat the end cap (4) threads and both sides of the thrust washers (304) with lithium grease.
3. Install all the seals, bearings and thrust washers on the end cap (4), piston sleeve (3) shaft (2) and housing (1). Refer to the Assembly Drawing on Page 2 and PT-4.5 Exploded View on Page 3 for correct locations and orientations.
4. Carefully insert the piston sleeve (3) into the housing (1) until it contacts the housing ring gear. Rotate the piston sleeve until the timing marks applied to the piston and housing during the disassembly process align. Using a plastic mallet or mandrel, tap the piston into the housing until the gear teeth contact.

5. Insert the shaft (2) into the piston sleeve (3), aligning the timing marks of the shaft with the piston sleeve. Once the timing marks are verified, rotate the shaft inward until the pressure seal (205) contacts the housing (1). Then tap gently to compress the seal and rotate the shaft into the housing.

**NOTICE** As the shaft is installed, be careful not to disengage the piston sleeve and housing gearing.

6. Thread the end cap (4) onto the shaft (2). Using a pry bar, tighten the end cap until the lock pin (109) holes align. Then insert the lock pins (109) into the holes with the dimple side up. Using a punch, tap the lock pins to the bottom of the hole. Insert the set screws (113) over the lock pins and tighten to 2.8 Nm. Install the port plugs (106).

## Fastener Torque Specifications

### Torque Values for Port Plugs and Fittings

Plug Size	Torque Value - Steel Plug / Fitting in Steel Port Nm	Torque Value - Steel Plug / Fitting in Aluminum Manifold Nm
BSPG G1/8	18 +/- 1	10 +/- 1

### Torque Values for Metric Fasteners

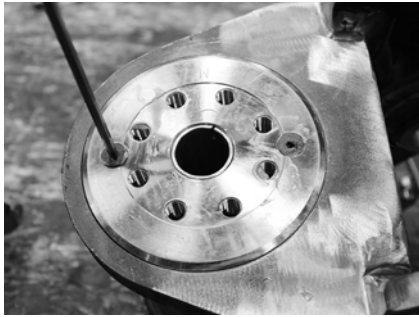
Fasteners	Socket Head Bolt (grd 12.9) Nm	Hex Head Bolt (grd 10.9) Nm	Jam Nut (grd 12.9) Nm
M10 x 1,50	60 +/- 3	44 +/- 3	27 +/- .2
M12 x 1,75	103 +/- 5	75 +/- 4	41 +/- .3
M16 x 2,00	258 +/- 7	187 +/- 5	54 +/- .5
M20 x 2,50	502 +/- 20	365 +/- 14	61 +/- 1
M24 x 3,00	868 +/- 27	630 +/- 20	68 +/- 2
M30 x 3,50	1 723 +/- 41	1 253 +/- 34	

## Greasing and Testing

### Greasing

After the actuator is assembled but before it is put into service, the thrust washer area must be packed with Lithium grease.

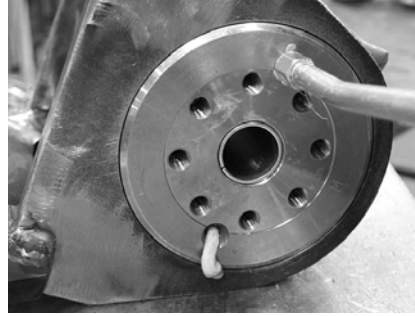
1. There are two grease ports located on both the shaft flange and the end cap. They are plugged with cap screws (113) or set screws. Remove the grease port screws from the shaft flange and end cap. (See exploded view on page 4)



#### NOTICE

If a hydraulic test bench is not available, the actuator can be rotated by hand, open the pressure ports and use a pry bar with cap screws inserted into the shaft flange to turn the shaft in the desired direction.

2. Insert the tip of a grease gun into one port and apply grease to the shaft flange. Continue applying until grease flows from the opposite port. Cycle the actuator five times and apply grease again. Repeat this process on the end cap. Insert the cap screws into the grease ports and tighten to 25 in-lbs. (2.8 Nm).



### Testing

If the equipment is available, the PowerTilt should be tested on a hydraulic test bench. The breakaway pressure — the pressure at which the shaft begins to rotate — should be approximately 28 bar. Cycle the actuator at least 25 times at 210 bar pressure.

#### Testing for internal leakage

Connect hydraulic lines to the housing ports. Bleed all air from the PowerTilt. Rotate the shaft to the end of rotation at 210 bar and maintain pressure. Remove the hydraulic line from the non-pressurized side. Continuous oil flow from the open housing port indicates internal leakage across the piston or cross port relief valve. Replace the line and rotate the shaft to the end of rotation in the opposite direction. Repeat the test procedure outlined above for the other port. If there is an internal leak, disassemble, inspect and repair.

## Install Quick Coupler

1. Install coupler on PowerTilt. Insert 8 ea. M10 screws (114) with washers (115) through lock plate (412) and torque to 68 Nm (50 ft-lbs).



2. Insert screw (409), 1" tie-rod bolt through center of PowerTilt from the torque foot end, install spacer (410) and lock-nut (411) and torque to 920 Nm (680 ft-lbs).



# Maintenance

## Daily

1. Grease the thrust washers at the two grease fittings with a high quality Lithium-based grease. Apply grease until clean grease flows from the grease reliefs. Severe operating conditions such as abrasive dust or prolonged submersion in water may require more frequent grease applications.
2. Make sure the grease reliefs are functioning properly. Open or replace non-functioning grease reliefs immediately.

### NOTICE

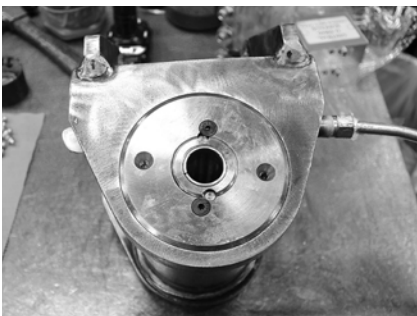
Never replace the grease relief valves with grease fittings or plugs.

### NOTICE

Do not operate the PowerTilt if the grease reliefs are not functioning.

## Monthly

Check shaft end play. When the end play exceeds 0.38 mm, the end cap must be tightened.



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4. **Warranty.** The warranty for the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of eighteen (18) months from the date of delivery or 2,000 hours of use, whichever occurs first; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the date of completion of the Services; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end-user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **EXEMPTION CLAUSE; DISCLAIMER OF WARRANTY, CONDITIONS, REPRESENTATIONS: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY, CONDITION, AND REPRESENTATION, PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, CONDITIONS, AND REPRESENTATIONS, WHETHER STATUTORY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THOSE RELATING TO DESIGN, NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED. UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER, THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".**

5. **Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

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7. **Confidential Information.** Buyer acknowledges and agrees that any technical, commercial, or other confidential information of Seller, including, without limitation, pricing, technical drawings or prints and/or part lists, which has been or will be disclosed, delivered or made available, whether directly or indirectly, to Buyer ("Confidential Information"), has been and will be received in confidence and will remain the property of Seller. Buyer further agrees that it will not use Seller's Confidential Information for any purpose other than for the benefit of Seller.

8. **Loss to Buyer's Property.** Any tools, patterns, materials, equipment or information furnished by Buyer or which are or become Buyer's property ("Buyer's Property"), will be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer ordering the Products manufactured using Buyer's Property. Furthermore, Seller shall not be responsible for any loss or damage to Buyer's Property while it is in Seller's possession or control.

9. **Special Tooling.** "Special Tooling" includes but is not limited to tools, jigs, fixtures and associated manufacturing equipment acquired or necessary to manufacture Goods. Seller may impose a tooling charge for any Special Tooling. Such Special Tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in the Special Tooling, even if such Special Tooling has been specially converted or adapted for manufacture of Goods for Buyer and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property owned by Seller in its sole discretion at any time.

10. **Security Interest.** To secure payment of all sums due from Buyer, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect Seller's security interest.

11. **User Responsibility.** Buyer, through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and any technical information provided with the Quote or the Products, such as Seller's instructions, guides and specifications. If Seller provides options of or for Products based upon data or specifications provided by Buyer, Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event Buyer is not the end-user of the Products, Buyer will ensure such end-user complies with this paragraph.

12. **Use of Products; Indemnity by Buyer.** Buyer shall comply with all instructions, guides and specifications provided by Seller with the Quote or the Products. Unauthorized Uses. If Buyer uses or resells the Products in

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13. **Cancellations and Changes.** Buyer may not cancel or modify, including but not limited to movement of delivery dates for the Products, any order for any reason except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage and any additional expense. Seller, at any time, may change features, specifications, designs and availability of Products.

14. **Limitation on Assignment.** Buyer may not assign its rights or obligations without the prior written consent of Seller.

15. **Force Majeure.** Seller is not liable for delay or failure to perform any of its obligations by reason of events or circumstances beyond its reasonable control. Such circumstances include without limitation: accidents, labor disputes or stoppages, government acts or orders, acts of nature, pandemics, epidemics, other widespread illness, or public health emergency, delays or failures in delivery from carriers or suppliers, shortages of materials, war (whether declared or not) or the serious threat of same, riots, rebellions, acts of terrorism, fire or any reason whether similar to the foregoing or otherwise. Seller will resume performance as soon as practicable after the event of force majeure has been removed. All delivery dates affected by force majeure shall be tolled for the duration of such force majeure and rescheduled for mutually agreed dates as soon as practicable after the force majeure condition ceases to exist. Force majeure shall not include financial distress, insolvency, bankruptcy, or other similar conditions affecting one of the parties, affiliates and/or sub-contractors.

16. **Waiver and Severability.** Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice either party's right to enforce that provision in the future. Invalidation of any provision of these Terms shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.

17. **Termination.** Seller may terminate any agreement governed by or arising from these Terms for any reason and at any time by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms, (b) becomes or is deemed insolvent, (c) appoints or has appointed a trustee, receiver or custodian for all or any part of Buyer's property, (d) files a petition for relief in bankruptcy on its own behalf, or one is filed against Buyer by a third party, (e) makes an assignment for the benefit of creditors; or (f) dissolves its business or liquidates all or a majority of its assets.

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20. **Governing Law.** These Terms and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.

21. **Entire Agreement.** These Terms, along with the terms set forth in the main body of any Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale and purchase. In the event of a conflict between any term set forth in the main body of a Quote and these Terms, the terms set forth in the main body of the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. These Terms may not be modified unless in writing and signed by an authorized representative of Seller.

22. **Compliance with Laws.** Buyer agrees to comply with all applicable laws, regulations, and industry and professional standards, including those of the United States of America, and the country or countries in which Buyer may operate, including without limitation the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti-Kickback Act"), U.S. and E.U. export control and sanctions laws ("Export Laws"), the U.S. Food Drug and Cosmetic Act ("FDCA"), and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), each as currently amended. Buyer agrees to indemnify, defend, and hold harmless Seller from the consequences of any violation of such laws, regulations and standards by Buyer, its employees or agents. Buyer acknowledges that it is familiar with all applicable provisions of the FCPA, the Anti-Kickback Act, Export Laws, the FDCA and the FDA and certifies that Buyer will adhere to the requirements thereof and not take any action that would make Seller violate such requirements. Buyer represents and agrees that Buyer will not make any payment or give anything of value, directly or indirectly, to any governmental official, foreign political party or official thereof, candidate for foreign political office, or commercial entity or person, for any improper purpose, including the purpose of influencing such person to purchase Products or otherwise benefit the business of Seller. Buyer further represents and agrees that it will not receive, use, service, transfer or ship any Products from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws. Buyer agrees to promptly and reliably provide Seller all requested information or documents, including end-user statements and other written assurances, concerning Buyer's ongoing compliance with Export Laws. 8/20



**Notes**



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Tel: +43 (0)7224 66201

### AZ – Azerbaijan, Baku

Tel: +994 50 2233 458

### BE/NL/LU – Benelux,

Hendrik Ido Ambacht  
Tel: +31 (0)541 585 000

### BY – Belarus, Minsk

Tel: +48 (0)22 573 24 00

### CH – Switzerland, Etoy

Tel: +41 (0)21 821 87 00

### CZ – Czech Republic,

Prague  
Tel: +420 284 083 111

### DE – Germany, Kaarst

Tel: +49 (0)2131 4016 0

### DK – Denmark, Ballerup

Tel: +45 43 56 04 00

### ES – Spain, Madrid

Tel: +34 902 330 001

### FI – Finland, Vantaa

Tel: +358 (0)20 753 2500

### FR – France, Contamine s/Arve

Tel: +33 (0)4 50 25 80 25

### GR – Greece

Tel: +30 69 44 52 78 25

### HU – Hungary, Budaörs

Tel: +36 23 885 470

### IE – Ireland, Dublin

Tel: +353 (0)1 466 6370

### IL – Israel

Tel: +39 02 45 19 21

### IT – Italy, Corsico (MI)

Tel: +39 02 45 19 21

### KZ – Kazakhstan, Almaty

Tel: +7 7273 561 000

### NO – Norway, Asker

Tel: +47 66 75 34 00

### PL – Poland, Warsaw

Tel: +48 (0)22 573 24 00

### PT – Portugal

Tel: +351 22 999 7360

### RO – Romania, Bucharest

Tel: +40 21 252 1382

### RU – Russia, Moscow

Tel: +7 495 645-2156

### SE – Sweden, Borås

Tel: +46 (0)8 59 79 50 00

### SL – Slovenia, Novo Mesto

Tel: +386 7 337 6650

### TR – Turkey, Istanbul

Tel: +90 216 4997081

### UK – United Kingdom, Warwick

Tel: +44 (0)1926 317 878

### ZA – South Africa,

Kempton Park  
Tel: +27 (0)11 961 0700

## North America

### CA – Canada, Milton, Ontario

Tel: +1 905 693 3000

### US – USA, Cleveland

Tel: +1 216 896 3000

## Asia Pacific

### AU – Australia, Castle Hill

Tel: +61 (0)2-9634 7777

### CN – China, Shanghai

Tel: +86 21 2899 5000

### HK – Hong Kong

Tel: +852 2428 8008

### IN – India, Mumbai

Tel: +91 22 6513 7081-85

### JP – Japan, Tokyo

Tel: +81 (0)3 6408 3901

### KR – South Korea, Seoul

Tel: +82 2 559 0400

### MY – Malaysia, Shah Alam

Tel: +60 3 7849 0800

### NZ – New Zealand, Mt Wellington

Tel: +64 9 574 1744

### SG – Singapore

Tel: +65 6887 6300

### TH – Thailand, Bangkok

Tel: +662 186 7000

### TW – Taiwan, Taipei

Tel: +886 2 2298 8987

## South America

### AR – Argentina, Buenos Aires

Tel: +54 3327 44 4129

### BR – Brazil, Sao Jose dos Campos

Tel: +55 080 0727 5374

### CL – Chile, Santiago

Tel: +56 22 303 9640

### MX – Mexico, Toluca

Tel: +52 72 2275 4200

## European Product Information Centre

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