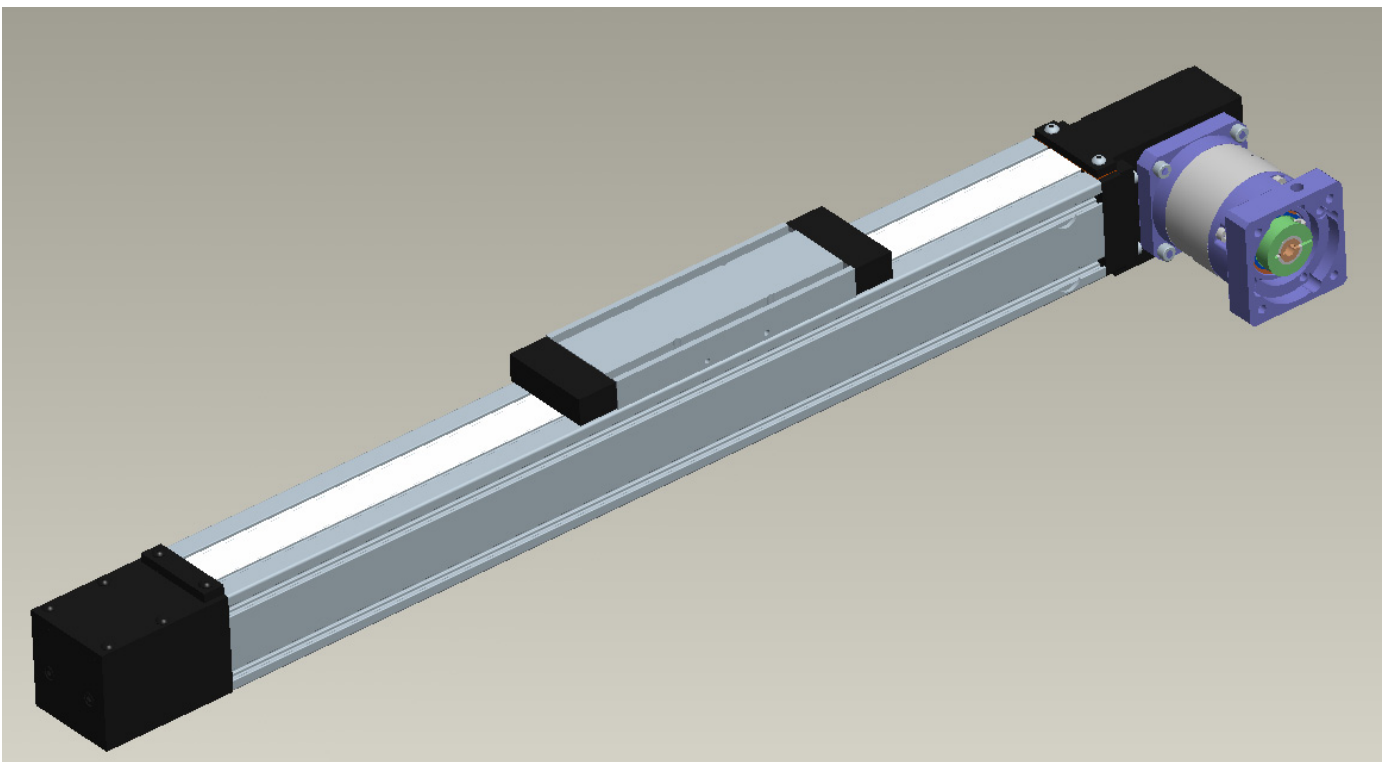


# HLE60 SERIES LINEAR DRIVES

## INSTALLATION , OPERATION , AND MAINTENANCE MANUAL

MANUAL NO. 100-5312-01 REV 5

HLE60 SR -SQUARE RAIL VERSION  
HLE60 RB- ROLLER WHEEL BEARING VERSION



**REVISION NOTES:**

**REV 4 1-20-2006**

CHANGED REVISION CODE FROM NUMBERS TO LETTERS  
UPDATED BELT TENSION PHOTO  
PG 32 PART#'S AND DESCRIPTIONS

**REV 5 3-12-2007**

COMPLETE UPDATE OF MANUAL TO HLE60 GEN2

 **WARNING**

**FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.**

This document and other information from Parker Hannifin Corporation, its subsidiaries, and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

## TABLE OF CONTENTS

|   |           |                                    |              |
|---|-----------|------------------------------------|--------------|
| <b>1 SAFETY</b> .....                                       | <b>4</b>  | <b>5 HLE60 CONFIGURABLE</b> .....  | <b>24-25</b> |
| 1.1 GENERAL.....  | 4         | <b>6 ASSEMBLIES HLE60RB</b> .....  |              |
| 1.2 IDENTIFICATION.....                                     | 4         | HLE60RB.....                       | 26           |
| 1.3 END USER SAFETY NOTICE.....                             | 4         | HLE60RB-NL- CARRIAGE.....          | 27           |
| 1.4 SAFETY OPERATING.....                                   | 5         | HLE60RB-VL-CARRIAGE.....           | 28           |
| 1.5 ADVICE ON PARTICULAR DANGERS.....                       | 5         | ARO/ALO-HLE60RB.....               | 29           |
| 1.6 UNAUTHORISED MODIFICATION.....                          | 5         | ARW/ALW-HLE60RB.....               | 30           |
| 1.7 HANDLING TRANSPORTING.....                              | 5         | MBR./MBL-HLE60RB.....              | 31           |
| <b>2 TECHNICAL DATA</b> .....                               | <b>6</b>  | MRW/MLW-HLE60RB.....               | 32           |
| 2.1 PRODUCT CONSTRUCTION.....                               | 6         | WBO-HLE60RB.....                   | 33           |
| 2.2 TECHNICAL DATA.....                                     | 7         | WRO/WLO-HLE60RB.....               | 34           |
| 2.3 CARRIAGE LOADING SR.....                                | 8         | TESION STATION HLE60RB.....        | 35           |
| 2.4 CARRIAGE LOADING RB.....                                | 9         | <b>7 ASSEMBLIES HLE60SR</b> .....  |              |
| 2.5 DIMENSIONS.....   | 10        | HLE60SR.....                       | 36           |
| 2.5.1 DIMENSIONS HLE60RB.....                               | 10        | HLE60SR-NL- CARRIAGE.....          | 37           |
| 2.5.2 DIMENSIONS HLE60SR.....                               | 11        | HLE60SR-VL-CARRIAGE.....           | 38           |
| <b>3 INSTALLATION</b> .....                                 | <b>12</b> | ARO/ALO-HLE60SR.....               | 39           |
| 3.1 GENERAL.....  | 12        | ARW/ALW-HLE60SR.....               | 40           |
| 3.2 SUBSTRUCTURE PREPARATION.....                           | 12        | MBR./MBL-HLE60SR.....              | 41           |
| 3.3 INSTALLING.....   | 12        | MRW/MLW-HLE60SR.....               | 42           |
| 3.3.1 INSTALLING SINGLE AXIS.....                           | 12        | WBO-HLE60SR.....                   | 43           |
| 3.3.2 IINSTALLING DUAL AXIS.....                            | 13        | WRO/WLO-HLE60SR.....               | 44           |
| 3.4 LIMIT SWITCHES.....                                     | 13        | TESION STATION HLE60SR.....        | 45           |
| 3.4.1 GENERAL.....  | 13        | <b>8 GEARBOX INFORMATION</b> ..... |              |
| 3.4.2 SETTING UP END OF TRAVELS.....                        | 14        | GEARBOX TECHNICAL INFO.....        | 46           |
| <b>4 MAINTENANCE</b> .....                                  | <b>15</b> | GEARBOX MOMENT OF INERTIAS.....    | 47           |
| 4.1 MAINTENANCE SCHEDULE.....                               | 15        | GEARBOX DIMENSIONAL.....           | 48           |
| 4.2 REPLACEMENT INTERVAL STRIP SEAL/<br>WEARING PARTS.....  | 15        | GEARBOX SHAFT LOADING.....         | 48           |
| 4.3 ABNORMAL TIMING BELT WEAR.....                          | 16        | MOTOR MOUNTING.....                | 49           |
| 4.4 MAINTENANCE & REPAIR.....                               | 17        |                                    |              |
| 4.4.1 SAFETY NOTICE.....                                    | 17        |                                    |              |
| 4.5 REPLACING, TENSIONING, AND<br>ALIGNING TIMINGBELTS..... | 17        |                                    |              |
| 4.5.1 GENERAL INFORMATION.....                              | 17        |                                    |              |
| 4.5.2 REPLACING TIMING BELT.....                            | 17        |                                    |              |
| 4.5.2 TENSIONING TIMING BELT.....                           | 17        |                                    |              |
| 4.5.2 CHECKING ADJUSTING BELT<br>TENSION.....               | 17        |                                    |              |
| 4.5.3 MEASURING TIMING BELT.....                            | 18        |                                    |              |
| 4.5.4 TIMING BELT TRACKING.....                             | 18        |                                    |              |
| 4.6 CARRIAGE.....   | 19        |                                    |              |
| 4.6.1 CHECKING CARRIAGE PLAYRB.....                         | 19        |                                    |              |
| 4.6.2 ADJUSTING CARRIAGE WHEELS.....                        | 19        |                                    |              |
| 4.6.3 CHECKING CARRIAGE PLAYSR.....                         | 20        |                                    |              |
| 4.6.4 CHANGING BEARING BLOCK SR.....                        | 20        |                                    |              |
| 4.6.5 LUBRICATION SR.....                                   | 21        |                                    |              |
| 4.6.6 REPLACING SQUARE RAIL SR.....                         | 21        |                                    |              |

## Safety

### 1.1 General





It is the responsibility of the end user to ensure that equipment is installed and operated in accordance with both local and federal safety codes and guidelines.

The user must ensure that the attachment of workpieces/tools or other devices on the moving carriage of the linear unit does not endanger persons and/or property.

### 1.2 Symbols and Definitions used within this document

Special attention with regard to the safety of personnel, equipment and property should be considered when one or more of the symbols listed below are shown in this document. During equipment installation and operation, any area/condition considered unsafe should be identified by posting appropriate signs or placards.

#### Safety notices used:

|   |                |   |
|---|----------------|---|
|    | <b>Danger</b>  | Dangerous situation - can lead to death or serious physical injury if not otherwise prevented by corresponding safety measures.                     |
|   | <b>Warning</b> | Possible dangerous situation - can lead to possible serious injury if not otherwise prevented by corresponding safety measures.                     |
|  | <b>Caution</b> | Possible dangerous situation - can lead to minor physical injury or damage to property if not otherwise prevented by corresponding safety measures. |
|  | <b>Note</b>    | Important product information - special handling instructions or indicates a certain section of the handbook to which you should refer.             |

#### 1.2.1 Operating personnel

The following work should only be carried out by trained and authorized personnel:

- Installation and calibration of the linear drive.
- Connection of safety limit switches.
- Installation and start-up of motors and drives.

### 1.3 End User Safety notices

Supervisors, Technicians, and Installation personnel should familiarize themselves with chapters on "Safety" and "Installation" of this document prior to Installation/operation of equipment.

**1.4 Safety notice for operating personnel**

Operating personnel must inspect linear drive unit(s)/machine once per shift for any signs of visible damage or loose hardware. Do not operate equipment suspected of erratic behavior or unusual noise levels.

Parker has specially designed components and accessories. Use only genuine Parker replacement parts. Use of unauthorized parts can effect machine performance and safety.

We accept no liability for damages arising through the use of non-genuine parts and accessories.

We accept no liability for safety features removed or disabled.

Use Federal and local safety requirements/regulations during installing and operation.

**1.5 Advice on particular dangers**



HLE linear drives must be supported at the prescribed minimum distances (see Chapter 3.2).

Stand clear of moving parts

**1.6 Unauthorized conversions and modifications**

Linear drive units can not be altered in any manner that will affect safety. Any unauthorized alterations will exclude any liability on the part of Parker.

**1.7 Handling and Transporting**

|   |                |   |
|---|----------------|---|
|  | <b>Danger</b>  | When lifting, stand clear of suspended load(s)!<br>Ensure parts subject to movement do not move off-center or shift out of position.  |
|  | <b>Caution</b> | When transporting long axes, permanent deformation of the aluminum profile due to deflection can result if not supported properly. Changes in profile straightness can adversely affect the performance of the moving carriage. |

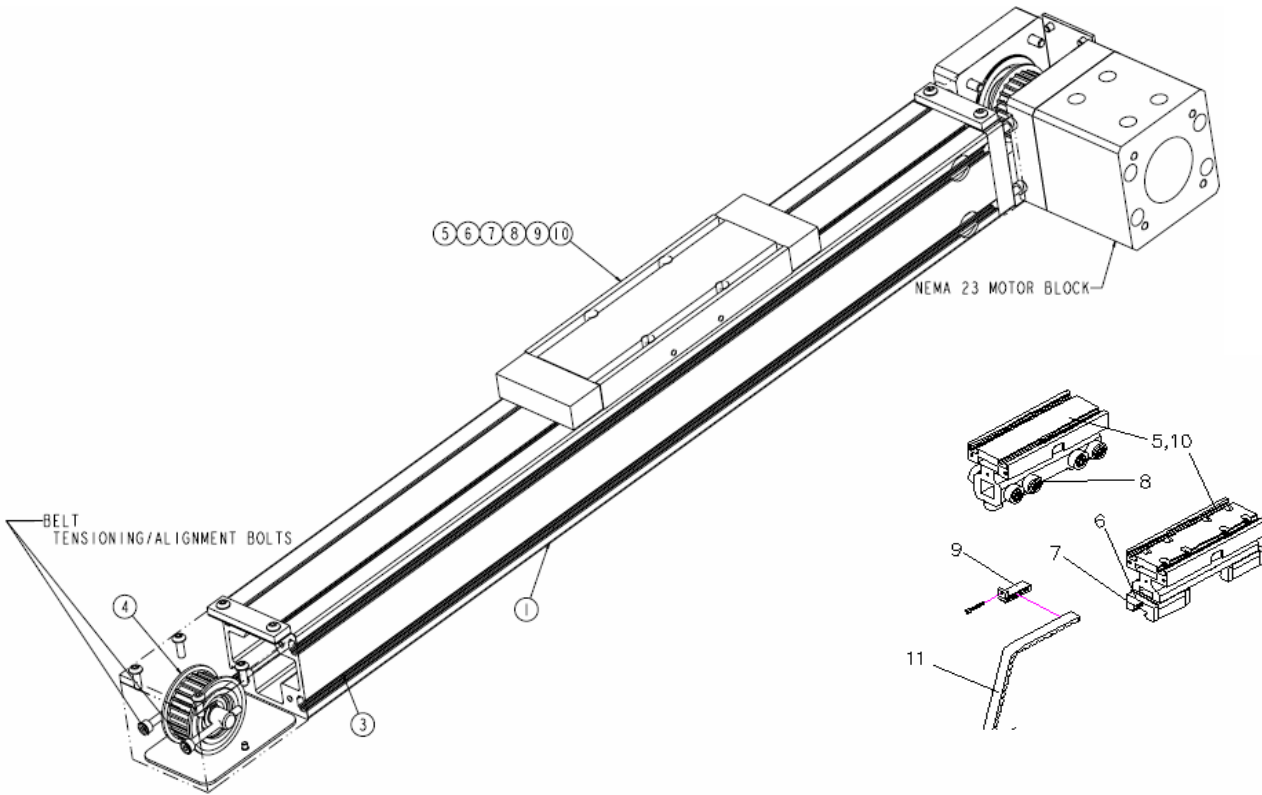
Always use transport equipment with adequate lifting capacity. Lifting straps or ropes must not be twisted, knotted, or frayed. If several ropes are used, all should be under equal tension.

An estimate of weight on the HLE 60 Series can be made as follows:

|                       | <u>Weight</u> |           |
|-----------------------|---------------|-----------|
|                       | HLE 60 SR     | HLE 60 RB |
| Basic Unit (0 Travel) | 20.3 kg       | 17 kg     |
| Each additional Meter | 5.5 Kg        | 3.62 kg   |

60 Series transportation weight (with motor and gearbox)

**Figure 1:** Reference value for HLE



**Aluminum profile (1)**

Main body of drive unit, with 4 External integrated “T” slots, running the entire length. Provides the support structure for drive unit. All profiles are anodized coated.

**Running surfaces SR & RB**

Steel square rail bolted within profile (1) for **Square Rail** version and extruded guidance system for wheels of **Roller Bearing** version.

**Plastic “T” Slot cover (3)**

Protects “T” slot from dirt. Contains wiring when “T” slots are used as conduit.

**Flanged Drive Pulley (4)**

Transfers drive torque to timing belt (11) and simultaneously guides the belt.

**Carriage (5)**

**Positioned by the timing belt, the**

**Bearing Blocks SR (6)**

Linear bearings specifically designed to transport heavy loads at high speeds make up the **SR** version. Rides on a precision square rail running the length of profile.

**Lubrication system (7)**

Lubrication fittings located on both ends of the carriage provide easy access for lubrication.

**Carriage Wheels RB (8)**

Totally enclosed, permanently lubricated ball bearings with polymer treads provide smooth and quiet high speed positioning on the **RB** version. Rides on extruded internal channels within the profile.

**Timing belt holding bracket (9)**

Secures timing belt within carriage. Makes changing timing belt possible without having to dismantle the load attachment plate (10). Provides method of adjusting timing belt tension. Note : The new tension bolts on idler end should be used for belt tensioning and alignment on GEN2 HLE60

**Load attachment plate (10)**

Aluminum profile with integrated “T” slots and cavity for passage of steel cover strip.

**Timing belt (11)**

Slip-free polyurethane timing belt reinforced with inlaid steel-cord. Used to provide power transmission between drive pulley and carriage.

**Drive station (12)**

Provides flange mounting on both sides of housing and flexibility in the options available:

**Motor block or PV60 Direct Mounting as standard options**

**Left shaft (WLO) / Right shaft (WRO) / Double shaft (WBO)**

Fixed mounting of drive pulley through a keyed shaft positioned between ball-bearing sets.

## 2.2 Technical data

| HLE60 Linear Drive | Unit | HLE 60 |    |
|--------------------|------|--------|----|
|                    |      | RB     | SR |

### Dimensions, mass moments of inertia

| Dimension of base unit, 1m stroke                 |                   |      |      |
|---|-------------------|------|------|
| Carriage + load attachment plate NL               | kg                | 0.8  | 1.8  |
| Carriage + load attachment plate VL               | kg                | 1.3  | 2.1  |
| Mass of drive profile                             | kg/m              | 5.1  | 5.5  |
| Mass moment of inertia related to the drive shaft |                   |      |      |
| Normal carriage NL                                | kgcm <sup>2</sup> | 3.07 | 3.52 |
| Extended carriage VL                              | kgcm <sup>2</sup> | 4.81 | 5.2  |

### Travel and speeds

|   |                  |       |       |
|---|------------------|-------|-------|
| Maximum travel speed <sup>1</sup>             | m/s              | 5.0   | 3.0   |
| Maximum acceleration <sup>1</sup>             | m/s <sup>2</sup> | 10.0  |       |
| Maximum travel distance, normal carriage NL   | mm               | 3,048 | 3,048 |
| Maximum travel distance, extended carriage VL | mm               | 2,896 | 2,896 |

### Geometrical data

|                                  |                   |                      |      |
|----------------------------------|-------------------|----------------------|------|
| Cross-section                    | mm x mm           | 57.2 x 57.2          |      |
| Moment of inertia I <sub>x</sub> | cm <sup>4</sup>   | 55.8                 | 48.3 |
| Moment of inertia I <sub>y</sub> | cm <sup>4</sup>   | 56.2                 | 59.5 |
| Modulus of elasticity            | N/mm <sup>2</sup> | 0.72*10 <sup>5</sup> |      |

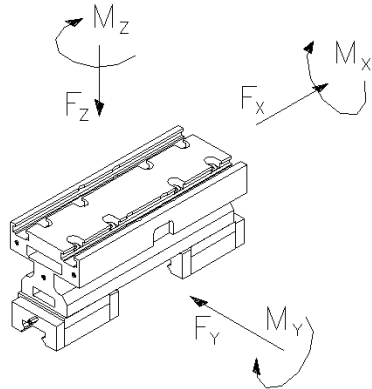
### Pulley data, torque's and forces

|  |        |        |  |
|--|--------|--------|--|
| Travel distance per revolution                   | mm/rev | 125    |  |
| Pulley diameter                                  | mm     | 39.8   |  |
| Belt weight                                      | g/mm   | 00.107 |  |
| Peak drive torque <sup>2</sup>                   | Nm     | 8.87   |  |
| Max. belt traction <sup>2</sup> (effective load) | N      | 668    |  |
| Repeatability                                    | mm     | 0.2    |  |

<sup>1</sup> Higher speeds and accelerations are possible. Please consult factory.

<sup>2</sup> increased tension of timing belt necessary.

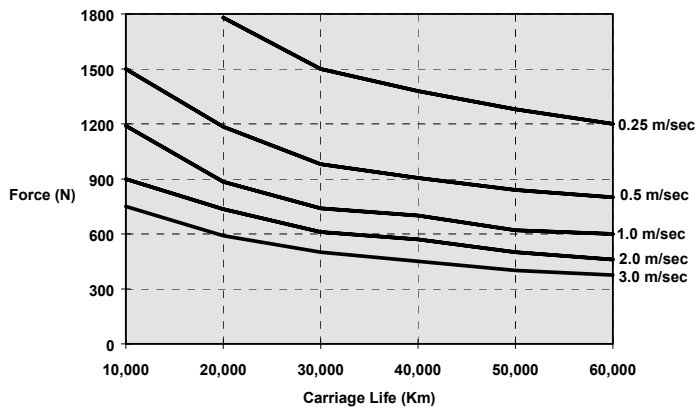
### 2.3 HLE 60 SR Carriage loads and timing belt



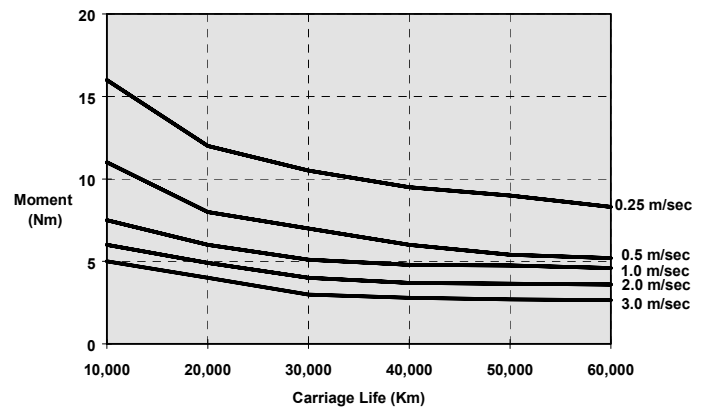
Forces transferred by the carriage and timing belt are speed dependent. Curves shown in graphs are valid for the normal carriage (NL).

Curves show the maximum load-bearing capacity of a carriage in one direction of force or torque. If several loads are applied from different directions, values stated in the curves **may not be fully exploited**, i.e. the load or speed should be reduced if necessary.

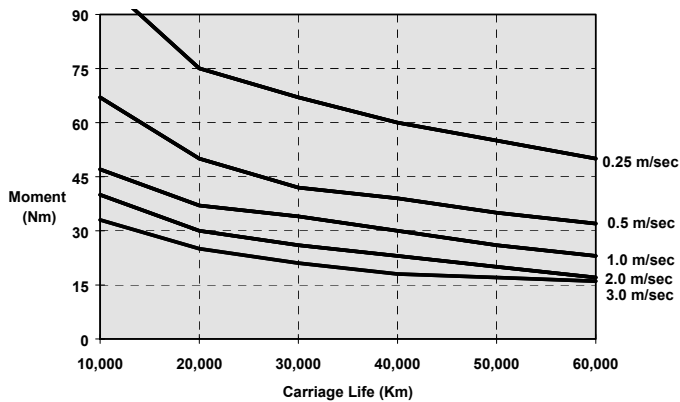
Life vs. Load  
HLE60SR Fz & Fy Normal & Side Loads



Life vs. Moment Load  
HLE60SR Mx

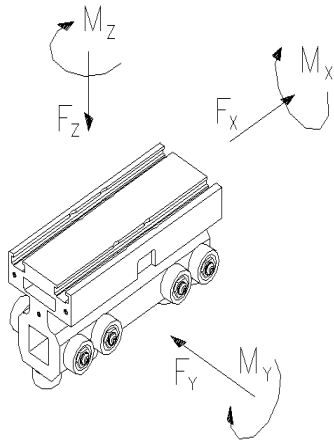


Life vs. Moment Load  
HLE60SR My & Mz



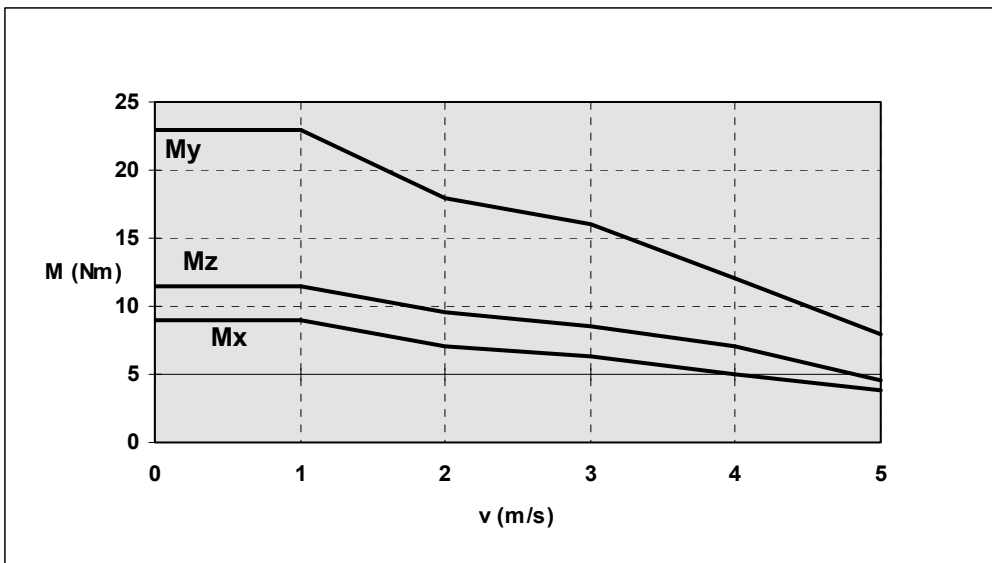
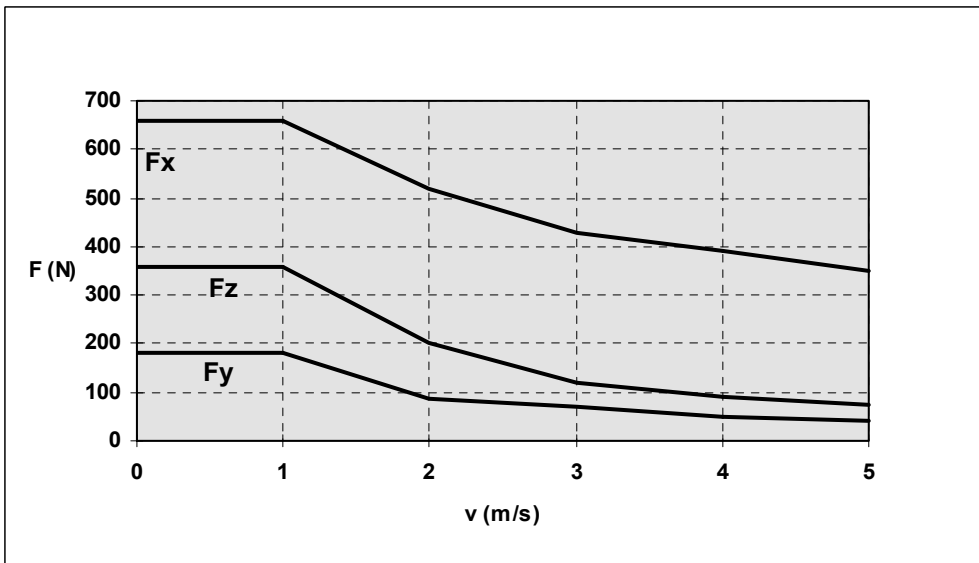


2.4 HLE 60 RB Carriage loads and timing belt strength



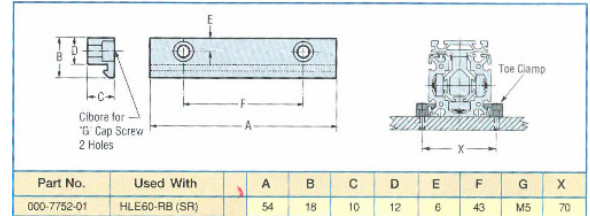
Forces transferred by the carriage and timing belt are speed dependent. Curves shown in graphs are valid for the normal carriage (NL). For extended carriages (VL), all values except for  $F_x$  (load-bearing capacity of timing belt) can be doubled if the load is applied in pairs or distributed uniformly along length of carriage.

Curves show the maximum load-bearing capacity of a carriage in one direction of force or torque. If several loads are applied from different directions, values stated in the curves **may not be fully exploited**, i.e. the load or speed should be reduced if necessary.



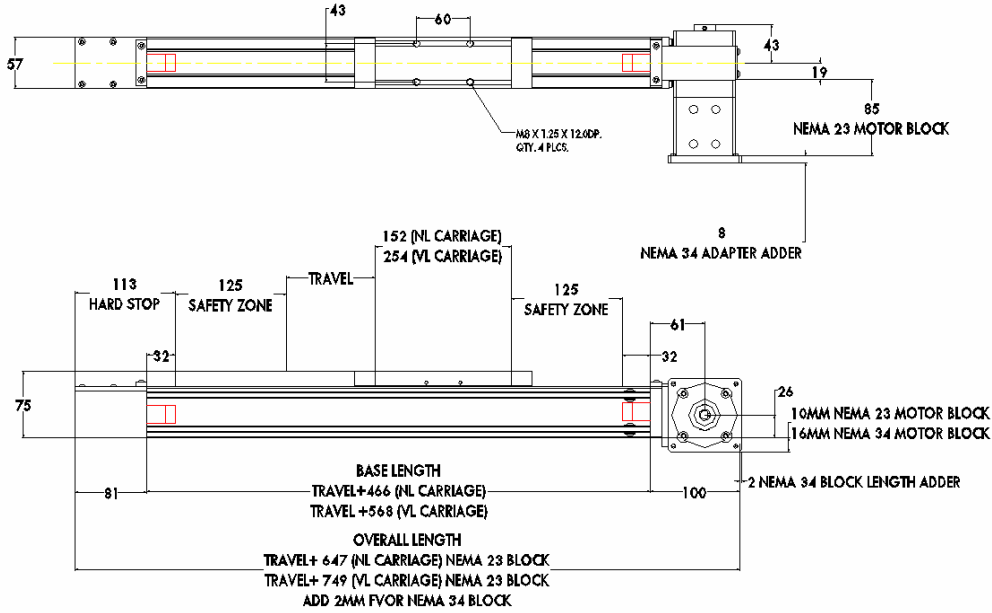
2.5 Dimensions

2.5.2 Dimensios HLE 60 RB Drive unit



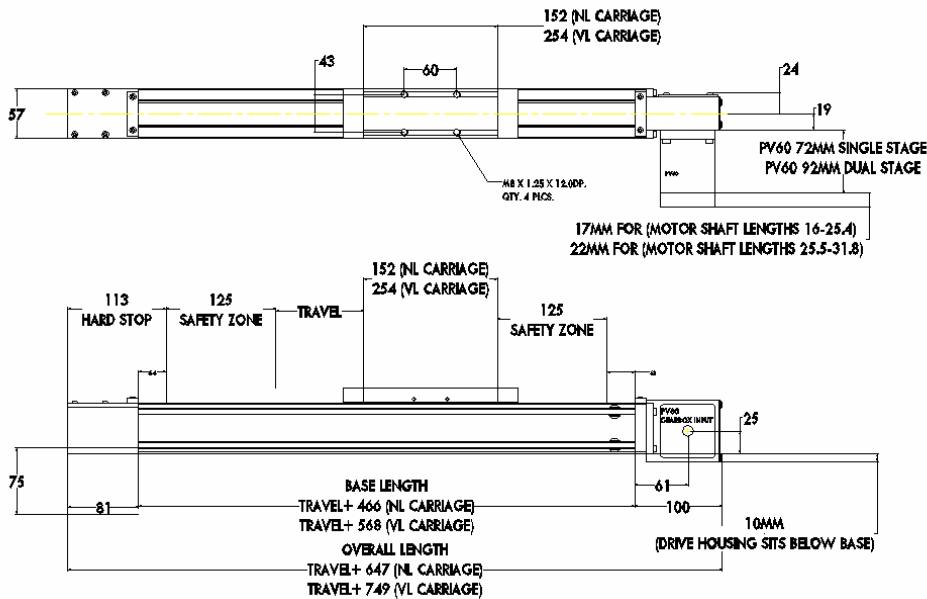
HLE60RB WITH NEMA MTR BLOCK OPTION

NOTE: SHOWN AS MBR  
MBL IS MIRROR IMAGE



HLE60RB WITH PV60 DIRECT DRIVE

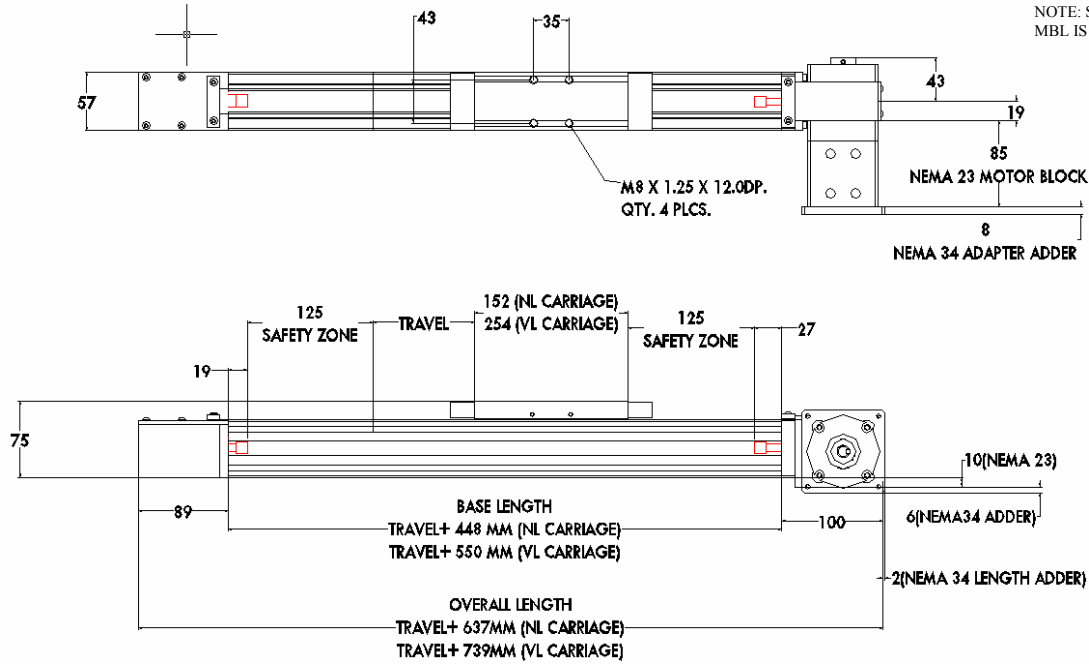
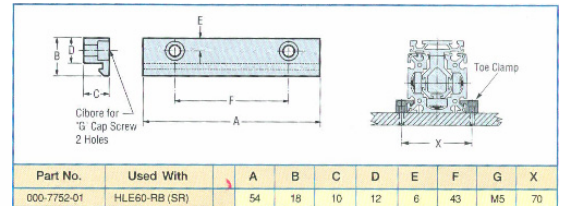
NOTE: SHOWN AS ARO  
ALO IS MIRROR IMAGE



2.5 Dimensions

2.5.1 Dimensios HLE 60 SR Drive unit

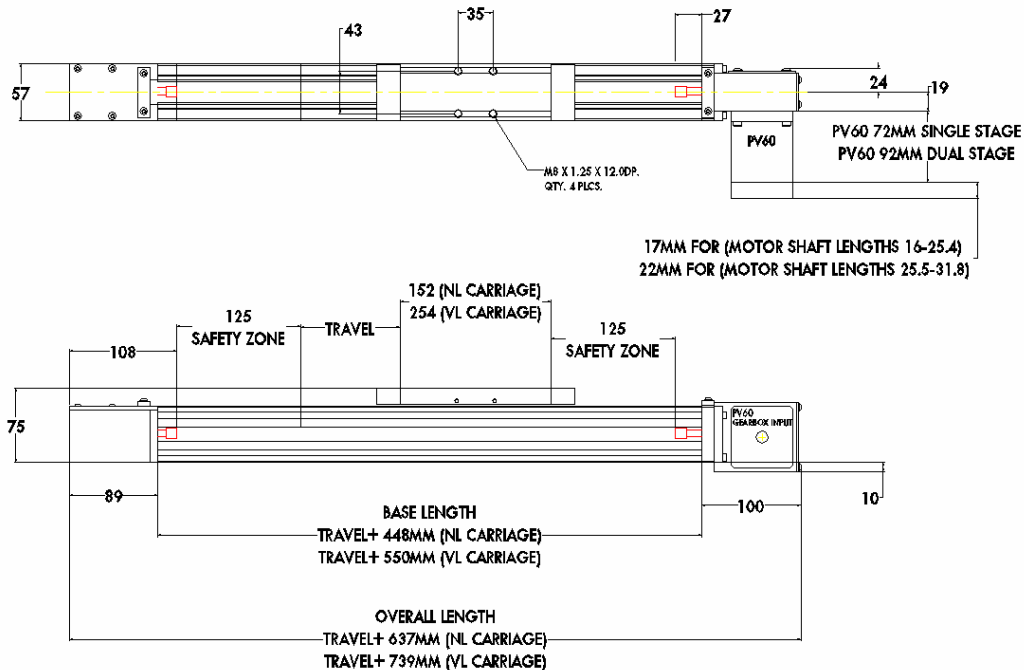
HLE60SR WITH NEMA MTR BLOCK OPTION



NOTE: SHOWN AS MBR  
MBL IS MIRROR IMAGE

HLE60SR WITH PV60 DIRECT DRIVE

NOTE: SHOWN AS ARO  
ALO IS MIRROR IMAGE



## 3 Installation


### 3.1 General

Single HLE linear drive units ordered with limit switches will be supplied completely assembled and mechanically ready for operation.

HLE double axes will be supplied dismantled for delivery and safety reasons. (Assembly instructions can be found in chapters 4.10).

Unless otherwise noted, motors should always be mounted in accordance to the motor manufacturer's specifications.


Unless otherwise specified, the standard installation of the linear drive is horizontal, with open slot in profile facing up.


|   |             |   |
|---|-------------|---|
|  | <b>Note</b> | In vertically mounted applications, the drive station should be at the top of the unit, placing belt tension between drive pulley and load. |
|---|-------------|---|


### 3.2 Substructure preparation

- Each point of support must be level and plane parallel to 0.2 mm.
- All points of support must be aligned to one another with parallelism not to exceed 0.5 mm.
- For double drive units, a one axis parallelism of 0.2 mm must be guaranteed.
- Ideal distance between supports provides drive deflection of 1 mm per meter, see catalog for reference dimensions.
- To simplify leveling, points of HLE drive support can include a series of adapter plates that can be leveled using adjustment screws.

### 3.3 Installing

|   |                |   |
|---|----------------|---|
|  | <b>Caution</b> | Permanent deformation of long drive units can occur if handled improperly. Twisted and bent profile can affect the performance of the carriage. |
|---|----------------|---|

|   |             |  |
|---|-------------|--|
|  | <b>Note</b> | During installation, plastic film tape may be used to cover the slot opening to prevent contamination by dirt and debris (does not apply to units equipped with cover system). |
|---|-------------|--|

|   |             |  |
|---|-------------|--|
|  | <b>Note</b> | Always make provisions for easy access to the belt tension adjustment screws and carriage assembly for maintenance purposes! |
|---|-------------|--|

#### 3.3.1 Installing a single axis

1. Remove drive unit from crate, strip off protective film and inspect for transportation damage.
2. Place protective tape over drive slot (does not apply to units equipped with cover system).
3. Place HLE on pre-leveled connection points (use leveling instrument).
4. Secure drive using clamping profiles within the "T"-slot grooves of profile. Do not drill into profile!
5. Attach equipment to load plate.
6. Remove dust cover (adhesive film).

### 3.3.2 Installing a double axis

1. Remove drive unit from crate, strip off protective film and inspect for transportation damage.
2. Place protective tape over drive slot (does not apply to units equipped with cover system).
3. Place HLE's on pre-leveled connection points (use leveling instrument).
4. Secure motor driven HLE using clamping profiles within the "T"-slot grooves of profile.  
Do not drill into profile!
5. Install second drive (non-driven axis) same as in step #4, but do not tighten fasteners.
6. Measure for parallelism using tape measurer [Figure 2 left].
7. Check squareness with diagonal measurement (tape measurer) [Figure 2 right]. If adjustment is needed, correct by moving non-driven axis.
8. Check horizontal orientation of both axes to one another (use leveling instrument), and correct by moving non-driven axis.
9. Install connecting axle shaft (does not apply if second axis is an idler unit).
10. Remove the dust cover (adhesive film).
11. Tighten all hardware.

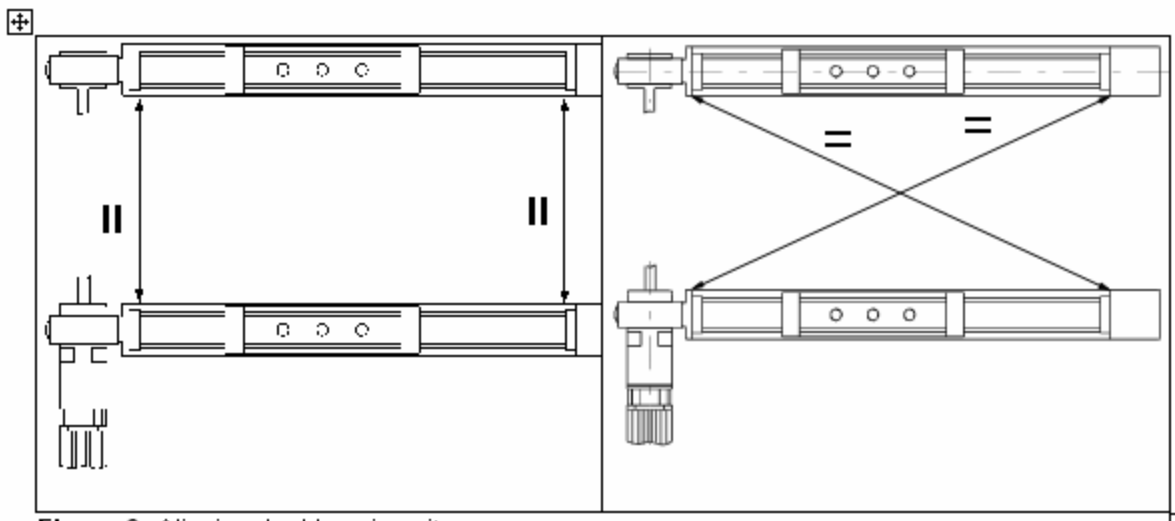




Figure 2: Aligning double axis unit

### 3.4 Limit Switches/Sensors


#### 3.4.1 General

- HLE's supplied with limit switches are pre-mounted to the unit but must be properly adjusted to customer requirements.

|   |             |  |
|---|-------------|--|
|  | <b>Note</b> | Requirements for switches/sensors when connecting motors and drives vary depending on manufacturer. Consult driver/controller manual for switch configuration. |
|---|-------------|--|

|   |             |  |
|---|-------------|--|
|  | <b>Note</b> | <b>Recommendation:</b> A minimum end of travel safety distance of <b>125mm</b> should be maintained. |
|---|-------------|--|

3.4.2 Setting up end of travel limits

|   |   |
|---|---|
|  | <p><b>Note</b></p> <p>Unless otherwise specified, the tripping magnet and initiator switches are mounted on the motor/gearbox side of the unit.</p> |
|---|---|

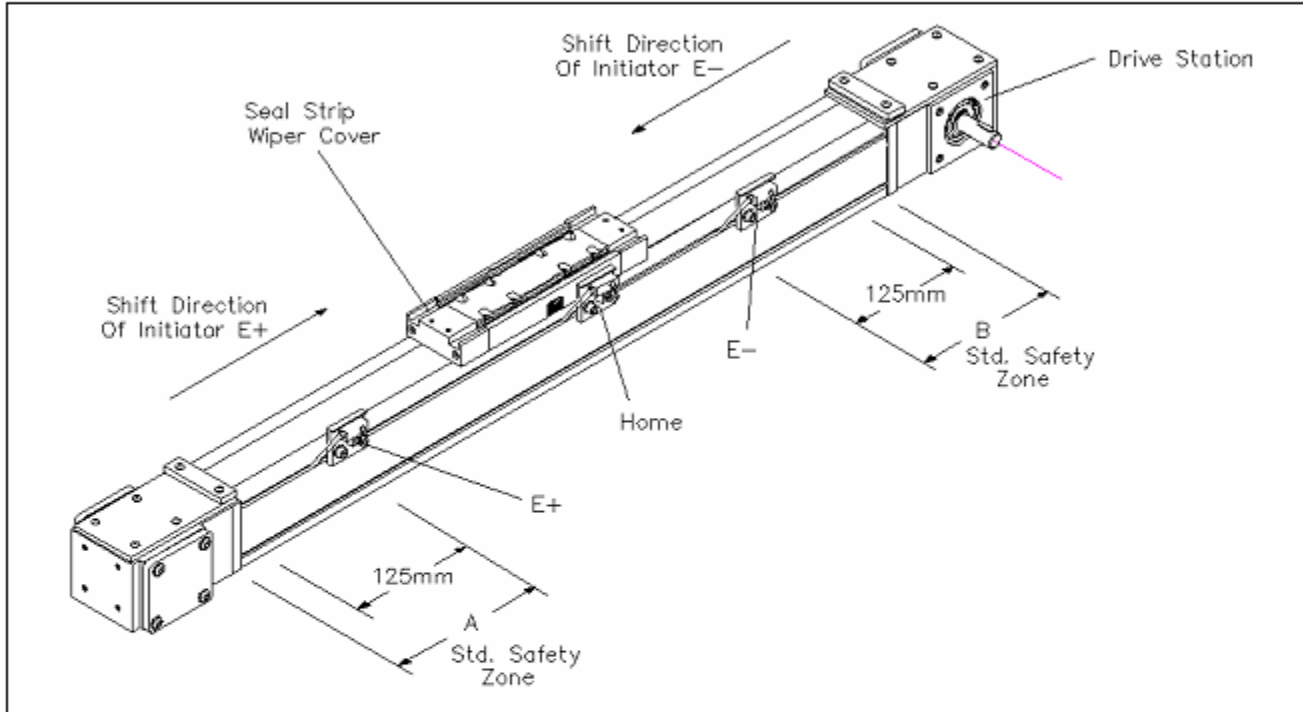


Figure 3: Limit Switches (initiators): setting up end of travel limits and safety zones.

| Dimen-<br>sions | Unit | HLE 60 SR/RB with cover seal |               |
|-----------------|------|------------------------------|---------------|
|                 |      | Std. Carriage                | Ext. Carriage |
| <b>A</b>        | mm   | 220                          | 283           |
| <b>B</b>        | mm   | 220                          | 283           |

Table 1: Distances for setting up the limit switches (initiators), based on 125 mm safety zone

## 4 Maintenance

### 4.1 Maintenance schedule

| When             | What         | Action   | Reference                      |
|------------------|--------------|--|--------------------------------|
| After Start-up   | Timing belt  | Check belt tension, tracking and adjustment.   | Chapter 4.5.4 & 4.5.5          |
| One week,        | Timing belt  | Measure timing belt tension. If tension is less than 0.9 x the operating tension, increase timing belt tension to 1.1 x the operating tension.   | Chapter 4.5.4                  |
| Daily            | Entire drive | Depending on the application, clean all affected parts (internal, tensioning station, drive station).  |                                |
| Every six months | Bearings     | For HLE 60 SR, lubricate carriage bearing blocks (see Note below).<br>For HLE 60 RB, check carriage side play.   | Chapter 4.6.6<br>Chapter 4.6.2 |
|                  | Timing belt  | Check tension.<br>Visually inspect timing belt for wear. Excessively worn belts should be replaced. For abnormal timing belt wear, see chapter 4.3, for possible cause(s) and cure(s). | Chapter 4.5.4 & 4.5.5          |

**Table 2:** HLE 60 maintenance schedule

**Note:For HLE60SR Only.** Use only LITHIUM HYDROXYSTEARATE SOAP BASE containing additives to enhance oxidation resistance and rust protection. (SHELL ALVANIA RL2)

**CAUTION: Never mix petroleum base, with synthetic base lubricants.** For special or severe service conditions, consult factory.

### 4.2 Replacement interval for steel strip cover wearing parts

| Travel   | What              | Action  | Reference      |
|----------|-------------------|---------|----------------|
| 3750 km  | Felt wiper bar    | Replace | Chapter 4.11.4 |
| 22000 km | Steel cover strip | Replace | Chapter 4.11.1 |

**Table 3:** HLE 60 wearing parts with steel strip cover

### 4.3 Abnormal timing belt wear

Several factors can cause abnormal timing belt wear. Determination of the type of belt wear may allow for the specification of a particular cause. The following table shows possible causes for typical cases:

| Observation   | Probable Cause  | Cure   |
|---|---|--|
| <b>Abnormal wear on belt tooth flank.</b>                             | Tension too high.   | Change timing belt, adjust tension (see 4.5.3).  |
|   | Drive torque too high.  | Check drive characteristics.   |
| <b>Abnormal wear on belt sides.</b>                                   | Incorrect timing belt tracking.   | Change timing belt, adjust tension (see 4.5.3).  |
|   | Edge of roller/pulley deformed.   | Change belt pulleys.   |
| <b>Shearing of belt teeth.</b>  | Tension too low.  | Change timing belt, adjust tension (see 4.5.3).  |
|   | Overload or system crash.   |  |
| <b>Tears in belt teeth or abnormal wear on loaded tooth profiles.</b> | Incorrect belt tension.   | Change timing belt, adjust tension (see 4.5.3).  |
|   | Overload.   | Change timing belt, adjust tension (see 4.5.3).<br>Check if load is greater than drive units capability.                                     |
|   | Aging of belt material.   | Change timing belt, adjust tension (see 4.5.3).  |
| <b>Broken timing belt.</b>  | Incorrect belt tension.   | Change timing belt, adjust tension (see 4.5.3).  |
|   | Overload.   | Change timing belt, adjust tension (see 4.5.3).<br>Check if load is greater than drive units capability.                                     |
| <b>Softening of belt material.</b>                                    | Operating temperature too high.   | Change timing belt, adjust tension (see 4.5.3).<br>Lower operating temperature.  |
|   | Contact with solvents.  | Change timing belt, adjust tension (see 4.5.3).<br>Do not clean belt with solvents.  |
| <b>Belt skipping over pulley, loss of machine zero point.</b>         | Tension too low<br>Incorrect motor position (bottom) in vertical application. | Adjust tension to correct value.<br>If possible, have drive on top. Alternative: increase tension or reduce loads in longitudinal direction. |

Table 2: Abnormal belt wear



## 4.4 Maintenance and repair

### 4.4.1 Safety notices

Before performing maintenance and/or repair, ensure the main electrical disconnect switch for the equipment being worked on is in the "OFF" position and secured with padlock(s). If additional automation equipment is in operation within the work area, barriers, fences or other means must be taken to ensure safety.

Where it is necessary to disconnect or remove safety devices during maintenance, such devices must be refitted and tested prior to placing equipment back in operation.

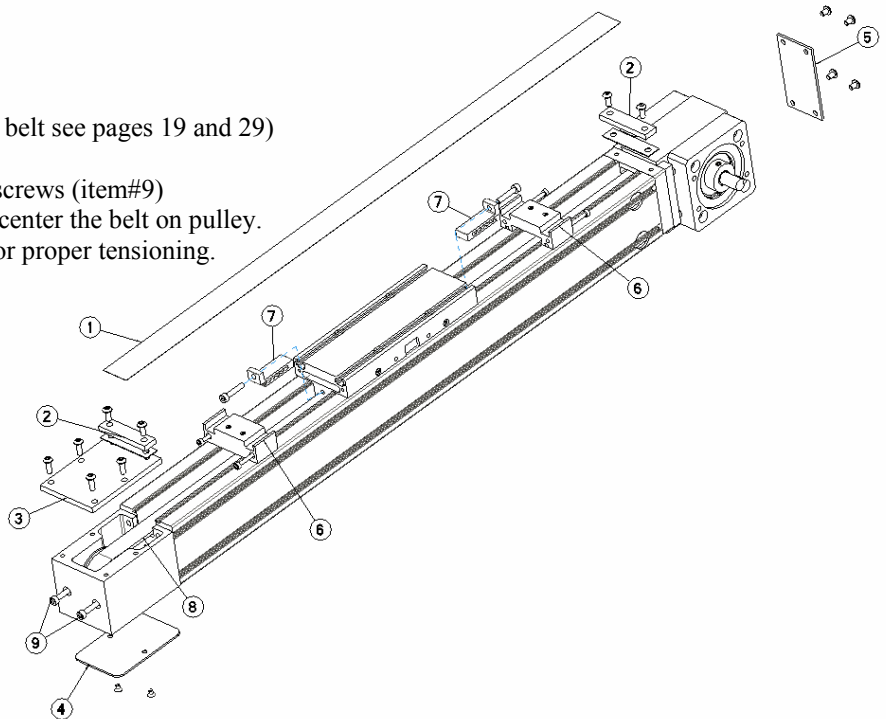
## 4.5 Replacing, tensioning and aligning timing belts

### 4.5.1 General information

- Unpack new timing belts immediately. Store flat on their side, in a coiled circular shape at room temperature in a dry place.
- Timing belts must not be kinked.
- The pitch of timing belt and mating pulley teeth must be the same.
- Long-term temperatures at a maximum of 178° F (80° C) are permitted.
- Store linear drives in a clean dry environment.

### 4.5.2 Replacing timing belt

1. Remove end caps (item#6)
2. Remove strip seal clamps(item#2)
3. Remove strip seal (item#1)
4. Remove cover plates (items#3,4,5)
5. Remove belt clamps (item#7)
6. Remove belt (item#8)
7. Measure existing belt (If you do not have old belt see pages 19 and 29)
8. Replace with belt of same length
9. Align/track and tension belt with tensioning screws (item#9)  
Run carriage from end to end repeatedly and center the belt on pulley.
10. Use tension meter and values on next page for proper tensioning.



### 4.5.3 Measuring timing belt tension

#### Belt tension measuring device RSM

The RSM belt tension measuring device calculates the oscillation frequency of the free running belt length. This is a very fast and easy method of tensioning any type of timing belt.


The belt tension measuring device can be obtained through Parker (Part. No. 003-7112-01).

| CARRIAGE AT FAR END OF TRAVEL FREQUENCY MEASURED AT MID TRAVEL |              |                   |                      |
|--|--------------|-------------------|----------------------|
| MM TRAVEL  | MM BELT SPAN | N NOMINAL PRELOAD | HZ NATURAL FREQUENCY |
| 100  | 435          | 334.4             | 90.45                |
| 150  | 485          | 334.4             | 81.13                |
| 200  | 535          | 334.4             | 73.54                |
| 250  | 585          | 334.4             | 67.26                |
| 300  | 635          | 334.4             | 61.96                |
| 350  | 685          | 334.4             | 57.44                |
| 400  | 735          | 334.4             | 53.53                |
| 450  | 785          | 334.4             | 50.12                |
| 500  | 835          | 334.4             | 47.12                |
| 550  | 885          | 334.4             | 44.46                |
| 600  | 935          | 334.4             | 42.08                |
| 650  | 985          | 334.4             | 39.95                |
| 700  | 1035         | 334.4             | 38.02                |
| 750  | 1085         | 334.4             | 36.26                |
| 800  | 1135         | 334.4             | 34.67                |
| 850  | 1185         | 334.4             | 33.20                |
| 900  | 1235         | 334.4             | 31.86                |
| 950  | 1285         | 334.4             | 30.62                |
| 1000   | 1335         | 334.4             | 29.47                |
| 1050   | 1385         | 334.4             | 28.41                |
| 1100   | 1435         | 334.4             | 27.42                |
| 1150   | 1485         | 334.4             | 26.50                |
| 1200   | 1535         | 334.4             | 25.63                |
| 1250   | 1585         | 334.4             | 24.82                |
| 1300   | 1635         | 334.4             | 24.06                |
| 1350   | 1685         | 334.4             | 23.35                |
| 1400   | 1735         | 334.4             | 22.68                |
| 1450   | 1785         | 334.4             | 22.04                |
| 1500   | 1835         | 334.4             | 21.44                |
| 1550   | 1885         | 334.4             | 20.87                |
| 1600   | 1935         | 334.4             | 20.33                |
| 1650   | 1985         | 334.4             | 19.82                |
| 1700   | 2035         | 334.4             | 19.33                |
| 1750   | 2085         | 334.4             | 18.87                |
| 1800   | 2135         | 334.4             | 18.43                |
| 1850   | 2185         | 334.4             | 18.01                |
| 1900   | 2235         | 334.4             | 17.60                |
| 1950   | 2285         | 334.4             | 17.22                |
| 2000   | 2335         | 334.4             | 16.85                |
| 2050   | 2385         | 334.4             | 16.50                |
| 2100   | 2435         | 334.4             | 16.16                |
| 2150   | 2485         | 334.4             | 15.83                |
| 2200   | 2535         | 334.4             | 15.52                |
| 2250   | 2585         | 334.4             | 15.22                |
| 2300   | 2635         | 334.4             | 14.93                |
| 2350   | 2685         | 334.4             | 14.65                |
| 2400   | 2735         | 334.4             | 14.39                |
| 2450   | 2785         | 334.4             | 14.13                |
| 2500   | 2835         | 334.4             | 13.88                |
| 2550   | 2885         | 334.4             | 13.64                |
| 2600   | 2935         | 334.4             | 13.41                |
| 2650   | 2985         | 334.4             | 13.18                |
| 2700   | 3035         | 334.4             | 12.96                |
| 2750   | 3085         | 334.4             | 12.75                |
| 2800   | 3135         | 334.4             | 12.55                |
| 2850   | 3185         | 334.4             | 12.35                |
| 2900   | 3235         | 334.4             | 12.16                |
| 2950   | 3285         | 334.4             | 11.98                |
| 3000   | 3335         | 334.4             | 11.80                |




Move carriage to far end of travel. Measure tension/frequency at mid point of belt span.


### 4.5.4 Timing belt tracking

|   |             |  |
|---|-------------|--|
|  | <b>Note</b> | Adjustments to timing belt tension must be done prior to checking/adjusting belt tracking. Tracking can only be checked with the carriage in motion. Proper tracking is when timing belt oscillates between tension station pulley flanges, but does not attempt to ride up on the sides of the flanges. |
|---|-------------|--|

#### 4.6.1 Checking carriage play on HLE 60 RB

|   |             |  |
|---|-------------|--|
|  | <b>Note</b> | Carriage play is when one can grab the load attachment plate and find movement (side to side or up and down) when applying moderate forces. Check for improper adjustment or worn carriage wheels. |
|---|-------------|--|

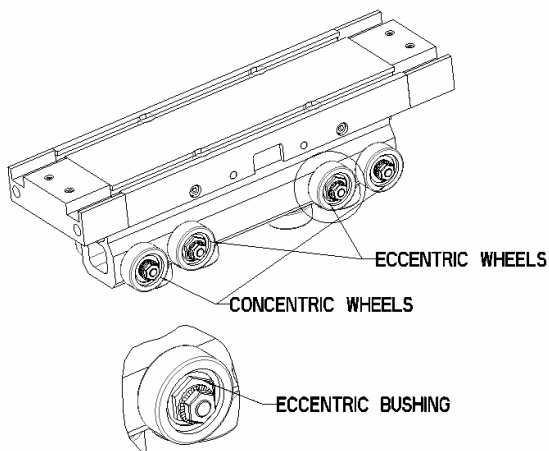
1. Remove the load from the load attachment plate.
2. If equipped with a steel strip cover - remove it
3. Remove timing belt from carriage:

|   |               |   |
|---|---------------|---|
|  | <b>Danger</b> | On vertical axis units, secure the carriage to prevent movement. When timing belt is disconnected from carriage, it will fall due to gravity if not supported. This can result in damage to people or property. |
|---|---------------|---|

4. Visually check to ensure all wheels are in contact with rail guides over the complete travel.
5. To check wheel pressure against profile guides; prevent wheels from turning using your index finger; wheels should stop rotating when applying minimal force against them. The carriage should feel smooth but tight throughout its travel.

#### 4.6.2 Adjusting carriage wheels HLE 60 RB

Carriages are designed with both concentric and eccentric wheels located on three sides of carriage body. Fixed or concentric wheels require no adjustment. Eccentric wheels are equipped with an off-set bushing, and when adjusted properly, remove excess play between carriage and profile.



Remove steel strip seal  
 Remove timing belt from carriage.  
 Remove Tension end assembly  
 Remove carriage  
 Clean inside surfaces of profile.


Adjust eccentric bushing with a 10 mm socket wrench in small stages until the carriage can be pushed freely and without play through the HLE profile. Proper adjustment has been achieved when, with minimal pressure from your finger, the wheel can be stopped from rotating.

Note: Concentric wheels should be carry load in normal direction. Eccentric wheels are for preloading the carriage in profile.


Repeat step 5 as necessary, until carriage adjustment is correct. And all wheels are in contact with profile

Note: Extended carriage has 4 additional eccentric wheels per side and will alternate preload one up and one down against profile surfaces

### 4.6.3 Checking carriage play on HLE 60SR

|   |             |  |
|---|-------------|--|
|  | <b>Note</b> | Carriage play is when one can grab the load attachment plate and find movement (side to side or up and down) when applying moderate forces. Check for a worn out linear bearing block or wear on the steel rail. |
|---|-------------|--|

Remove the load from the load attachment plate.  
 If equipped with a steel strip cover - remove it:  
 Remove timing belt from carriage: (see 4.5.2).


|   |               |   |
|---|---------------|---|
|  | <b>Danger</b> | On vertical axis units, secure the carriage to prevent movement. When timing belt is disconnected from carriage, it will fall due to gravity if not supported. This can result in damage to people or property. |
|---|---------------|---|


Visually check for rust or corrosion of the steel rail system. If corrosion exists, completely changing out both steel rail and bearing block assembly  
 Push the carriage over the complete travel while observing the area where the linear bearing block meets the steel rail.  
 The carriage should feel smooth but tight throughout the travel.  
 Lubricate the bearing block and check for excessive leakage at end seals.  
 Excessive side to side movement indicates wear between linear bearing block and steel rail.  
 Completely change out both steel rail and bearing block assembly .  
**There are no adjustments to linear bearing blocks to compensate for wear.**

### 4.6.4 Changing bearing blocks HLE 60 SR

#### General

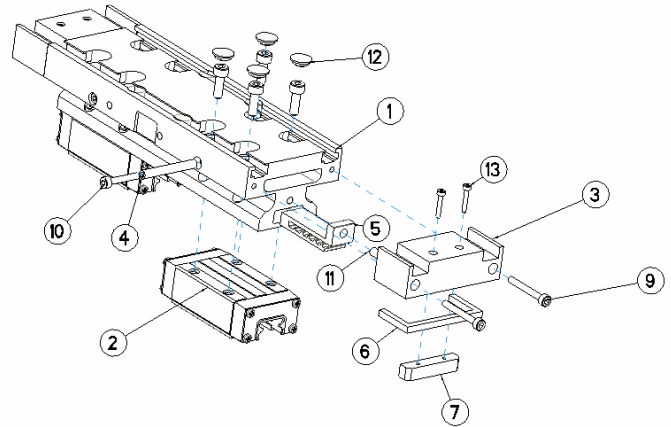
Linear bearing blocks consist of re-circulating (one string on each side) ball bearings captured within the block. Bearing blocks are sealed against the square steel rail and lubricated through a fitting located at the end of each block. Lubrication is required. Although linear bearing blocks are capable of operating at a maximum temperature of 248°F (120°C) and continuously at 212°F (100°C), the timing belt can only withstand environmental temperatures between 40°F (-40°C) to 178°F (+80°C).

|   |                |   |
|---|----------------|---|
|  | <b>Warning</b> | If checking for bearing block damage while carriage is in motion within profile, care should be taken to prevent injury. If possible, move the carriage manually (best done if motor and gearbox are removed and drive unit is horizontal). If using motor, operate drive unit with jog button at low speed (< 1m/min). |
|---|----------------|---|

|   |             |   |
|---|-------------|---|
|  | <b>Note</b> | When removing bearing block from guide rail observe reference markings on both block and rail. Bearing blocks are ground on one side (its ref. mark) and rails have arrows embossed on the top of the rail indicating its ref. mark. During re-assembly it is important to match these reference marks (see below). |
|---|-------------|---|

#### 4.6.4 Changing bearing blocks HLE 60 SR (cont.)

Remove carriage from steel rail guide  
 Place on a clean surface.  
 Remove socket head cap screws from top of carriage.  
 Lift old bearing block(item#2) from carriage frame.  
 Position replacement block on carriage (note reference mark on side of block (machined ground side).When re-inserting carriage this side should align with rail side that is banked against profile edge  
 Thread in socket head screws with screw retention (Loc-tite) but do not tighten.  
 Repeat steps 3 through 5 for second bearing block.  
 Clean inside of linear drive profile and apply grease to steel rail  
 Guide carriage assembly onto steel rail and insert into profile

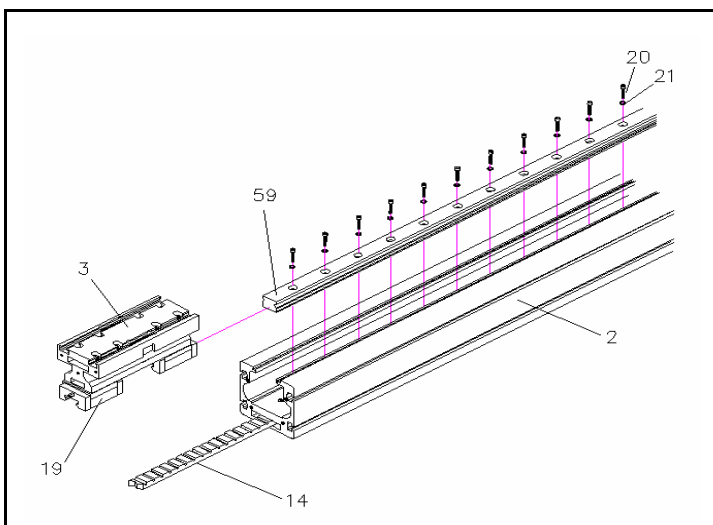


#### 4.6.5 Lubrication of bearing block

Remove steel strip seal  
 Center carriage in relation to travel.  
 Remove timing belt (see 4.5.2) from carriage .  
 Using a grease gun, pump 3 shots of grease into fitting.  
 Repeat steps 3 & 4 on opposite side of carriage for second bearing block.  
 Re-install timing belt (see 4.5.2).  
 Replace steel strip seal

**NOTE:** Use only LITHIUM 12 HYDROXYSTEARATE SOAP BASE(SHELL ALVANIA RS2) containing additives to enhance oxidation resistance and rust protection. **CAUTION: Never mix petroleum base, with synthetic base lubricants.** For special or sever service conditions, consult factory.

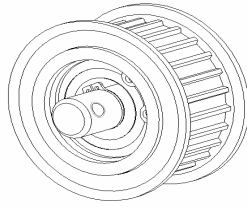
#### 4.6.6 Changing steel square rail



Remove carriage  
 Using a 4mm allen wrench remove all bolts washers located on top of square rail.  
 Lift rail up and out through access slot in profile  
 Clean inside of profile.  
 Position new rail within profile (ref. arrow mark side of rail against ledge running the length of profile) and re-Install hardware from step #2 into new square rail (do not tighten).  
 Push rail against ledge while tightening all bolts.

#### 4.6.7 Replacing Tensioning Pulley Assembly 002-2754-03

1. Remove end caps (item#6)
2. Remove strip seal clamps(item#2)
3. Remove strip seal (item#1)
4. Remove cover plates (items#3,4)
5. Remove belt clamp (item#7)
6. Pull belt around existing pulley (item#8)
7. Remove tensioning screws( item#9)
8. Replace tensioning pulley assembly
9. Reassemble ( 7 thru 1)
10. Align/track and tension belt with tensioning screws (item#9)  
Run carriage from end to end repeatedly and center the belt on pulley.
11. Use tension meter and values on page 18 for proper tensioning.

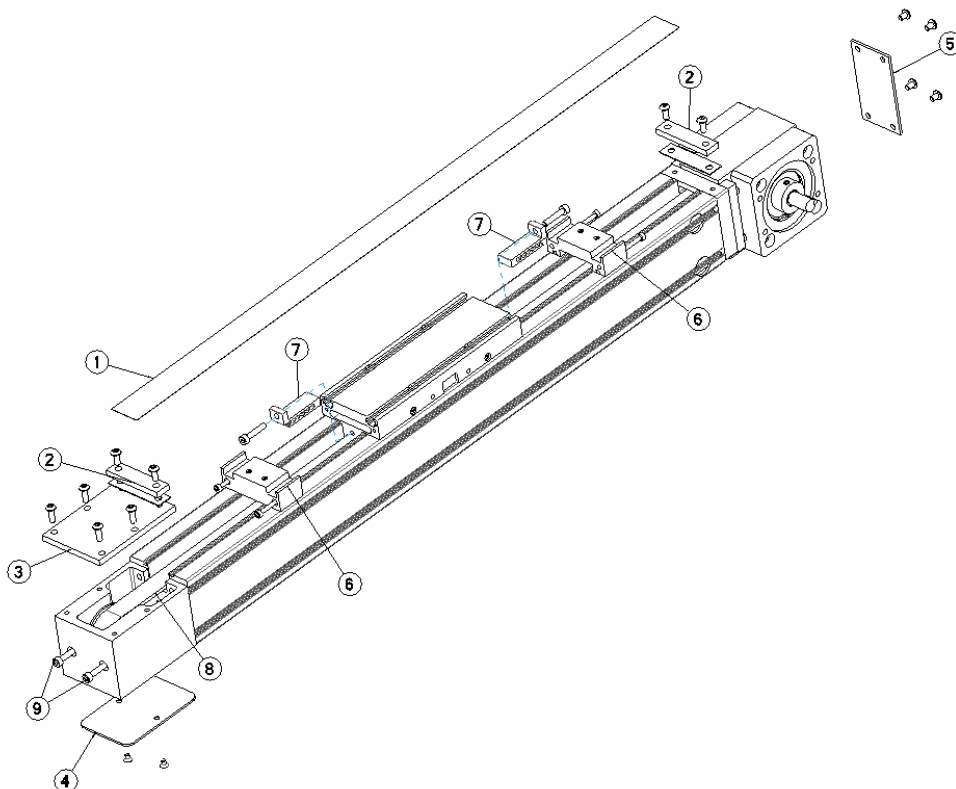


#### 4.6.8 Replacing drive end stations

Please see assembly drawing exploded views to determine parts required

#### 4.6.9 Replacing strip seal

1. Remove strip seal clamps(item#2)
2. Remove endcaps (item#6)
3. Remove strip seal (item#1)
4. Replace strip seal (Make sure the strip seal rides over rod guides inside carriage cavity)
5. Reassemble end caps



#### 4.6.10 Double Axis General

Double axes are generally shipped as two single axis assemblies. Link shafts with coupling sets are dismantled for ease of shipping. The couplings only allow for minimal misalignment and offset angles between the two axis. (care must be taken when mounting dual axis to assure the axial alignment is maintained.)

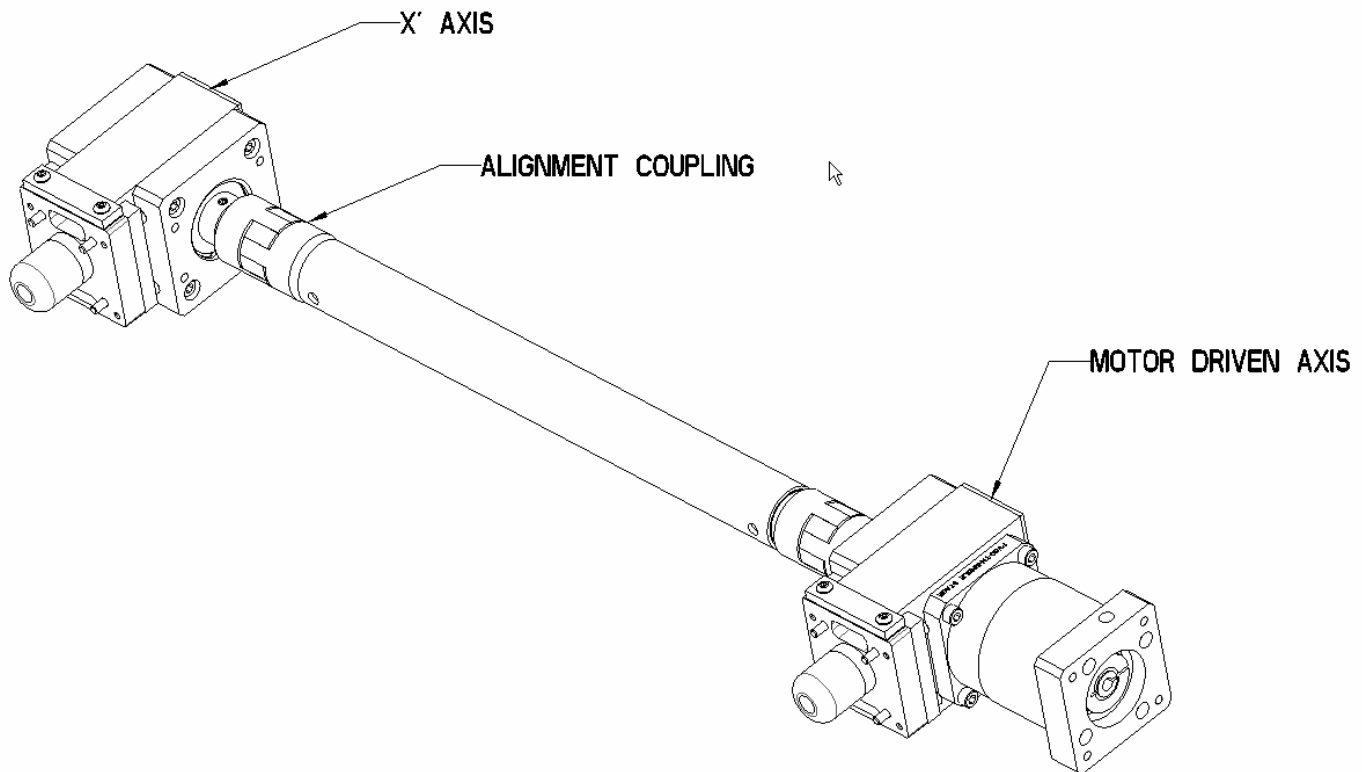
Clamping style couplings provide a method of adjusting carriage position that would otherwise not be possible with a fixed keyway design.

#### 4.6.10 Aligning carriages OF DUAL AXIS UNIT

Refer to section 1.5 for initial set up directions. of dual axis on page 13.

Once mounted and aligned loosen one coupling on the x' axis. (non motor mounted axis)

1. Move carriage of motor driven axis to end of travel and let rest against bumper.
2. Move carriage of x' axis to same relative location on its axis.
3. Tighten the coupling to the specified torque ( 2.2 N-M)



# HLE60 GEN2 Configurable

**HLE60** **RB** **NL** **E** **1000** **DA0000** **MBL**

ROLLER BELT **RB**  
SQUARE RAIL **SR**

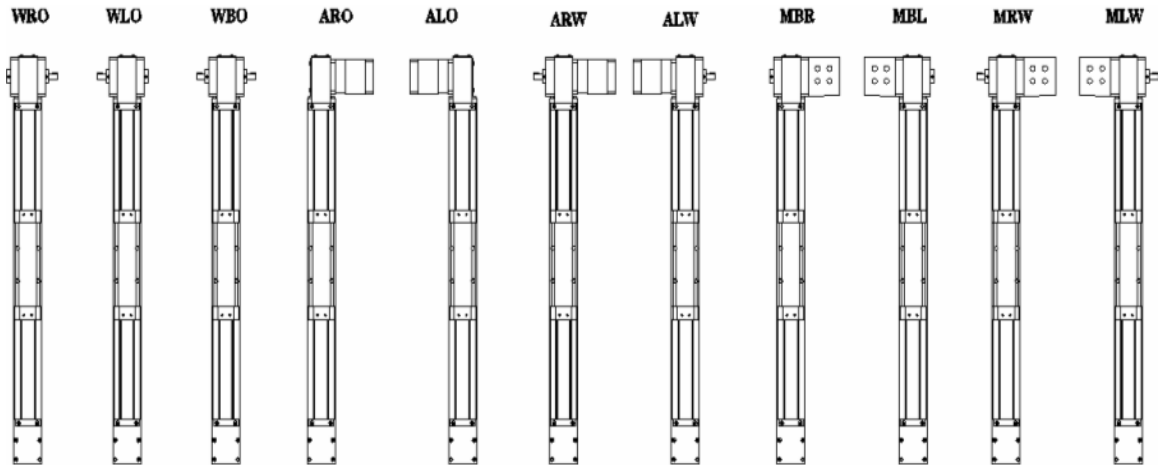
STANDARD CARRIAGE **NL**  
EXTENDED CARRIAGE **VL**

IDLER UNIT **M**  
SINGLE AXIS **E**  
DUAL AXIS UNIT **D**

TRAVEL ( MAX "NL" CARRIAGE=3000mm) **XXXX**  
( MAX "VL" CARRIAGE=2900mm)

NO DRIVE SHAFT SINGLE AXIS **DA0000**  
DUAL AXIS UNIT XXXX=MM CTR. TO CTR. 200MM MIN/1500MM MAX. **DAXXXX**  
DUAL AXIS UNIT XXXX=MM CTR. TO CTR. 200MM MIN/1500MM MAX. W COVERED LINK SHAFT **DCXXXX**

IDLER UNIT **WOO**  
SHAFT RIGHT **WRO**  
SHAFT LEFT **WLO**  
DUAL SHAFT **WBO**  
Gearhead RIGHT **ARO**  
Gearhead LEFT **ALO**  
Gearhead RIGHT SHAFT LEFT **ARW**  
Gearhead LEFT SHAFT RIGHT **ALW**  
MOTOR BLOCK RIGHT **MBR**  
MOTOR BLOCK LEFT **MBL**  
MOTOR BLOCK RIGHT SHAFT LEFT **MRW**  
MOTOR BLOCK LEFT SHAFT RIGHT **MLW**  
DUAL AXIS Gearhead DRIVE RIGHT **DAR**  
DUAL AXIS Gearhead DRIVE LEFT **DAL**  
DUAL AXIS MOTOR BLOXK RIGHT **DMR**  
DUAL AXIS MOTOR BLOCK LEFT **DML**





# HLE60 GEN2 Configurable

**SP1** **G12NN** **H1** **K21** **ZA** **LHO**

**LHO** NO LIMIT SWITCHES  
**LH3** THREE NPN PROX SWITCHES 10V-30 VDC  
**LH4** THREE PNP PROX SWITCHES 10-30 VDC

**ZA** UNIT WITH STRIP SEAL  
**ZB** UNIT WITHOUT STRIP SEAL

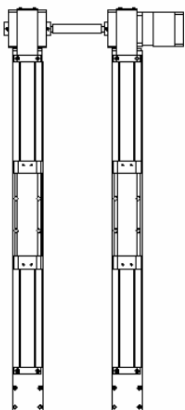
**K00-HLE60** NO MOTOR KIT  
**K21-HLE60** MOTOR KIT LV23/HV23/OS23/ES23/VS23  
**K22-HLE60** MOTOR KIT BE23X  
**K23-HLE60** MOTOR KIT SM23/SE23  
**K24-HLE60** MOTOR KIT LV34/HV34  
**K25-HLE60** MOTOR KIT BE34/NO34X/JO34X/TS31/TS32  
**K26-HLE60** MOTOR KIT RS34/ES34  
**K27-HLE60** MOTOR KIT NO70/JO70  
**K28-HLE60** MOTOR KIT SMB60

**H1** NORMAL ORIENTATION CARRIAGE UP  
**H2** INVERTED ORIENTATION CARRIAGE DOWN  
**H3** CARRIAGE ON SIDE DRIVE STATION UP  
**H4** CARRIAGE ON ITS SIDE DRIVE STATION DOWN

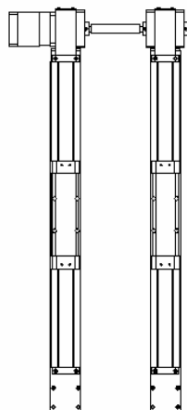
**G0** NO GEARBOX REQUIRES MBR/MBL/MRW/MLW  
**G1** CUSTOMER SUPPLIED GEARHEAD  
**G1203** PV60 GEARHEAD 3:1 RATIO  
**G1205** PV60 GEARHEAD 5:1 RATIO  
**G1210** PV60 GEARHEAD 10:1 RATIO  
**G1215** PV60 GEARHEAD 15:1 RATIO  
**G1225** PV60 GEARHEAD 25:1 RATIO

**SP19** DRIVE HOUSING FOR PV60-FN  
**SP20** IDLER UNIT  
**SP21** NO MOTOR BLOCK  
**SP22** MOTOR BLOCK NEMA23 W 0.375" BORE COUPLING  
**SP23** MOTOR BLOCK NEMA23 W 0.25" BORE COUPLING  
**SP24** MOTOR BLOCK NEMA34 W 0.375" BORE COUPLING  
**SP25** MOTOR BLOCK NEMA34 W 0.50" BORE COUPLING  
**SP28** MOTOR BLOCK NEMA23 NO COUPLING  
**SP29** MOTOR BLOCK NEMA34 NO COUPLING  
**SP30** MOTOR BLOCK NEO70 W 11.0MM BORE COUPLING

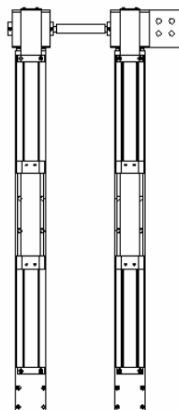
**DAR**



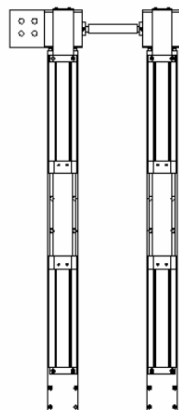
**DAL**



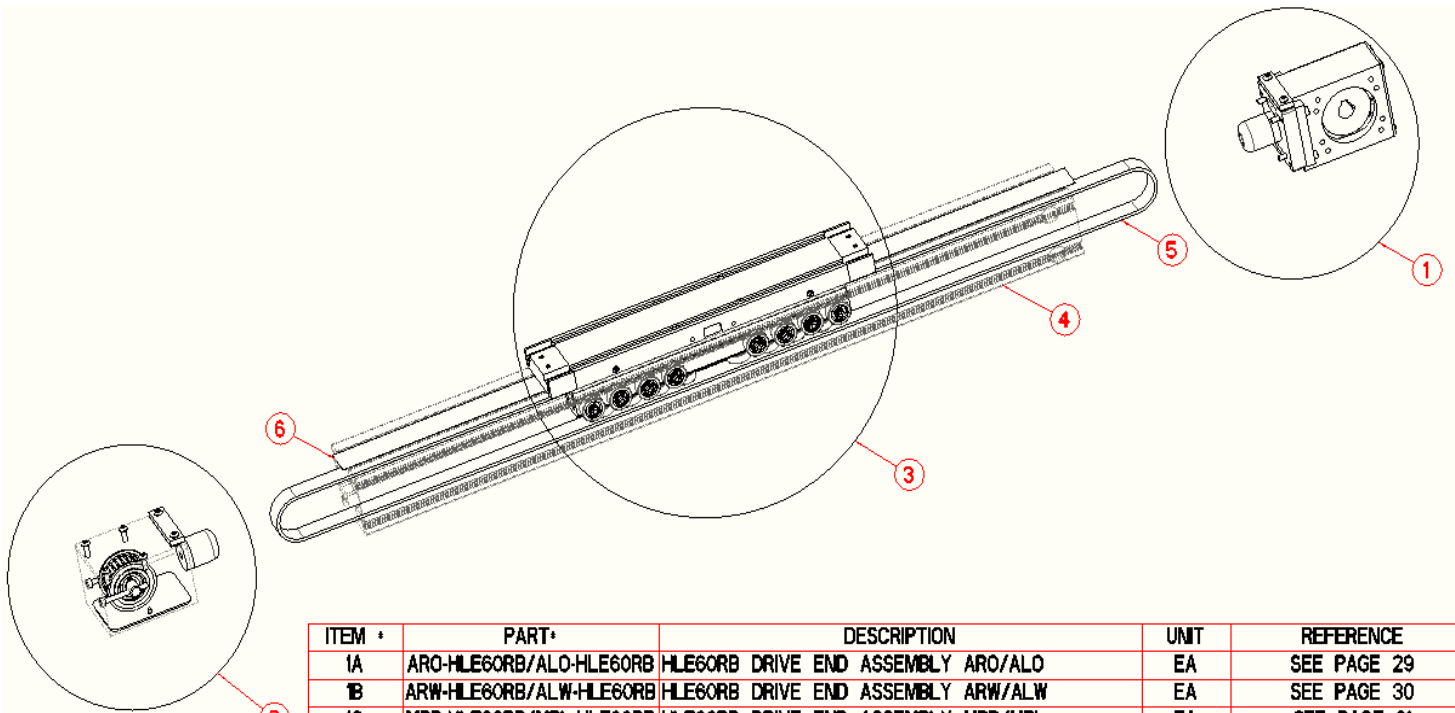
**DMR**



**DML**



## HLE60RB ASSEMBLY COMPONENTS



| ITEM # | PART#                   | DESCRIPTION                             | UNIT   | REFERENCE   |
|--------|-------------------------|---|--------|-------------|
| 1A     | ARO-HLE60RB/ALO-HLE60RB | HLE60RB DRIVE END ASSEMBLY ARO/ALO      | EA     | SEE PAGE 29 |
| 1B     | ARW-HLE60RB/ALW-HLE60RB | HLE60RB DRIVE END ASSEMBLY ARW/ALW      | EA     | SEE PAGE 30 |
| 1C     | MBR-HLE60RB/MBL-HLE60RB | HLE60RB DRIVE END ASSEMBLY MBR/MBL      | EA     | SEE PAGE 31 |
| 1D     | MRW-HLE60RB/MLW-HLE60RB | HLE60RB DRIVE END ASSEMBLY MRW/MLW      | EA     | SEE PAGE 32 |
| 1E     | WBO-HLE60RB             | HLE60RB DRIVE END ASSEMBLY WBO          | EA     | SEE PAGE 33 |
| 1F     | WRO-HLE60RB/WLO-HLE60RB | HLE60RB DRIVE END ASSEMBLY WRO/WLO      | EA     | SEE PAGE 34 |
| 2      | 002-2754-01             | HLE60RB TENSION STATION ASSEMBLY        | EA     | SEE PAGE 35 |
| 3A     | NL-HLE60RB              | HLE60RB STANDARD "NL" CARRIAGE ASSEMBLY | EA     | SEE PAGE 27 |
| 3B     | VL-HLE60RB              | HLE60RB EXTENDED "VL" CARRIAGE ASSEMBLY | EA     | SEE PAGE 28 |
| 4      | 100-0340-01             | HLE60RB MACHINED BASE                   | METERS | SEE PAGE 26 |
| 5      | 003-1860-01             | HLE60RB TIMING BELT 16MM WIDE 5MM PITCH | METERS | SEE PAGE 26 |
| 6      | 003-1879-01             | HLE60RB STRIP SEAL                      | METERS | SEE PAGE 26 |

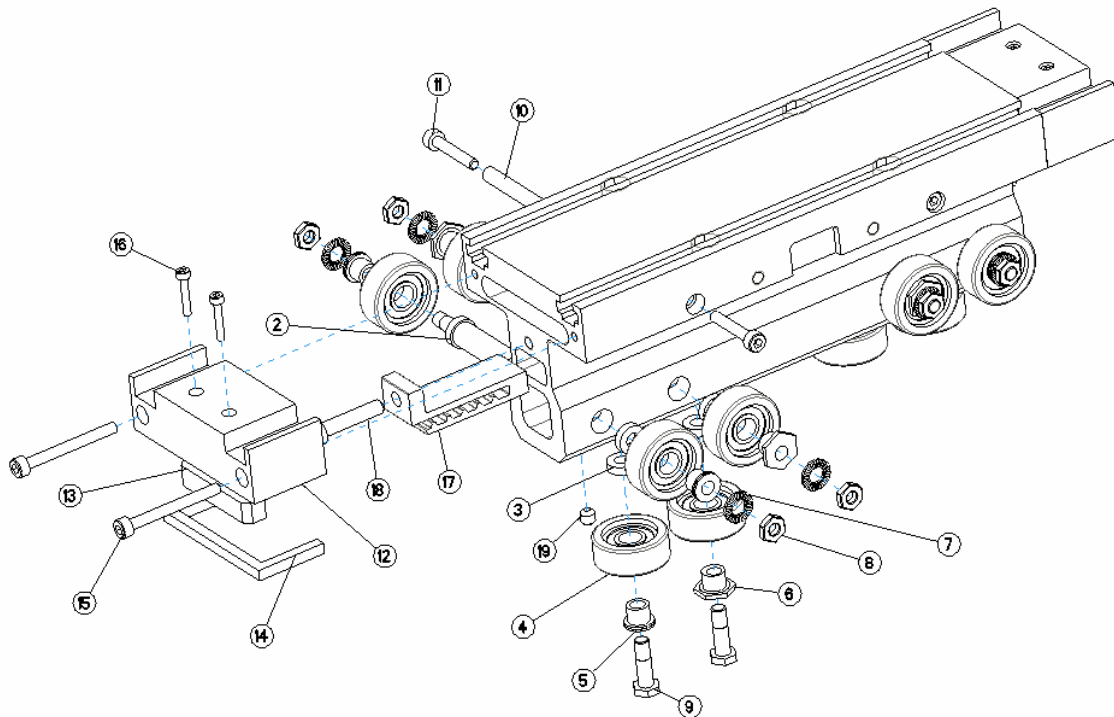
**HLE 60RB**

**REQUIRED BELT LENGTH P/N 003-1860-01**  
 NL/VL/SL CARRIAGE 1272MM + (2 X TRAVEL)

**BASE LENGTH P/N 100-0340-01**  
 NL CARRIAGE 466 MM +TRAVEL  
 VL CARRIAGE 568 MM +TRAVEL  
 SL CARRIAGE 314 MM+TRAVEL+ SPECIAL CARRIAGE LENGTH

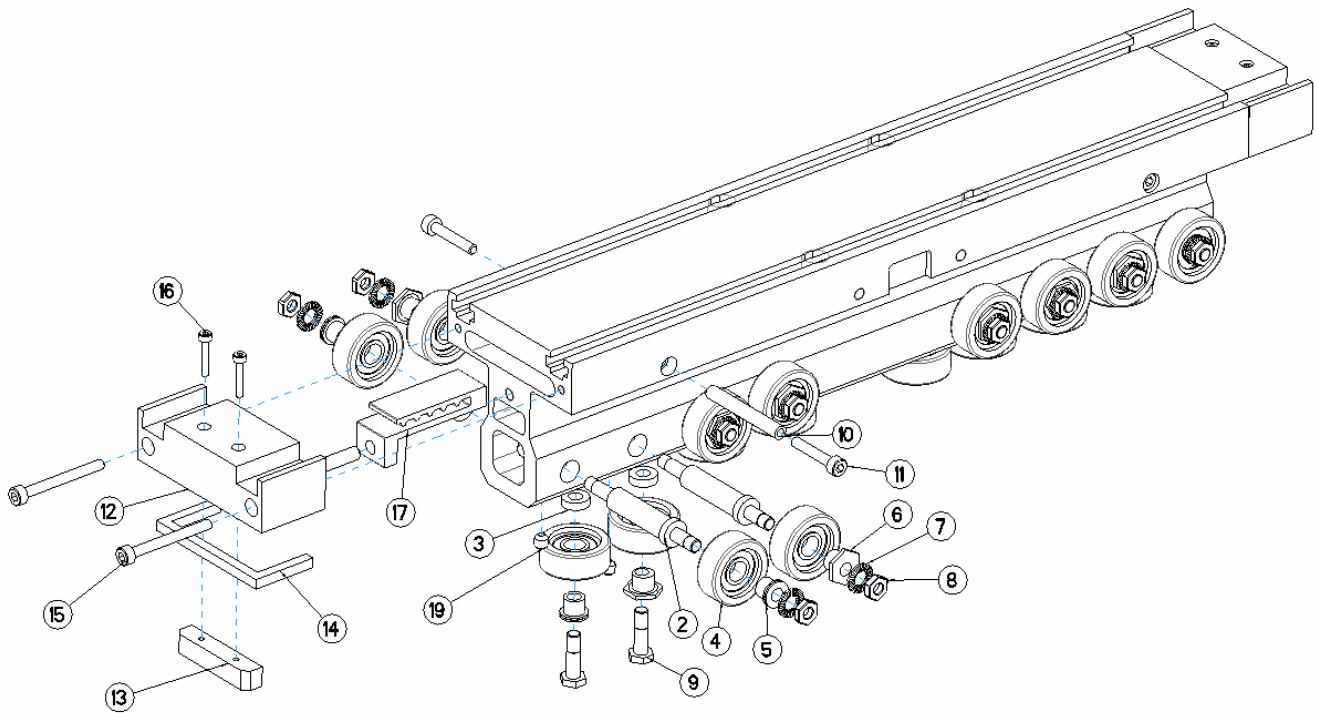
**STRIP SEAL P/N 003-1879-01**  
 NL CARRIAGE 480 MM +TRAVEL  
 VL CARRIAGE 582 MM +TRAVEL  
 SL CARRIAGE 328 MM+TRAVEL+ SPECIAL CARRIAGE LENGTH

## HLE60RB NL CARRIAGE ASSEMBLY COMPONENTS



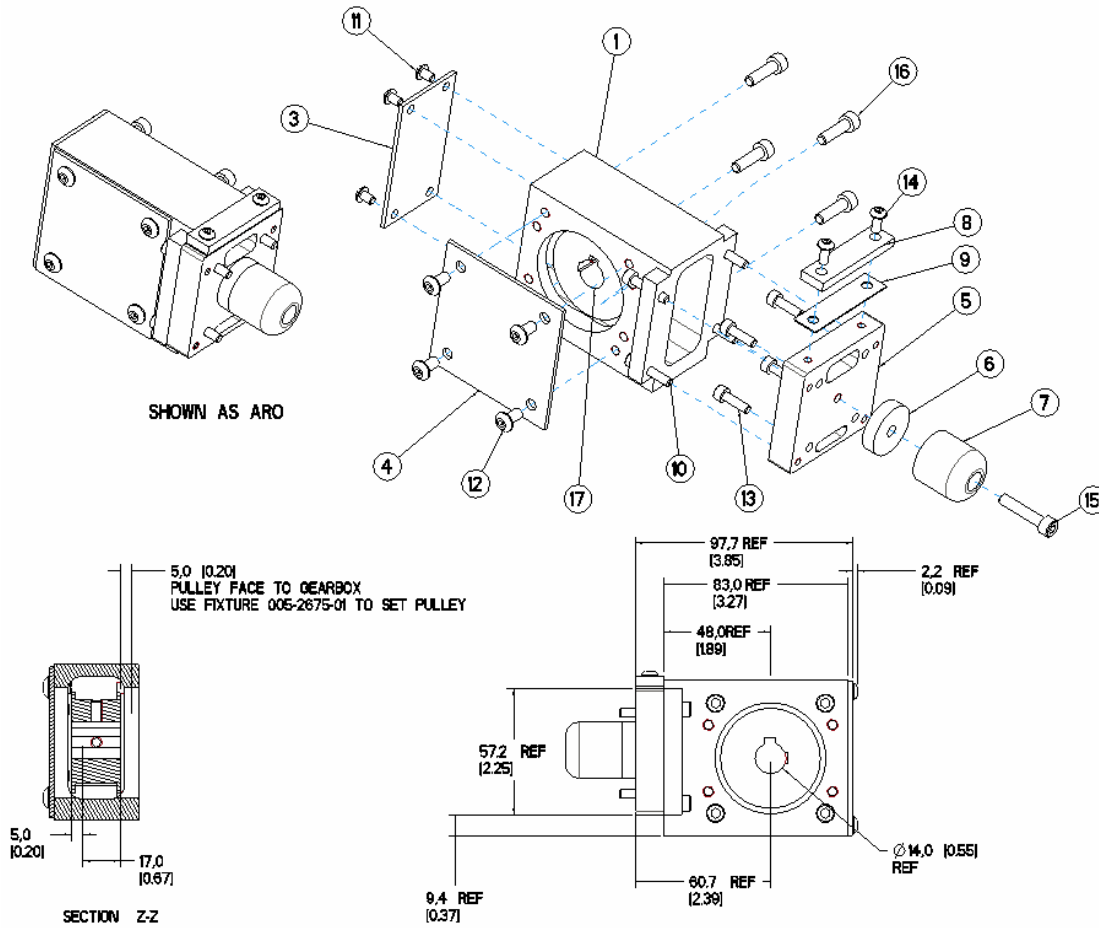
| Part Number   | ITEM | QTY. | DESCRIPTION                      |
|---------------|------|------|----------------------------------|
| 100-0226-01   | 1    | 1    | CARRIAGE NL HLE60                |
| 100-6971-01   | 2    | 4    | AXEL SIDE HLE60RB                |
| 000-7318-01   | 3    | 8    | SPACER                           |
| 416-201062    | 4    | 12   | WHEEL HLE60                      |
| 100-0800-02   | 5    | 6    | SLEEVE CONCENTRIC WHHEL          |
| 100-0801-02   | 6    | 6    | SLEEVE ECCENTRIC WHHEL           |
| 135-728705    | 7    | 8    | RIBBED WASHER M4                 |
| NHJ-M004-0070 | 8    | 12   | JAM NUT M4                       |
| 100-6972-01   | 9    | 4    | AXEL BOTTOM HLE60RB              |
| 100-7930-01   | 10   | 2    | ROD WEAR GUIDE                   |
| SCH-M003-0016 | 11   | 2    | SOCKET HEAD CAP SCREW M3 X 18 LG |
| 100-0356-01   | 12   | 2    | ENDCAP                           |
| 100-0785-01   | 13   | 2    | WEAR BAR ENDCAP                  |
| 003-1986-01   | 14   | 2    | FELT SEAL                        |
| SCH-M003-0030 | 15   | 4    | SOCKET HEAD CAP SCREW M3 X 30 LG |
| SCH-M002-0012 | 16   | 4    | SOCKET HEAD CAP SCREW M2 X 12 LG |
| 100-0220-01   | 17   | 2    | BELT CLAMP                       |
| SCH-M004-0016 | 18   | 2    | SOCKET HEAD CAP SCREW M4 X 16 LG |
| SSH-M004-0004 | 19   | 4    | SOCKET HEAD ST SCREW M4 X 4LG    |

## HLE60RB VL CARRIAGE ASSEMBLY COMPONENTS



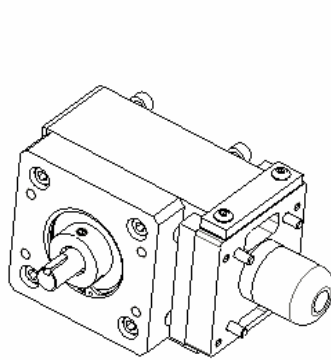
| Part Number   | ITEM | QTY. | DESCRIPTION                      |
|---------------|------|------|----------------------------------|
| 100-0239-01   | 1    | 1    | CARRIAGE NL HLE60                |
| 100-6971-01   | 2    | 8    | AXEL SIDE HLE60RB                |
| 000-7318-01   | 3    | 16   | SPACER                           |
| 416-201062    | 4    | 24   | WHEEL HLE60                      |
| 100-0800-02   | 5    | 6    | SLEEVE CONCENTRIC WHHEL          |
| 100-0801-02   | 6    | 18   | SLEEVE ECCENTRIC WHHEL           |
| 135-728705    | 7    | 16   | RIBBED WASHER M4                 |
| NHJ-M004-0070 | 8    | 24   | JAM NUT M4                       |
| 100-6972-01   | 9    | 8    | AXEL BOTTOM HLE60RB              |
| 100-7930-01   | 10   | 2    | ROD WEAR GUIDE                   |
| SCH-M003-0016 | 11   | 2    | SOCKET HEAD CAP SCREW M3 X 18 LG |
| 100-0356-01   | 12   | 2    | ENDCAP                           |
| 100-0785-01   | 13   | 2    | WEAR BAR ENDCAP                  |
| 003-1986-01   | 14   | 2    | FELT SEAL                        |
| SCH-M003-0030 | 15   | 4    | SOCKET HEAD CAP SCREW M3 X 30 LG |
| SCH-M002-0012 | 16   | 4    | SOCKET HEAD CAP SCREW M2 X 12 LG |
| 100-0220-01   | 17   | 2    | BELT CLAMP                       |
| SCH-M004-0016 | 18   | 2    | SOCKET HEAD CAP SCREW M4 X 16 LG |

**ARO/ALO-HLE60RB DRIVE END ASSEMBLY**

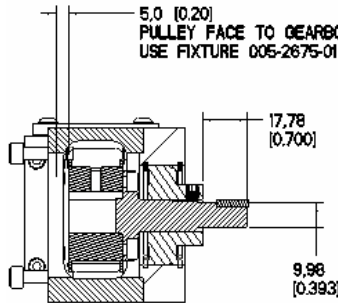
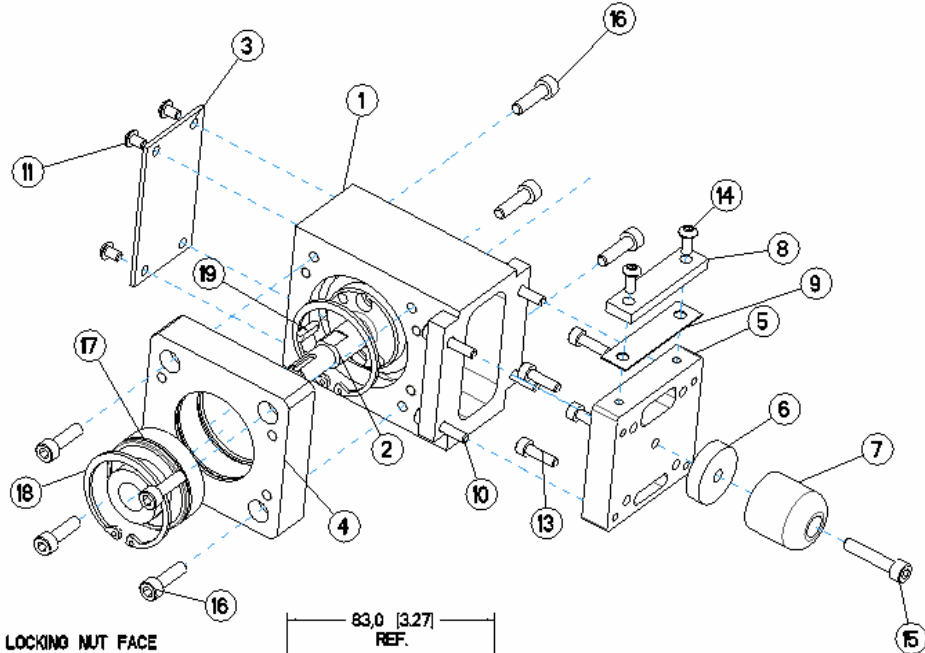


| PART#         | ITEM# | QTY | DESCRIPTION                          |
|---------------|-------|-----|--------------------------------------|
| 102-1500-01   | 1     | 1   | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2     | 1   | PULLEY DRIVE HLE60 PV60 DIRECT GEN2  |
| 102-1501-01   | 3     | 1   | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1502-01   | 4     | 1   | COVER PLATE 2 HLE60 DRIVE END GEN2   |
| 102-0284-01   | 5     | 1   | HLE60RB DRV HSG ADPTER PLT GEN2      |
| 000-6736-01   | 6     | 1   | SPACER BUMPER                        |
| 003-1801-01   | 7     | 1   | BUMPER HEL60RB                       |
| 000-7346-01   | 8     | 1   | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 9     | 1   | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 10    | 4   |                                      |
| SBH-M004-0006 | 11    | 4   |                                      |
| SBH-M005-0010 | 12    | 4   |                                      |
| SCH-M004-0014 | 13    | 4   |                                      |
| SBH-M004-0010 | 14    | 2   |                                      |
| SCH-M005-0025 | 15    | 1   |                                      |
| SCH-M005-0018 | 16    | 4   |                                      |
| SSH-M005-0006 | 17    | 2   |                                      |

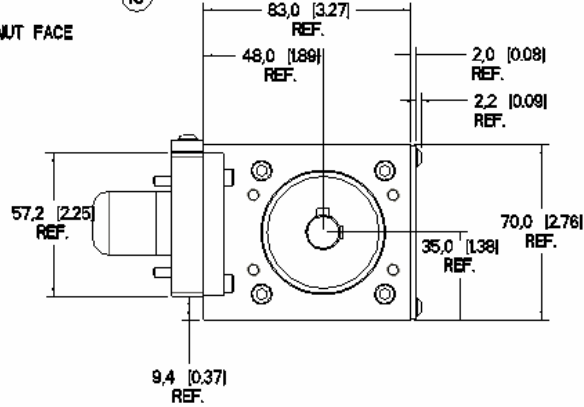
**ARW/ALW-HLE60RB DRIVE END ASSEMBLY**



ARW-HLE60RB SHOWN  
(WITHOUT GEARBOX)



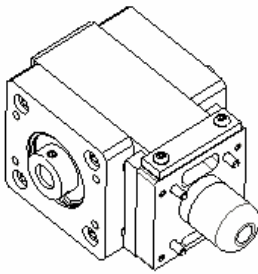
SECTION 2-7



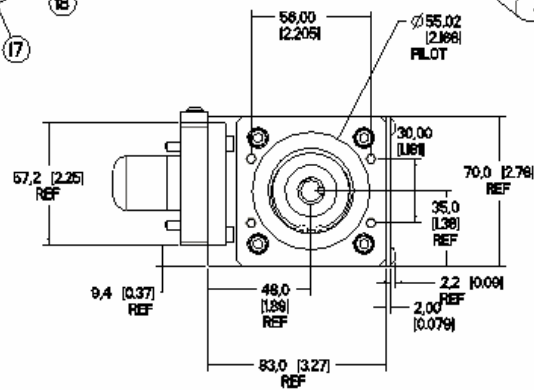
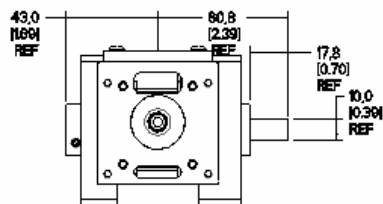
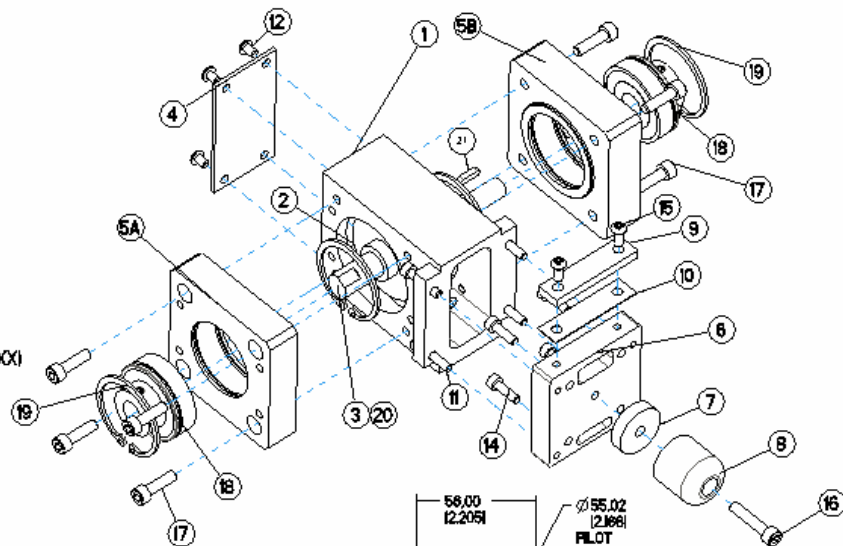
| Part Number   | ITEM | QTY. |  |
|---------------|------|------|--|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2   |
| 002-2834-03   | 2    | 1    | STUB SHAFT PULLEY ASSY HLE60 PV60 GEN2 |
| 102-1501-01   | 3    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2     |
| 102-1505-01   | 4    | 1    | BEARING HOUSING HLE60 GEN2             |
| 102-0284-01   | 5    | 1    | HLE60RB DRV HSG ADPTER PLT GEN2        |
| 000-6736-01   | 6    | 1    | SPACER BUMPER                          |
| 003-1803-01   | 7    | 1    | BUMPER HEL60RB                         |
| 000-7346-01   | 8    | 1    | STRIP SEAL RETAINER CLAMP              |
| 003-2171-01   | 9    | 1    | STRIP SEAL GASKET                      |
| SCH-M004-0020 | 10   | 4    |  |
| SBH-M004-0006 | 11   | 4    |  |
| SCH-M004-0014 | 13   | 4    |  |
| SBH-M004-0010 | 14   | 2    |  |
| SCH-M005-0025 | 15   | 2    |  |
| SCH-M005-0018 | 16   | 8    |  |
| 003-4075-01   | 17   | 1    | BRG W/LKNG SET SCRW                    |
| 003-1507-33   | 18   | 2    |  |
| 003-2226-04   | 19   | 1    |  |



## MBR/MBL-HLE60RB DRIVE END ASSEMBLY

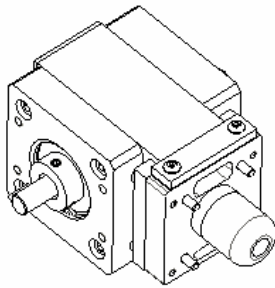


MBR SHOWN  
 MBL ROTATE DRIVE SHAFT 180° RADIALLY  
 AND SWAP BEARING HOUSING PLATES(102-1505-XX)  
 (ONE IS PILOTTED FOR MTR BLOCK!)

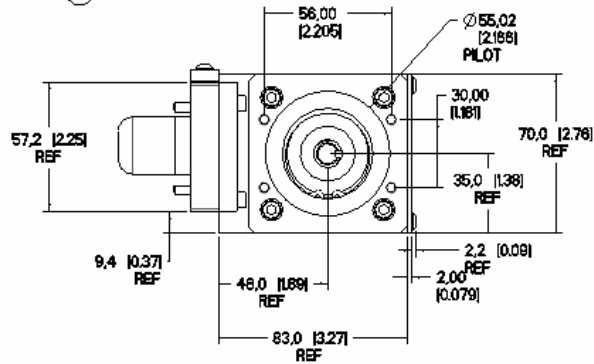
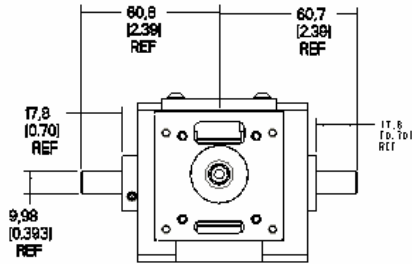
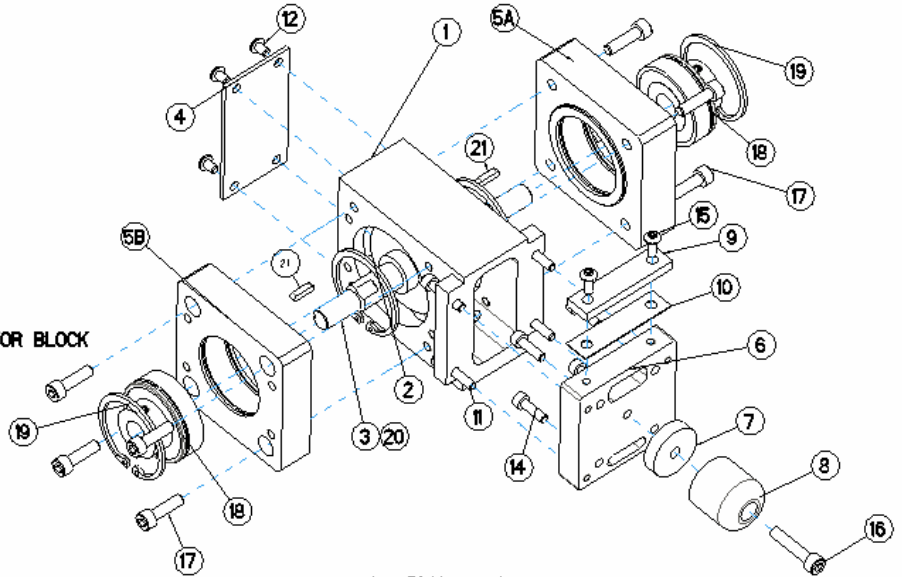


| Part Number   | ITEM | QTY. | Part Description                     |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY                               |
| 102-1503-02   | 3    | 1    | DRIVE SHAFT HLE60 WRO/WLO GEN2       |
| 102-1501-01   | 4    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1505-01   | 5A   | 1    | BEARING HSG MTR PILOT HLE60 GEN2     |
| 102-1505-02   | 5B   | 1    | BEARING HOUSING HLE60 GEN2           |
| 102-0284-01   | 6    | 1    | HLE60RB DRV HSG ADPTER PLT GEN2      |
| 000-6736-01   | 7    | 1    | SPACER BUMPER                        |
| 003-1801-01   | 8    | 1    | BUMPER HEL60RB                       |
| 000-7346-01   | 9    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 10   | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 11   | 4    |                                      |
| SBH-M004-0006 | 12   | 4    |                                      |
| SCH-M004-0014 | 14   | 4    |                                      |
| SBH-M004-0010 | 15   | 2    |                                      |
| SCH-M005-0025 | 16   | 1    |                                      |
| SCH-M005-0018 | 17   | 8    |                                      |
| 003-4075-01   | 18   | 2    | BRG W/LKNG SET SCRW                  |
| 003-1507-33   | 19   | 4    |                                      |
| 003-2226-29   | 20   | 1    |                                      |
| 003-2226-04   | 21   | 1    |                                      |

**MRW/MLW-HLE60RB DRIVE END ASSEMBLY**



MRW SHOWN  
MLW SWAP BEARING HOUSING 5A AND 5B  
5A HAS TAPPED HOLES AND PILOT TO ACCEPT MOTOR BLOCK

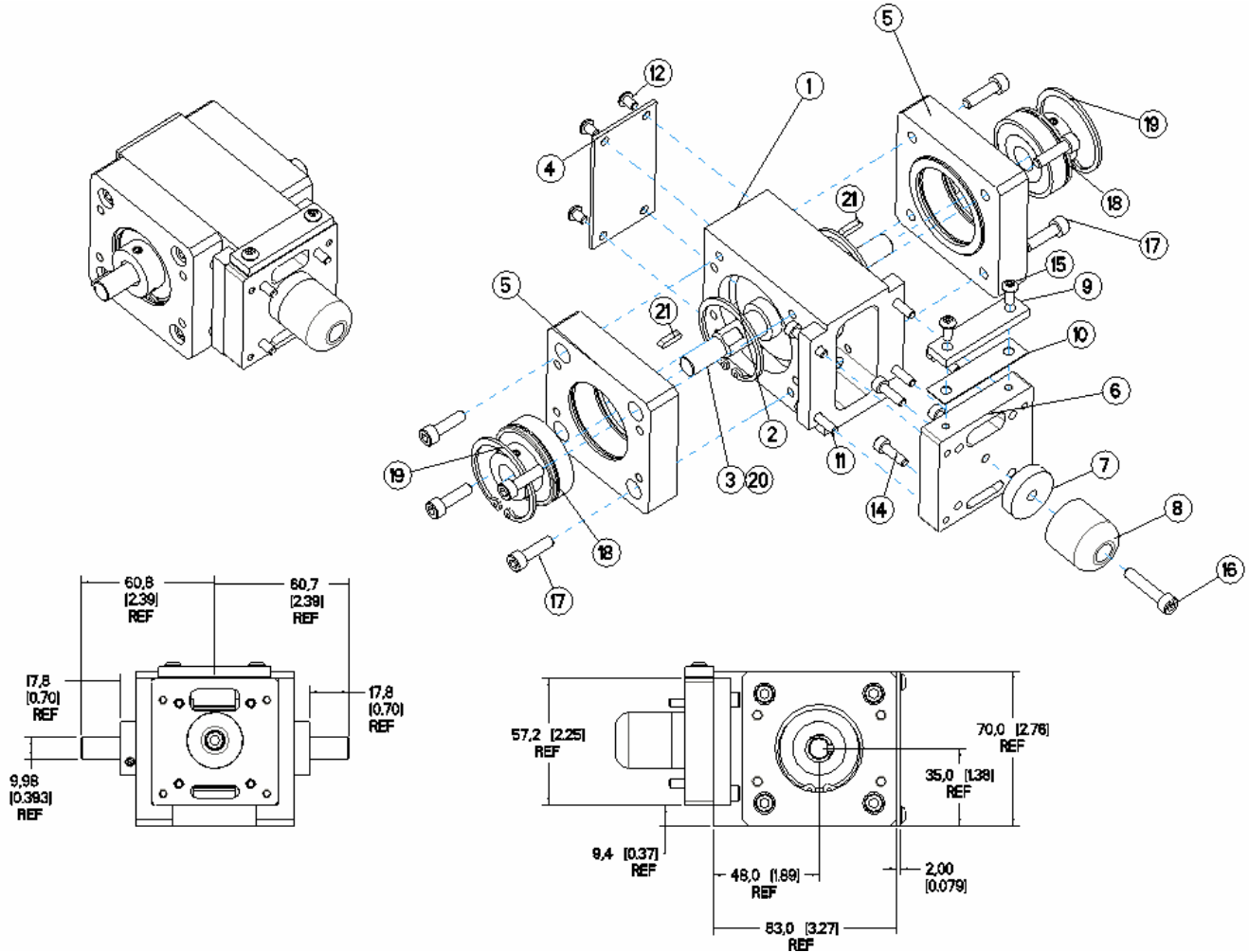


| Part Number   | ITEM | QTY. | DESCRIPTION                          |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY                               |
| 102-1503-01   | 3    | 1    | DRIVE SHAFT HLE60 WBO GEN2           |
| 102-1501-01   | 4    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1505-01   | 5A   | 1    | BEARING HOUSING MTR PILOT HLE60 GEN2 |
| 102-1505-02   | 5B   | 1    | BEARING HOUSING HLE60 GEN2           |
| 102-0284-01   | 6    | 1    | HLE60RB DRV HSG ADPTER PLT GEN2      |
| 000-6736-01   | 7    | 1    | SPACER BUMPER                        |
| 003-1801-01   | 8    | 1    | BUMPER HEL 60RB                      |
| 000-7346-01   | 9    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 10   | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 11   | 4    |                                      |
| SBH-M004-0006 | 12   | 4    |                                      |
| SCH-M004-0014 | 14   | 4    |                                      |
| SBH-M004-0010 | 15   | 2    |                                      |
| SCH-M005-0025 | 16   | 1    |                                      |
| SCH-M005-0018 | 17   | 8    |                                      |
| 003-4075-01   | 18   | 2    | BRG W/LKNG SET SCRW                  |
| 003-1507-33   | 19   | 4    |                                      |
| 003-2226-29   | 20   | 1    |                                      |
| 003-2226-04   | 21   | 2    |                                      |



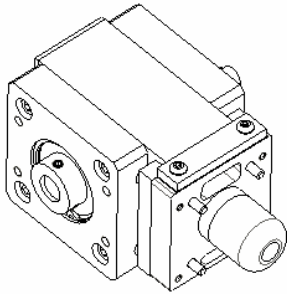


**WBO-HLE60RB DRIVE END ASSEMBLY**

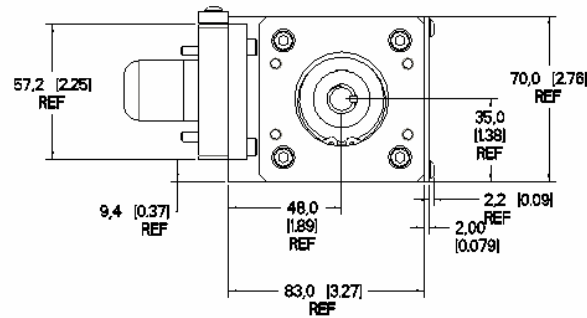
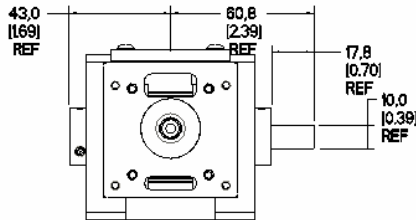
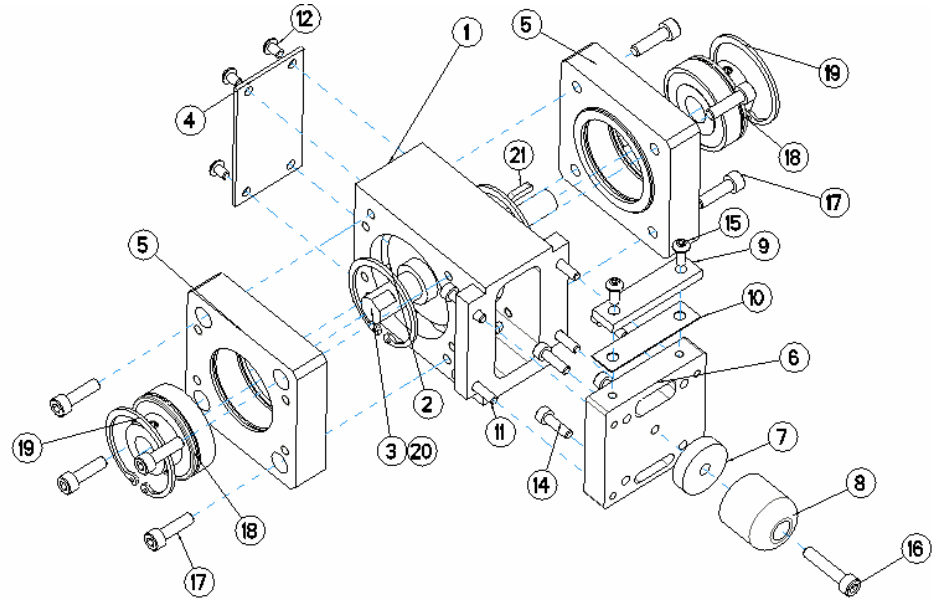


| Part Number   | ITEM | QTY. | DESCRIPTION                          |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY                               |
| 102-1503-01   | 3    | 1    | DRIVE SHAFT HLE60 WBO GEN2           |
| 102-1501-01   | 4    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1505-02   | 5    | 2    | BEARING HOUSING HLE60 GEN2           |
| 102-0284-01   | 6    | 1    | HLE60RB DRV HSG ADPTER PLT GEN2      |
| 000-6736-01   | 7    | 1    | SPACER BUMPER                        |
| 003-1801-01   | 8    | 1    | BUMPER HEL60RB                       |
| 000-7346-01   | 9    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 10   | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 11   | 4    |                                      |
| SBH-M004-0006 | 12   | 4    |                                      |
| SCH-M004-0014 | 14   | 4    |                                      |
| SBH-M004-0010 | 15   | 2    |                                      |
| SCH-M005-0025 | 16   | 1    |                                      |
| SCH-M005-0018 | 17   | 8    |                                      |
| 003-4075-01   | 18   | 2    | BRG W/LKNG SET SCR                   |
| 003-1507-33   | 19   | 4    |                                      |
| 003-2226-29   | 20   | 1    |                                      |
| 003-2226-04   | 21   | 2    |                                      |

**WRO/WLO-HLE60RB-DRIVE END ASSEMBLY**



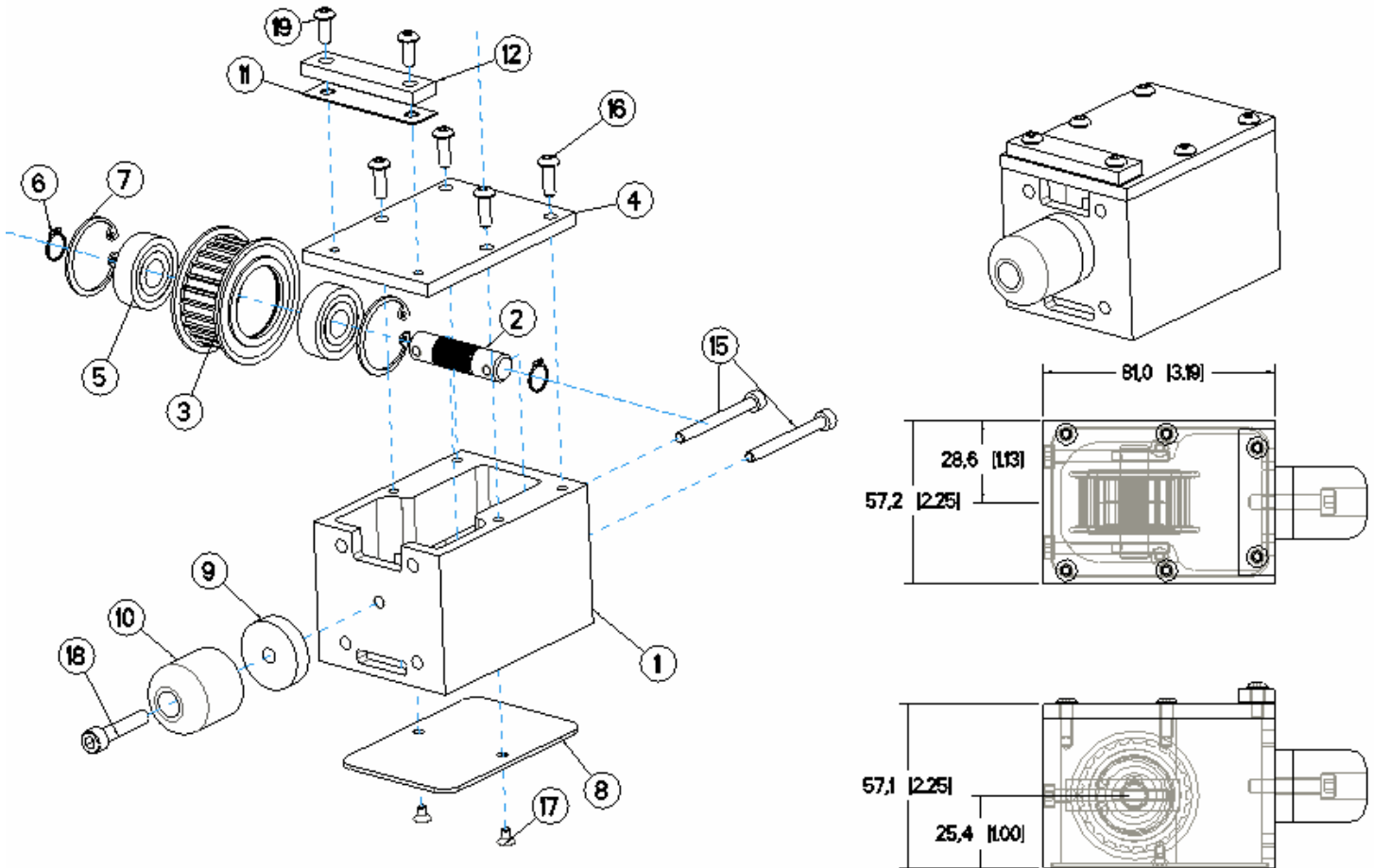
WRO SHOWN  
WLO ROTATE DRIVE SHAFT 180° RADIALLY



| Part Number   | ITEM | QTY. | PART DESCRIPTION                     |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY                               |
| 102-1503-02   | 3    | 1    | DRIVE SHAFT HLE60 WRO/WLO GEN2       |
| 102-1501-01   | 4    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1505-02   | 5    | 2    | BEARING HOUSING HLE60 GEN2           |
| 102-0284-01   | 6    | 1    | HLE60RB DRV HSG ADPTER PLT GEN2      |
| 000-6736-01   | 7    | 1    | SPACER BUMPER                        |
| 003-1801-01   | 8    | 1    | BUMPER HEL60RB                       |
| 000-7346-01   | 9    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 10   | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 11   | 4    |                                      |
| SBH-M004-0006 | 12   | 4    |                                      |
| SCH-M004-0014 | 14   | 4    |                                      |
| SBH-M004-0010 | 15   | 2    |                                      |
| SCH-M005-0025 | 16   | 1    |                                      |
| SCH-M005-0018 | 17   | 8    |                                      |
| 003-4075-01   | 18   | 2    | BRG W/LKNG SET SCRW INNER RACE       |
| 003-1507-33   | 19   | 4    |                                      |
| 003-2226-29   | 20   | 1    |                                      |
| 003-2226-04   | 21   | 1    |                                      |

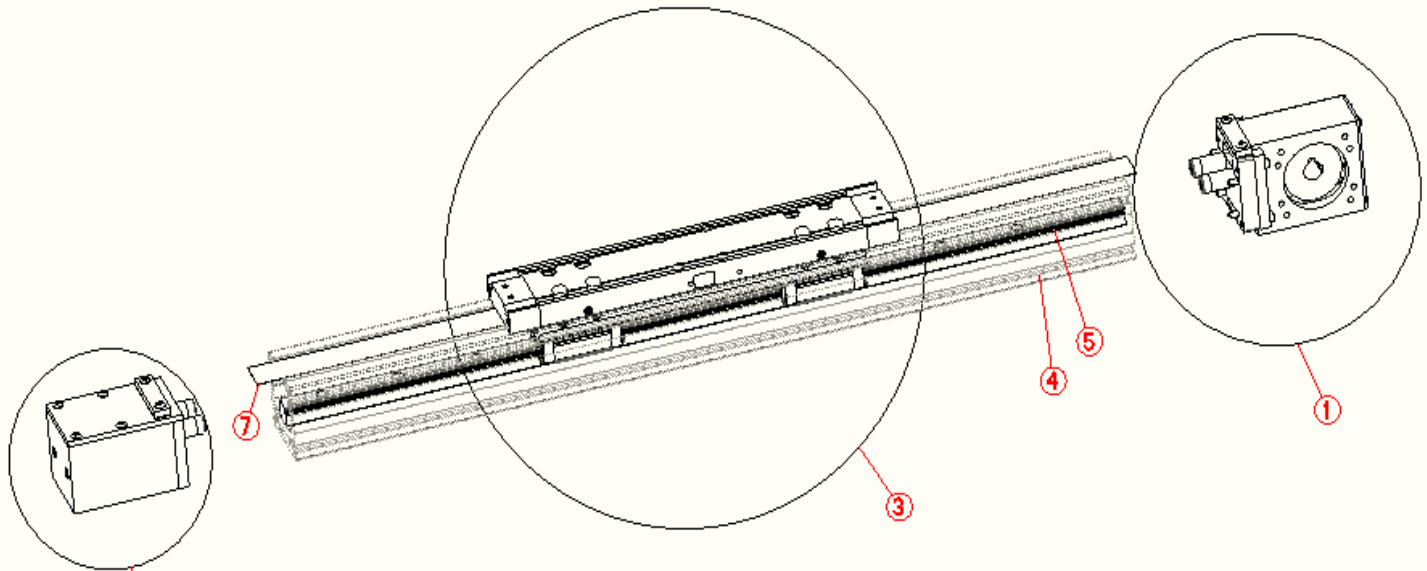


## 002-2754-01 HLE60RB TENSION END ASSEMBLY



| Part Number   | ITEM | QTY. | DESCRIPTION               |
|---------------|------|------|---------------------------|
| 102-0280-01   | 1    | 1    | HSG,TENSION,HLE60         |
| 102-0282-01   | 2    | 1    | SHAFT,HLE60 TENSION       |
| 101-2953-01   | 3    | 1    | PULLEY,IDLER HLE60        |
| 102-0281-01   | 4    | 1    | COVER,TOP HLE60RB TEN HSG |
| 003-1087-31   | 5    | 2    | BRG,RAD,10MM X 26MM X 8MM |
| 003-1759-08   | 6    | 2    | RETAINER RING,5100-39     |
| 003-1807-15   | 7    | 2    | RET RING 5008-100         |
| 100-1990-01   | 8    | 1    | COV BOTTOM HLE-60         |
| 000-6746      | 9    | 1    | SPACER BUMPER HLE-60RB    |
| 003-1801-01   | 10   | 1    | BUMPER RUBBER             |
| 003-2171-01   | 11   | 1    | GASKET STRIP SEAL,HLE60   |
| 000-7346-01   | 12   | 1    | RET SEAL SIZE 1           |
| SCH-M004-0040 | 15   | 2    | SCR CAP HD HEX M4 X 40MM  |
| SBH-M004-0012 | 16   | 4    | SCR BUT HD HEX M4 X 12MM  |
| SFH-M003-0006 | 17   | 2    | SCR FLAT HD HEX M3 X 6MM  |
| SCH-M005-0025 | 18   | 2    | SCR CAP HD HEX M5 X 25MM  |
| SBH-M004-0010 | 19   | 2    | SCR BUT HD HEX M4 X 10MM  |

## HLE60SR ASSEMBLY COMPONENTS



| ITEM # | PART#           | DESCRIPTION                             | UNIT   | REFERENCE   |
|--------|-----------------|---|--------|-------------|
| 1A     | ARO/ALO-HLE60SR | HLE60SR DRIVE END ASSEMBLY ARO/ALO      | EA     | SEE PAGE 39 |
| 1B     | ARW/ALW-HLE60SR | HLE60SR DRIVE END ASSEMBLY ARW/ALW      | EA     | SEE PAGE 40 |
| 1C     | MBR/MBL-HLE60SR | HLE60SR DRIVE END ASSEMBLY MBR/MBL      | EA     | SEE PAGE 41 |
| 1D     | MRW/MLW-HLE60SR | HLE60SR DRIVE END ASSEMBLY MRW/MLW      | EA     | SEE PAGE 42 |
| 1E     | WBO-HLE60SR     | HLE60SR DRIVE END ASSEMBLY WBO          | EA     | SEE PAGE 43 |
| 1F     | WRO/WLO-HLE60SR | HLE60SR DRIVE END ASSEMBLY WRO/WLO      | EA     | SEE PAGE 44 |
| 2      | 002-2754-02     | HLE60SR TENSION STATION ASSEMBLY        | EA     | SEE PAGE 45 |
| 3A     | NL-HLE60SR      | HLE60SR STANDARD "NL" CARRIAGE ASSEMBLY | EA     | SEE PAGE 37 |
| 3B     | VL-HLE60SR      | HLE60SR EXTENDED "VL" CARRIAGE ASSEMBLY | EA     | SEE PAGE 38 |
| 4      | 100-1778-01     | HLE60SR MACHINED BASE                   | METERS | SEE PAGE 36 |
| 5      | 100-1777-01     | HLE60SR SQUARE RAIL                     | METERS | SEE PAGE 36 |
| 6      | 003-1860-01     | HLE60SR TIMING BELT 16MM WIDE 5MM PITCH | METERS | SEE PAGE 36 |
| 7      | 003-1879-01     | HLE60SR STRIP SEAL                      | METERS | SEE PAGE 36 |

**HLE 60SR**

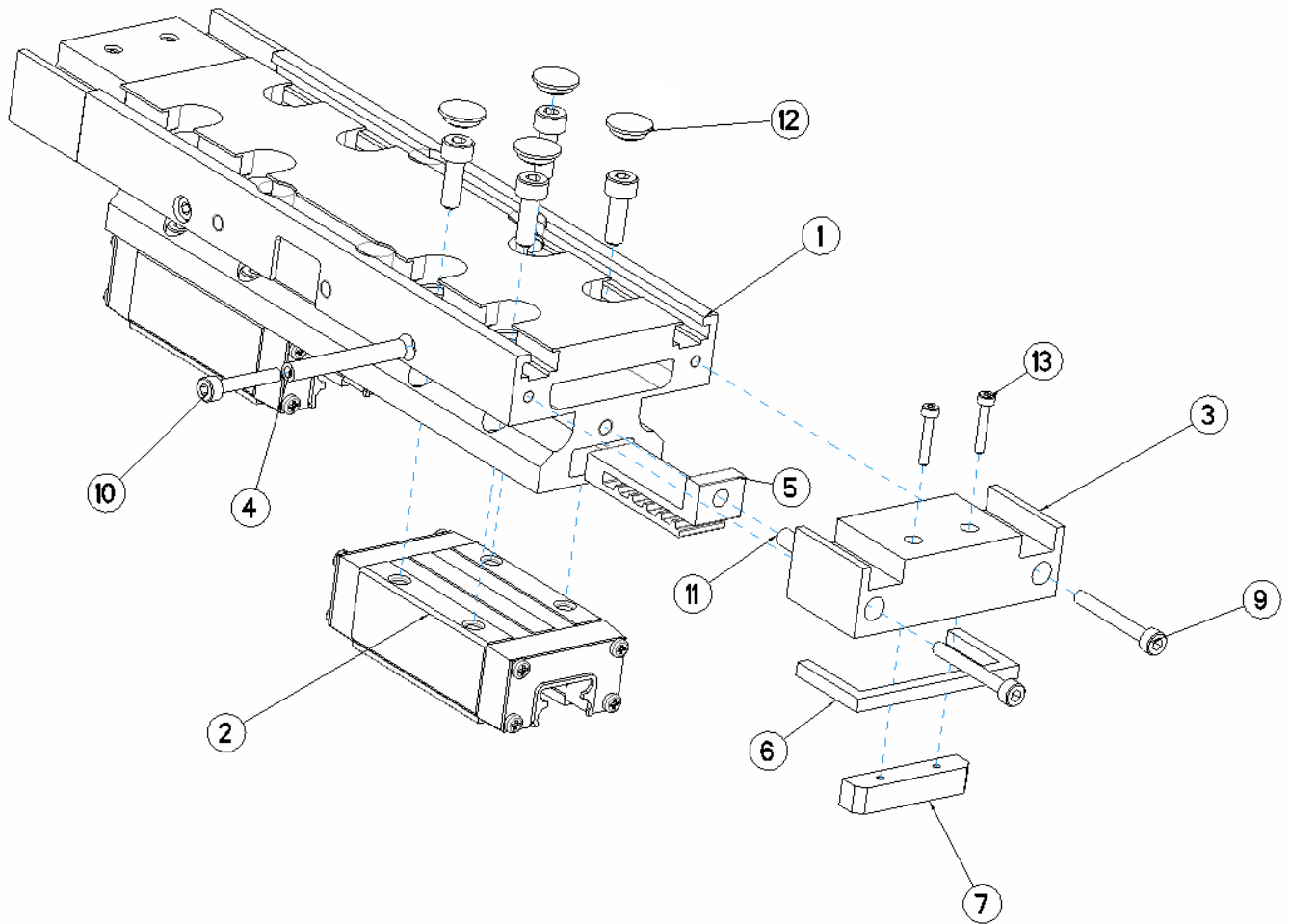
**REQUIRED BELT LENGTH P/N 003-1860-01**  
**NL/VL/SL CARRIAGE 1256MM + (2 X TRAVEL)**

**BASE LENGTH P/N 100-1778-01**  
**NL CARRIAGE 448 MM +TRAVEL**  
**VL CARRIAGE 550 MM +TRAVEL**  
**SL CARRIAGE 297 MM+TRAVEL+ SPECIAL CARRIAGE LENGTH**

**RAIL LENGTH P/N 100-1777-01**  
**NL CARRIAGE 444 MM +TRAVEL**  
**VL CARRIAGE 546 MM +TRAVEL**  
**SL CARRIAGE 291 MM+TRAVEL+ SPECIAL CARRIAGE LENGTH**

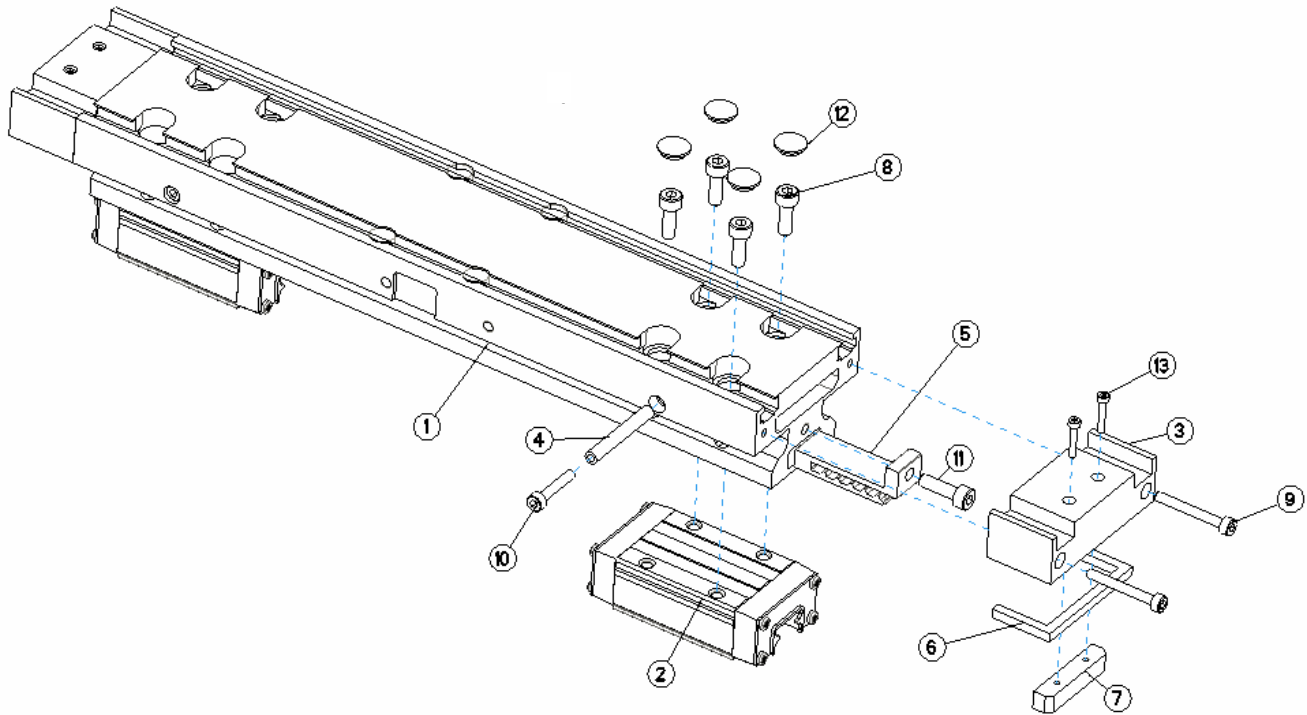
**STRIP SEAL P/N 003-1879-01**  
**NL CARRIAGE 464 MM +TRAVEL**  
**VL CARRIAGE 566 MM +TRAVEL**  
**SL CARRIAGE 313 MM+TRAVEL+ SPECIAL CARRIAGE LENGTH**

## HLE60SR NL CARRIAGE ASSEMBLY COMPONENTS



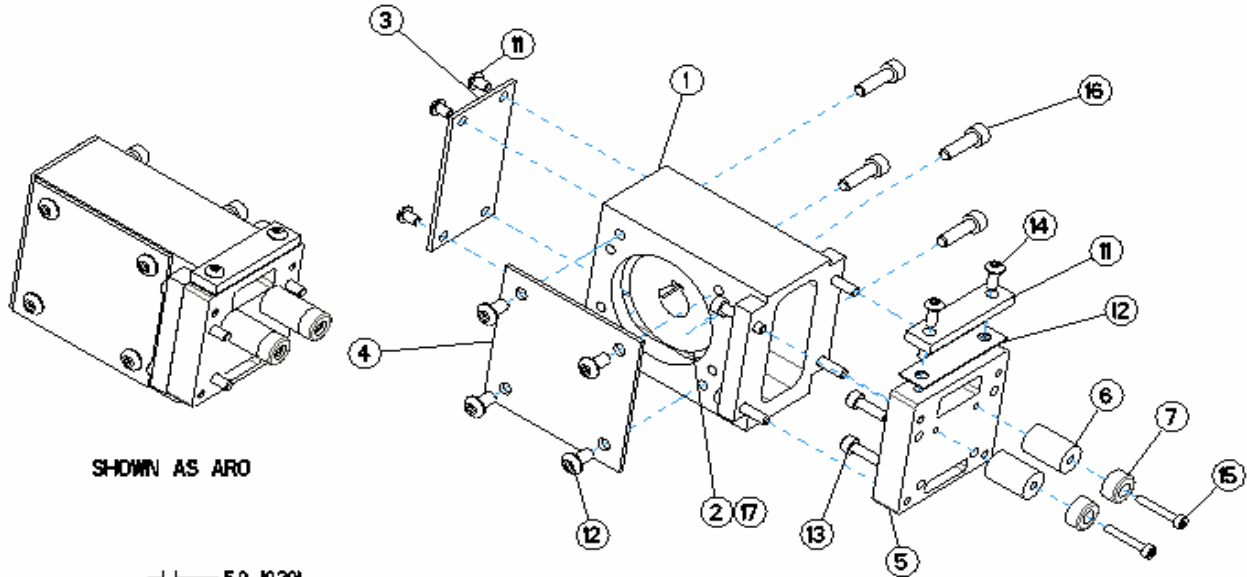
| Part Number   | ITEM | QTY. | DESCRIPTION                 |
|---------------|------|------|-----------------------------|
| 100-1598-01   | 1    | 1    | CARRIAGE HLE-60SR NL (MACH) |
| 002-1898-01   | 2    | 2    | BRG,LIN,GREASED,LWHS15C1BT1 |
| 100-0356-01   | 3    | 2    | END CAP SIZE 1              |
| 100-7930-01   | 4    | 2    | ROD GUIDE HLE60             |
| 100-0220-01   | 5    | 2    | CLAMP BELT HLE60            |
| 003-1986-01   | 6    | 2    | SEAL FELT PHC-8272          |
| 100-0785-01   | 7    | 2    | RETAINER STRIP HLE-60       |
| SCH-M004-0025 | 8    | 2    | SCR CAP HD HEX M4 X 25MM    |
| SCH-M003-0030 | 9    | 4    | SCR CAP HD HEX M3 X 30MM    |
| SCH-M003-0018 | 10   | 4    | SCR CAP HD HEX M3 X 18MM    |
| SCH-M004-0012 | 11   | 8    | SCR CAP HD HEX M4 X 12MM    |
| 100-0976-01   | 12   | 8    | PLUG MTG HOLE HLE60SR       |
| SCH-M002-0012 | 13   | 4    | SCR CAP HD HEX M2 X 12MM    |

## HLE60SR VL CARRIAGE ASSEMBLY COMPONENTS

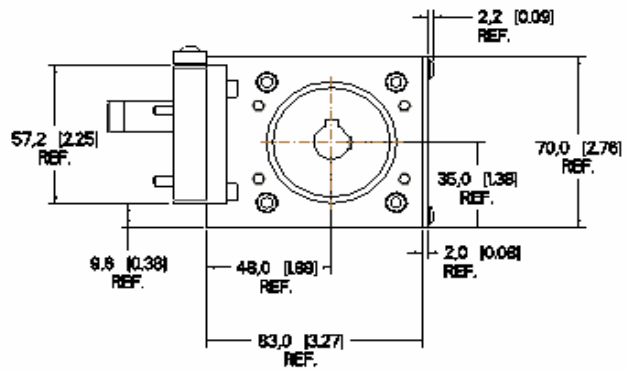
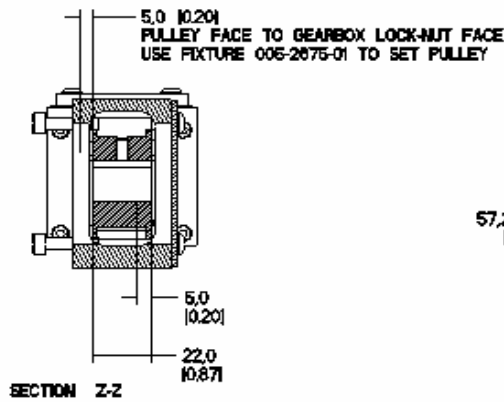


| Part Number   | ITEM | QTY. | DESCRIPTION                 |
|---------------|------|------|-----------------------------|
| 100-4962-01   | 1    | 1    | CARRIAGE HLE-60SR VL (MACH) |
| 002-1898-01   | 2    | 2    | BRG,LIN,GREASED,LWHS15C1BT1 |
| 100-0356-01   | 3    | 2    | END CAP SIZE 1              |
| 100-7930-01   | 4    | 2    | ROD GUIDE HLE60             |
| 100-0220-01   | 5    | 2    | CLAMP BELT HLE60            |
| 003-1986-01   | 6    | 2    | SEAL FELT PHC-8272          |
| 100-0785-01   | 7    | 2    | RETAINER STRIP HLE-60       |
| SCH-M004-0016 | 8    | 2    | SCR CAP HD HEX M4 X 16MM    |
| SCH-M003-0030 | 9    | 4    | SCR CAP HD HEX M3 X 30MM    |
| SCH-M003-0018 | 10   | 4    | SCR CAP HD HEX M3 X 18MM    |
| SCH-M004-0012 | 11   | 8    | SCR CAP HD HEX M4 X 12MM    |
| 100-0976-01   | 12   | 8    | PLUG MTG HOLE HLE60SR       |
| SCH-M002-0012 | 13   | 4    | SCR CAP HD HEX M2 X 12MM    |

**ARO/ALO-HLE60SR-DRIVE END ASSEMBLY**



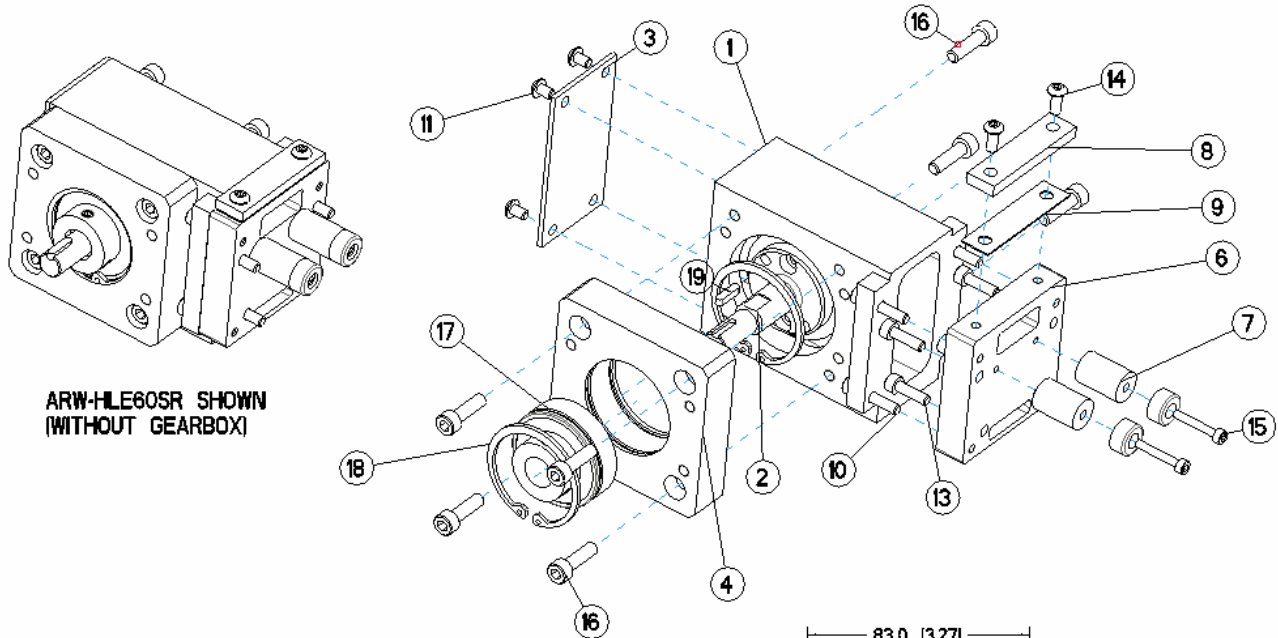
SHOWN AS ARO



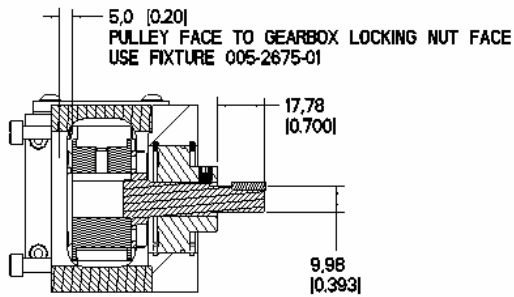
| Part Number   | ITEM | QTY. | DESCRIPTION                          |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY DRIVE HLE60 PV60 DIRECT GEN2  |
| 102-1501-01   | 3    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1502-01   | 4    | 1    | COVER PLATE 2 HLE60 DRIVE END GEN2   |
| 102-0285-01   | 5    | 1    | HLE60SR DRV HSG ADPTER PLT GEN2      |
| 100-1196-02   | 6    | 2    | SPACER BUMPER                        |
| 003-1588-01   | 7    | 2    | BUMPER HEL60SR                       |
| 000-7346-01   | 8    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 9    | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 10   | 4    |                                      |
| SBH-M004-0006 | 11   | 4    |                                      |
| SBH-M005-0010 | 12   | 4    |                                      |
| SCH-M004-0014 | 13   | 4    |                                      |
| SBH-M004-0010 | 14   | 2    |                                      |
| SCH-M003-0020 | 15   | 2    |                                      |
| SCH-M005-0018 | 16   | 4    |                                      |
| SSH-M005-0006 | 17   | 2    |                                      |



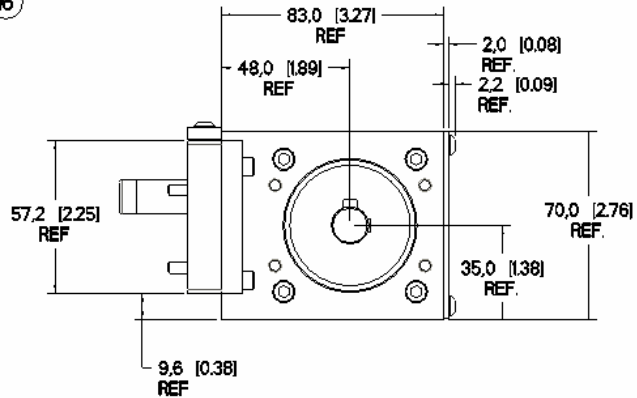
**ARW/ALW -HLE60SR DRIVE END ASSEMBLY**



ARW-HLE60SR SHOWN  
(WITHOUT GEARBOX)



SECTION Z-Z

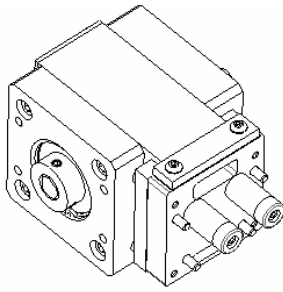


| Part Number   | ITEM | QTY. |  |
|---------------|------|------|--|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2   |
| 002-2834-03   | 2    | 1    | STUB SHAFT PULLEY ASSY HLE60 PV60 GEN2 |
| 102-1501-01   | 3    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2     |
| 102-1505-01   | 4    | 1    | BEARING HOUSING HLE60 GEN2             |
| 102-0285-01   | 5    | 1    | HLE60SR DRV HSG ADPTER PLT GEN2        |
| 100-1196-02   | 6    | 2    | SPACER BUMPER                          |
| 003-1588-01   | 7    | 2    | BUMPER HEL60SR                         |
| 000-7346-01   | 8    | 1    | STRIP SEAL RETAINER CLAMP              |
| 003-2171-01   | 9    | 1    | STRIP SEAL GASKET                      |
| SCH-M004-0020 | 10   | 4    |  |
| SBH-M004-0006 | 11   | 4    |  |
| SCH-M004-0014 | 13   | 4    |  |
| SBH-M004-0010 | 14   | 2    |  |
| SCH-M003-0020 | 15   | 2    |  |
| SCH-M005-0018 | 16   | 8    |  |
| 003-4075-01   | 17   | 1    | BRG W/LKNG SET SCRW                    |
| 003-1507-33   | 18   | 2    |  |
| 003-2226-04   | 19   | 1    |  |

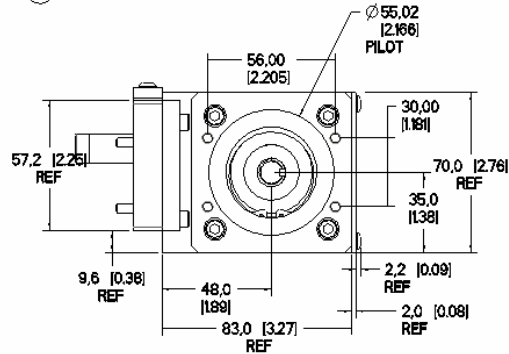
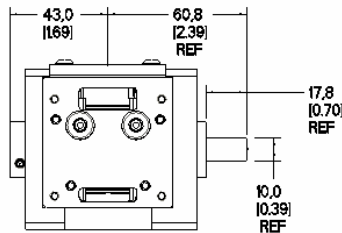
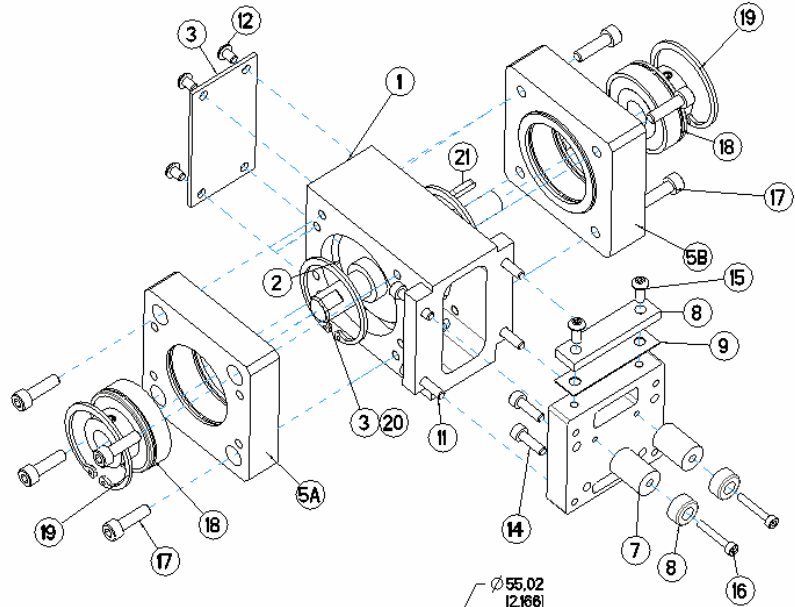




**MBR/MBL -HLE60SR-DRIVE END ASSEMBLY**



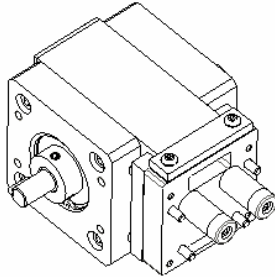
MBR SHOWN  
 MBL ROTATE DRIVE SHAFT 180° RADIALLY  
 AND SWAP BEARING HOUSING PLATES(102-1505-XX)  
 (ONE IS PILOTED FOR MTR BLOCK)



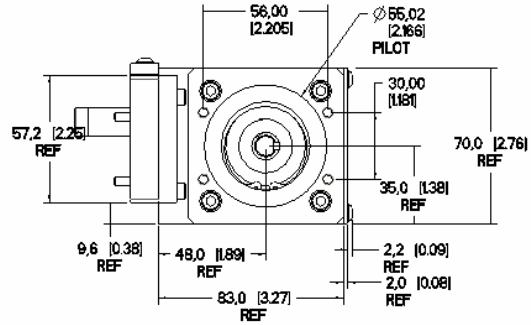
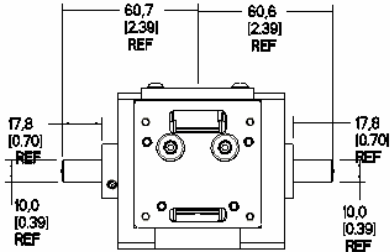
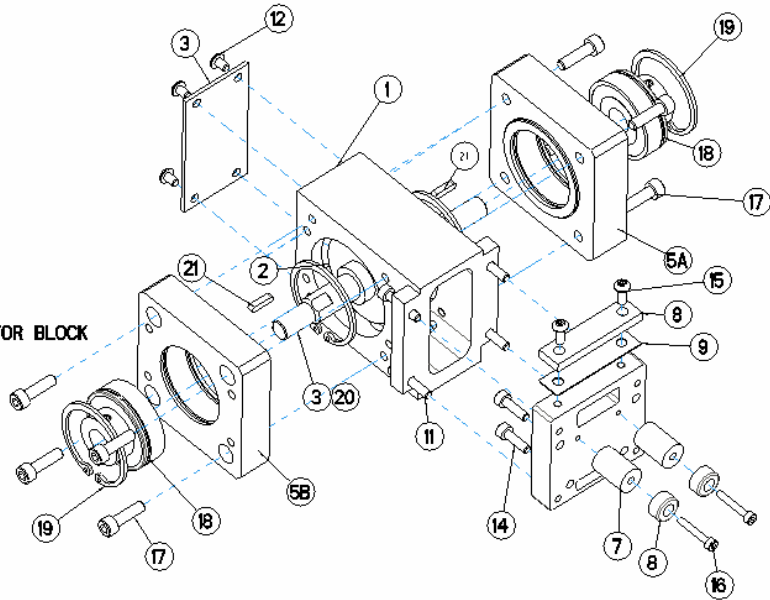
| Part Number   | ITEM | QTY. | DESCRIPTION                          |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY                               |
| 102-1503-02   | 3    | 1    | DRIVE SHAFT HLE60 WROWLO GEN2        |
| 102-1501-01   | 4    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1505-01   | 5A   | 1    | BEARING HSG MTR PILOT HLE60 GEN2     |
| 102-1505-02   | 5B   | 1    | BEARING HOUSING HLE60 GEN2           |
| 102-0285-01   | 6    | 1    | HLE60SR DRV HSG ADPTER PLT GEN2      |
| 100-1196-02   | 7    | 2    | SPACER BUMPER                        |
| 003-1588-01   | 8    | 2    | BUMPER HEL60SR                       |
| 000-7346-01   | 9    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 10   | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 11   | 4    |                                      |
| SBH-M004-0006 | 12   | 4    |                                      |
| SCH-M004-0014 | 14   | 4    |                                      |
| SBH-M004-0010 | 15   | 2    |                                      |
| SCH-M003-0020 | 16   | 2    |                                      |
| SCH-M005-0018 | 17   | 8    |                                      |
| 003-4075-01   | 18   | 2    | BRG W/LKNG SET SCRW ASS201-008H      |
| 003-1507-33   | 19   | 4    |                                      |
| 003-2226-29   | 20   | 1    |                                      |
| 003-2226-04   | 21   | 1    |                                      |



**MRW/MLW-HLE60SRDRIVE END ASSEMBLY**



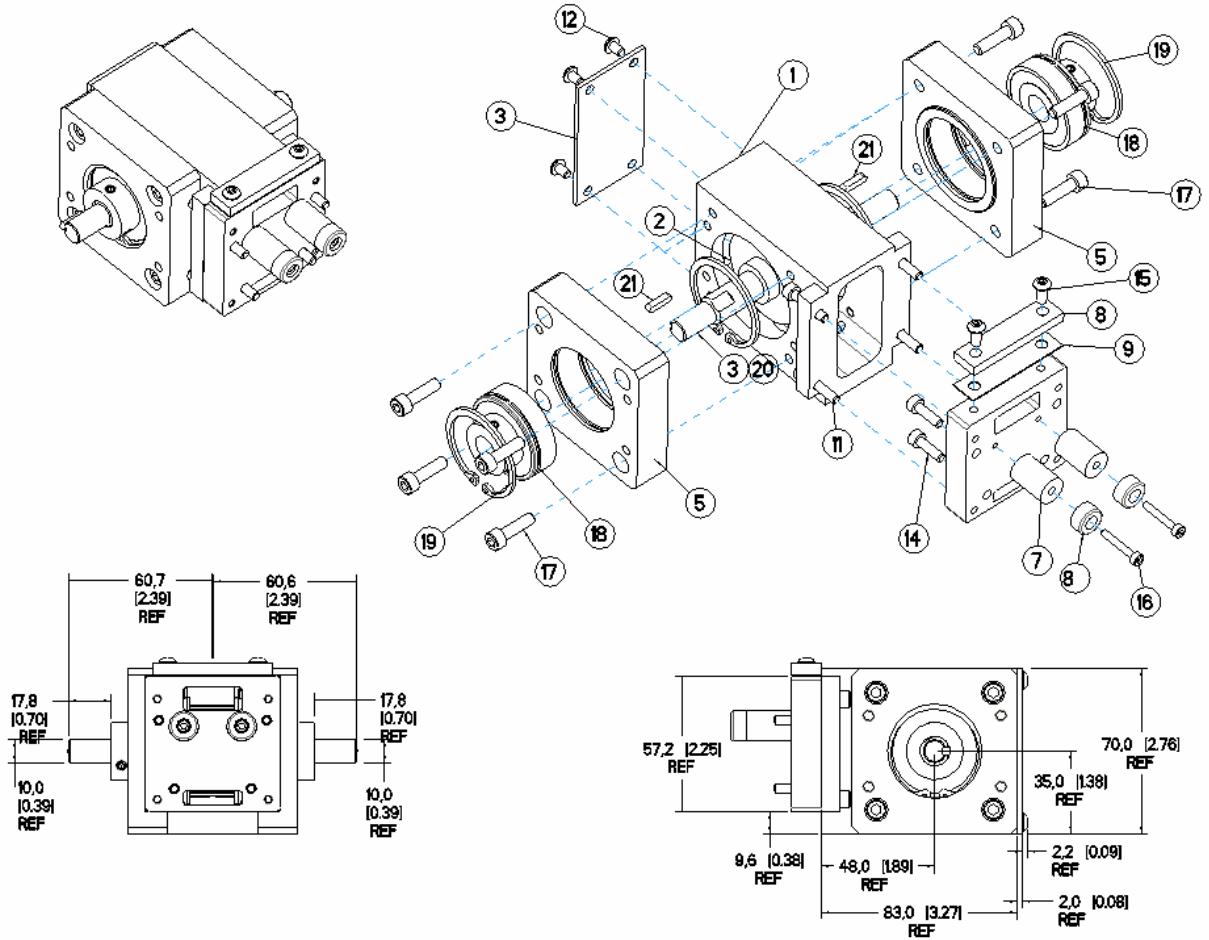
MRW SHOWN  
MLW SWAP BEARING HOUSING 5A AND 5B  
5A HAS TAPPED HOLES AND PILOT TO ACCEPT MOTOR BLOCK



| Part Number   | ITEM | QTY. | DESCRIPTION                          |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY                               |
| 102-1503-01   | 3    | 1    | DRIVE SHAFT HLE60 WBO GEN2           |
| 102-1501-01   | 4    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1505-01   | 5A   | 1    | BEARING HOUSING MTR PILOT HLE60 GEN2 |
| 102-1505-02   | 5B   | 1    | BEARING HOUSING HLE60 GEN2           |
| 102-0285-01   | 6    | 1    | HLE60SR DRV HSG ADPTER PLT GEN2      |
| 100-1196-02   | 7    | 2    | SPACER BUMPER                        |
| 003-1588-01   | 8    | 2    | BUMPER HEL60SR                       |
| 000-7346-01   | 9    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 10   | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 11   | 4    |                                      |
| SBH-M004-0006 | 12   | 4    |                                      |
| SCH-M004-0014 | 14   | 4    |                                      |
| SBH-M004-0010 | 15   | 2    |                                      |
| SCH-M003-0020 | 16   | 2    |                                      |
| SCH-M005-0018 | 17   | 8    |                                      |
| 003-4075-01   | 18   | 2    | BRG W/LKNG SET SCRW                  |
| 003-1507-33   | 19   | 4    |                                      |
| 003-2226-29   | 20   | 1    |                                      |
| 003-2226-04   | 21   | 2    |                                      |



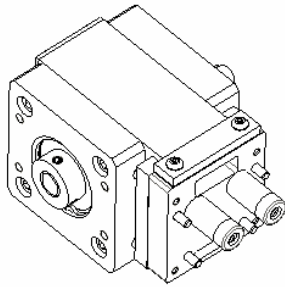
**WBO-HLE60SR DRIVE END ASSEMBLY**



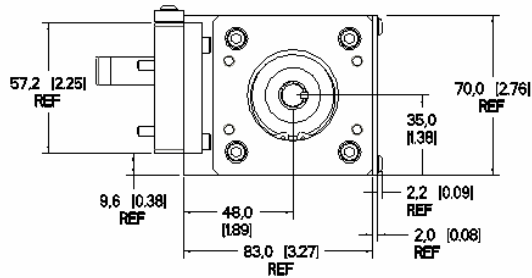
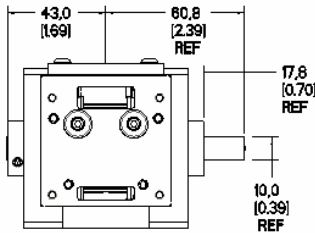
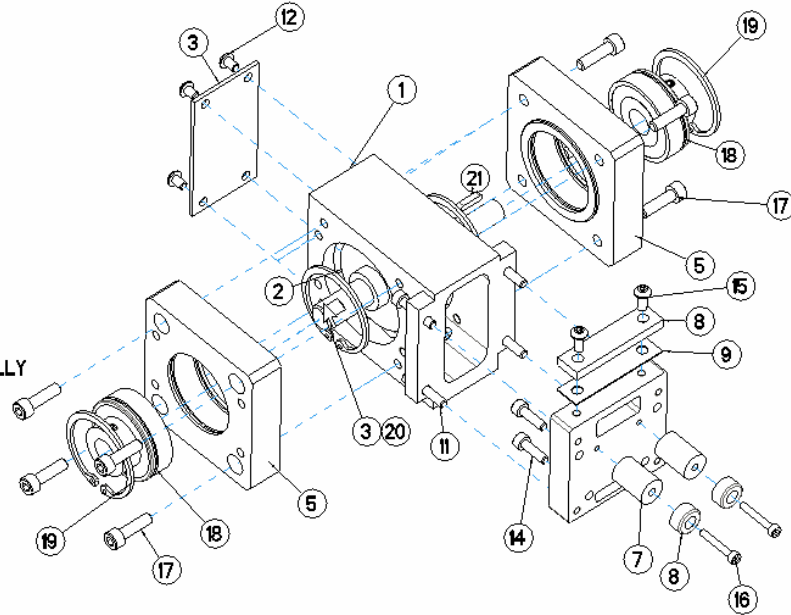
| Part Number   | ITEM | QTY. | PART DESCRIPTION                     |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY                               |
| 102-1503-01   | 3    | 1    | DRIVE SHAFT HLE60 WBO GEN2           |
| 102-1501-01   | 4    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1505-02   | 5    | 2    | BEARING HOUSING HLE60 GEN2           |
| 102-0285-01   | 6    | 1    | HLE60SR DRV HSG ADPTER PLT GEN2      |
| 100-1196-02   | 7    | 2    | SPACER BUMPER                        |
| 003-1588-01   | 8    | 2    | BUMPER HEL60SR                       |
| 000-7346-01   | 9    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 10   | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 11   | 4    |                                      |
| SBH-M004-0006 | 12   | 4    |                                      |
| SCH-M004-0014 | 14   | 4    |                                      |
| SBH-M004-0010 | 15   | 2    |                                      |
| SCH-M003-0020 | 16   | 2    |                                      |
| SCH-M005-0018 | 17   | 8    |                                      |
| 003-4075-01   | 18   | 2    | BRG W/LKING SET SCRW                 |
| 003-1507-33   | 19   | 4    |                                      |
| 003-2226-29   | 20   | 1    |                                      |
| 003-2226-04   | 21   | 2    |                                      |



**WRO/WLO-HLE60SR DRIVE END ASSEMBLY**



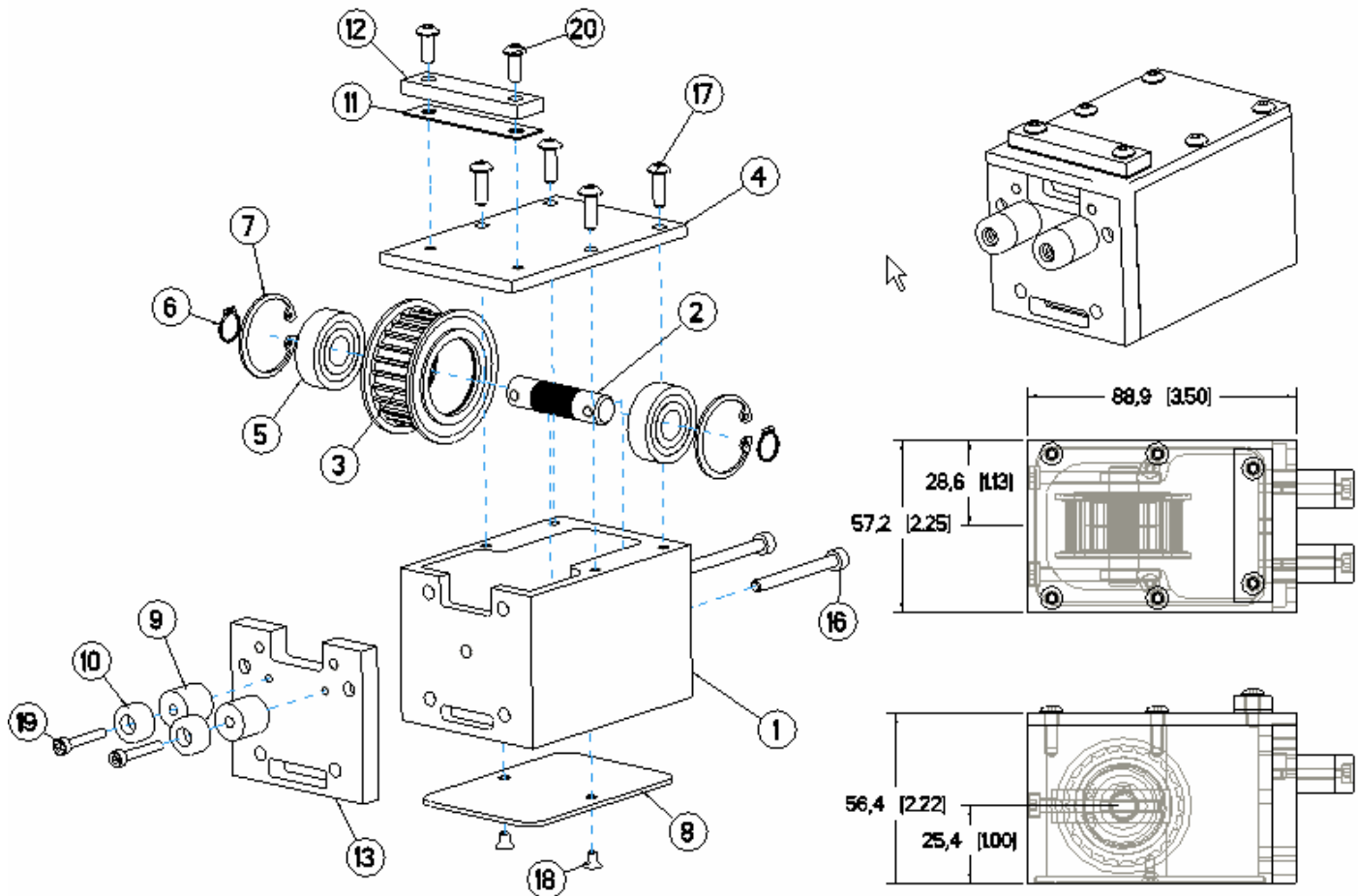
WRO SHOWN  
WLO ROTATE DRIVE SHAFT 180° RADIALLY



| Part Number   | ITEM | QTY. | DESCRIPTION                          |
|---------------|------|------|--------------------------------------|
| 102-1500-01   | 1    | 1    | DRIVE HOUSING HLE60-PV60 DIRECT GEN2 |
| 102-0513-01   | 2    | 1    | PULLEY                               |
| 102-1503-02   | 3    | 1    | DRIVE SHAFT HLE60 WRO/WLO GEN2       |
| 102-1501-01   | 4    | 1    | COVER PLATE 1 HLE60 DRIVE END GEN2   |
| 102-1505-02   | 5    | 2    | BEARING HOUSING HLE60 GEN2           |
| 102-0285-01   | 6    | 1    | HLE60SR DRV HSG ADPTER PLT GEN2      |
| 100-1196-02   | 7    | 2    | SPACER BUMPER                        |
| 003-1588-01   | 8    | 2    | BUMPER HEL60SR                       |
| 000-7346-01   | 9    | 1    | STRIP SEAL RETAINER CLAMP            |
| 003-2171-01   | 10   | 1    | STRIP SEAL GASKET                    |
| SCH-M004-0020 | 11   | 4    |                                      |
| SBH-M004-0006 | 12   | 4    |                                      |
| SCH-M004-0014 | 14   | 4    |                                      |
| SBH-M004-0010 | 15   | 2    |                                      |
| SCH-M003-0020 | 16   | 2    |                                      |
| SCH-M005-0018 | 17   | 8    |                                      |
| 003-4075-01   | 18   | 2    | BRG W/LKNG SET SCRW INNER RACE       |
| 003-1507-33   | 19   | 4    |                                      |
| 003-2226-29   | 20   | 1    |                                      |
| 003-2226-04   | 21   | 1    |                                      |



## 002-2754-02 HLE60SR TENSION END ASSEMBLY



| Part Number   | ITEM | QTY. | DESCRIPTION               |
|---------------|------|------|---------------------------|
| 102-0280-01   | 1    | 1    | HSG,TENSION,HLE60         |
| 102-0282-01   | 2    | 1    | SHAFT,HLE60 TENSION       |
| 101-2953-01   | 3    | 1    | PULLEY,IDLER HLE60        |
| 102-0281-02   | 4    | 1    | COVER,TOP HLE60SR TEN HSG |
| 003-1087-31   | 5    | 2    | BRG,RAD,10MM X 26MM X 8MM |
| 003-1759-08   | 6    | 2    | RETAINER RING,5100-39     |
| 003-1807-15   | 7    | 2    | RET RING 5008-100         |
| 100-1990-01   | 8    | 1    | COV BOTTOM HLE-60         |
| 100-1196-01   | 9    | 2    | SPACER BUMPER HLE-60SR    |
| 003-1588-01   | 10   | 2    | BUMPER BUNA-5             |
| 003-2171-01   | 11   | 1    | GASKET STRIP SEAL,HLE60   |
| 000-7346-01   | 12   | 1    | RET SEAL SIZE 1           |
| 100-1783-01   | 13   | 1    | ADPT ENDBLK HLE-60SR      |
| SCH-M004-0040 | 16   | 2    | SCR CAP HD HEX M4 X 40MM  |
| SBH-M004-0012 | 17   | 4    | SCR BUT HD HEX M4 X 12MM  |
| SFH-M003-0006 | 18   | 2    | SCR FLAT HD HEX M3 X 6MM  |
| SCH-M003-0020 | 19   | 2    | SCR CAP HD HEX M3 X 20MM  |
| SBH-M004-0010 | 20   | 2    | SCR BUT HD HEX M4 X 10MM  |

# PV60 Gearbox Technical Information

## PV Series, Specifications



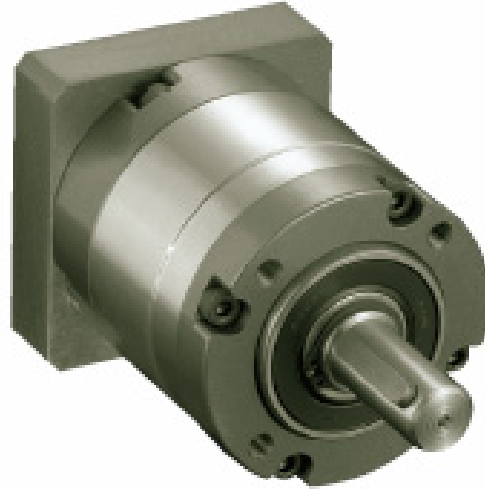
| Parameter                                      | Units          | Ratio                            |                      |
|--|----------------|----------------------------------|----------------------|
| Nominal Output Torque, $T_{nom r}$             | Nm (in-lb)     | 3                                | 12 (106.2)           |
|  |                | 4                                | 18.9 (167.265)       |
|  |                | 5                                | 19.6 (173.46)        |
|  |                | 7                                | 16.7 (147.795)       |
|  |                | 10                               | 10.6 (93.81)         |
|  |                | 12                               | 18.2 (161.07)        |
|  |                | 15                               | 19.4 (171.69)        |
|  |                | 16                               |                      |
|  |                | 20                               | 21.5 (190.255)       |
|  |                | 25                               | 20.0 (177)           |
|  |                | 30                               | 22.5 (199.125)       |
|  |                | 35                               |                      |
|  |                | 40                               | 21.5 (190.275)       |
|  |                | 50                               | 20 (177)             |
| 70   | 16.7 (147.795) |                                  |                      |
| 100  | 10.6 (93.81)   |                                  |                      |
| Max. Acceleration Output Torque, $T_{acc r^1}$ | Nm (in-lb)     | 3                                | 24 (212.4)           |
|  |                | 4,5,12,15                        | 36.4 (322.14)        |
|  |                | 7,70                             | 33.4 (295.59)        |
|  |                | 10,100                           | 21.2 (187.62)        |
| Emergency Stop Output Torque, $T_{em r^2}$     | Nm (in-lb)     | 3,4,5,12,15,16,20,25,30,35,40,50 | 55 (486.75)          |
|  |                | 7,70                             | 44 (389.4)           |
|  |                | 10,100                           | 39 (345.15)          |
|  |                |                                  |                      |
| Nominal Input Speed, $N_{nom r}$               | RPM            | All Ratios                       | 4000                 |
| Maximum Input Speed, $N_{max r}$               | RPM            | All Ratios                       | 6000                 |
| Lifetime                                       | h              | All Ratios                       | 20,000               |
| Standard Backlash <sup>3</sup>                 | arc-min        | ≤ 10:1                           | < 12                 |
|  |                | > 10:1                           | < 16                 |
| Efficiency at Nominal Torque                   | %              | ≤ 10:1                           | 96                   |
|  |                | > 10:1                           | 94                   |
| Noise Level at 3000 RPM <sup>4</sup>           | dB(A)          | All Ratios                       | 65                   |
| Maximum Allowable Case Temperature             | Degree C       | All Ratios                       | -20 to 100           |
| Lubrication                                    |                | All Ratios                       | Lifetime lubrication |
| Mounting Position                              |                | All Ratios                       | Any                  |
| Direction of Rotation                          |                | All Ratios                       | Same as input        |
| Degree of Protection                           |                | All Ratios                       | IP 64                |

1)  $t_{acc}+t_{dec}=2(t_{acc}+t_{cont}+t_{dec})$   
 $T_{cont}=.25T_{acc}$   
 2) Maximum of 1000 stops.  
 3) Measured at 2% of rated torque.  
 4) Measure at 1m.  
 $r$  = rated values

## PV60 Gearbox Technical Information

**PV Series, Inertia Table<sup>1</sup>**

| Units  | Ratio | PV80/PV23          |
|--|-------|--------------------|
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 3     | 0.1400<br>0.000124 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 4     | 0.1000<br>0.000089 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 5     | 0.0840<br>0.000074 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 7     | 0.0750<br>0.000066 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 10    | 0.0070<br>0.000006 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 12    | 0.0970<br>0.000086 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 15    | 0.0830<br>0.000073 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 16    | ----<br>----       |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 20    | 0.0830<br>0.000073 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 25    | 0.0830<br>0.000073 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 28    | ----<br>----       |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 30    | 0.0700<br>0.000062 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 35    | ----<br>----       |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 40    | 0.0700<br>0.000062 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 50    | 0.0700<br>0.000062 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 70    | 0.0700<br>0.000062 |
| kg cm <sup>2</sup><br>in lb sec <sup>2</sup> | 100   | 0.0700<br>0.000062 |



(1) Note: All moments of inertia values are as reflected at the input shaft of the gearhead.

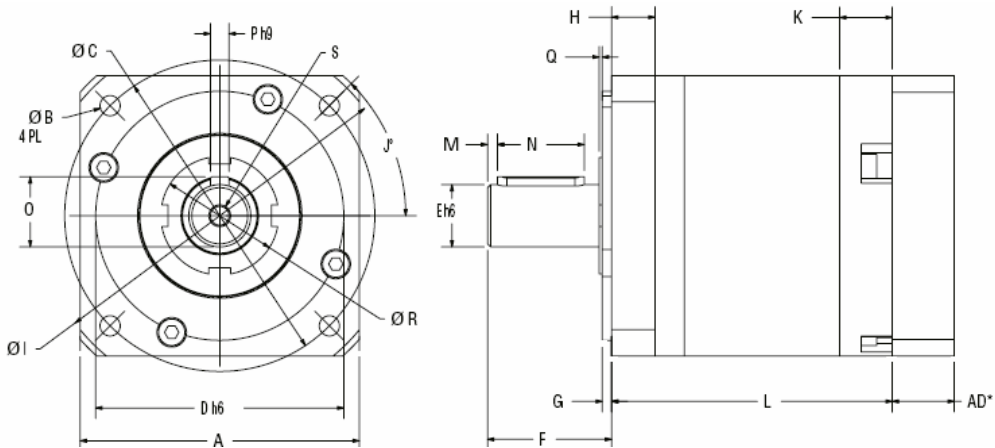
# PV60 Gearbox Technical Information

**PV Flange Face Dimensions**  
Units: mm (In)

|         | A      |        | B         |             | C              |                       | D                   |                 | E                |                  | F          |       | G   |       | H    |       | I  |       | J  |
|---------|--------|--------|-----------|-------------|----------------|-----------------------|---------------------|-----------------|------------------|------------------|------------|-------|-----|-------|------|-------|----|-------|----|
|         | Square | Flange | Bolt Hole | Bolt Circle | Pilot Diameter | Output Shaft Diameter | Output Shaft Length | Pilot Thickness | Flange Thickness | Housing Diameter | Lead Angle |       |     |       |      |       |    |       |    |
| PV60-FN | 62     | 2.441  | 5.5       | 0.217       | 70             | 2.756                 | 50                  | 1.969           | 14               | 0.551            | 25         | 0.984 | 2.5 | 0.098 | 10.3 | 0.406 | 80 | 3.150 | 45 |

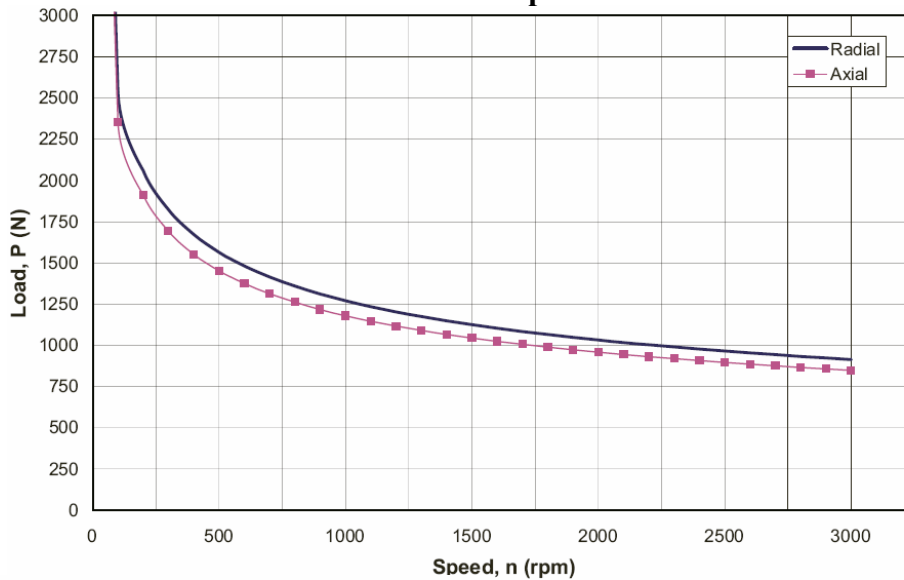
|         | K              | L1     |                | L2     |                | M                    |               | N          |              | O               | P                 |             | Q |       | R | S     |    |       |       |
|---------|----------------|--------|----------------|--------|----------------|----------------------|---------------|------------|--------------|-----------------|-------------------|-------------|---|-------|---|-------|----|-------|-------|
|         | Rear Thickness | Length | (Ratio < 10:1) | Length | (Ratio > 10:1) | Dist. From Shaft End | Keyway Length | Key Height | Keyway Width | Shoulder Height | Shoulder Diameter | Tap x Depth |   |       |   |       |    |       |       |
| PV60-FN | 16             | 0.630  | 71.5           | 2.815  | 91.5           | 3.602                | 3.2           | 0.126      | 16           | 0.630           | 16                | 0.630       | 5 | 0.197 | 1 | 0.039 | 28 | 1.102 | M5x12 |



## PV Series, Output shaft load rating

### PV60-FN

#### Load vs. Speed



- 1) Maximum axial load,  $F_a$ .
- 2) Maximum radial load applied to the center of the shaft,  $F_r$ .
- 3) Radial load curves can be used to combine (radial + axial) load if  $F_a/F_r < .22$ .
- 4) If  $F_a/F_r > .22$  consult factory.





# PV60 Gearbox Technical Information

## Gearbox Installation

### Parts supplied:

- PV Series gearhead with input section.
- 4 Socket head cap screws with lock washers.
- Allen wrench.

### Mounting Instructions

Step 1. Remove the plastic plug from the pinion screw hole access in the rear adapter plate of the gearhead. **Fig. 1**

Step 2. Rotate the pinion until the head of the pinion screw is aligned with the pinion screw access hole.

Step 3. Insert the supplied allen wrench through the pinion bolt access hole into the head of the pinion bolt and loosen the pinion bolt.

Step 4. Position the motor vertically with the shaft pointing upward. Make sure motor shaft is clean and dry for best installation. Insert the motor shaft into the gearhead pinion. If the motor shaft has a flat, rotate the shaft so that the flat is opposite the pinion bolt. Align the motor flange mounting holes to the holes on the gearhead. **Fig. 2** Align split in bushing sleeve with split in pinion. Tighten pinion screw using supplied wrench to torque valve in table below.

Step 5. Check that the gearhead is fully seated onto the motor flange. Secure the gearhead to the motor using the 4 socket cap screws and 4 lock washers supplied. Refer to the torque specification table below. Reinsert plastic cap into pinion bolt access hole.



Fig.1

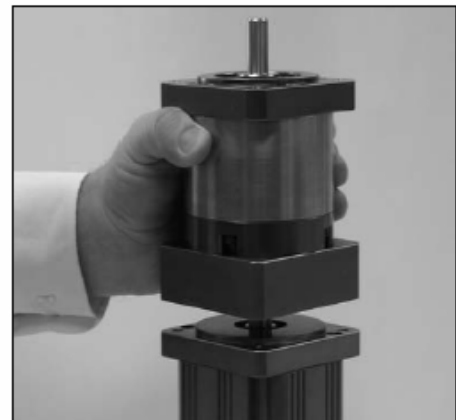


Fig.2

## Screw Tightening Torques

| Frame Size<br>(mm) | Motor Shaft Diameter |               | Screw Size | Tightening Torque |          |
|--------------------|----------------------|---------------|------------|-------------------|----------|
|                    | mm                   | (inches)      |            | Nm                | (in-lbs) |
| 60                 | 5.8 - 16             | (.230 - .630) | M4         | 4.6               | [41]     |

**Note:** Torques shown are minimum tightening values. Bolts can be safely tightened up to 25% higher for increased holding torques. Optionally, Loctite 242 can be applied to the threads of the pinion bolts.



---

Aerospace | **Automation** | Climate & Industrial Controls | Filtration  
Fluid Connectors | Hydraulics | Instrumentation | Seal