1. **Revision Log**

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| Revision Log | | | | | |
| Revision Level | Revision Date | Section | Description | | Revised By |
| REL | 21Jan2014 | ----- | Initial release | | pstrieder |
| A | 20Mar2015 | 0.0, Header, Footer | Added 0.0. Revision Log; renumbered per new scheme (was PC-WI-X18) | | drw |
| B | 31Oct2016 | 5.3 | Updated Fill Reservoir Requirements | | Hart |
| C | 14Dec2016 | 4.2, | Add new grease types. Added design recommendations, Remove Visual GO/NOGO, Remove Grease injected soft brush | | MJG |
| D | 2/3/17 | Title and header, footer | Change from CP-WI-MFG-X18 Global Standard for the Dispensing and Application of Greases to CP-WI-MFG-X305 Global Standard for the Dispensing and Application of Greases | | JY |
| E | 5/17/2017 |  | Add audit Questions | | MJG |
| F | 3/21/19 |  | Mass update, complete re-write to standard | | NT |
| G | 2/7/22 |  | Mass update for dispensing for materials | | AZ |
| H | 12/1/2023 |  | Replaced GHSP logo with newer version | | BB |
| Approval: | | CN: RS,FS | | MX: JH | |
| US: JA | | Other (as req’d): DRW | |

1. **Purpose:** 
   1. To define the global standard for the use and application of dispensed materials within GHSP manufacturing facilities.
2. **Scope:** 
   1. This global standard applies to all GHSP manufacturing facilities.
3. **Definitions:**
   1. GHS – Global Harmonization System
      1. An internationally agreed-upon standard, that was set up to replace the assortment of hazardous material classification and labeling schemes previously used around the world.
4. **References:**
   1. CP-WI-MFG-X301 Global Standard Production Equipment Safety, Ergonomic, and Delivery Checklist
5. **Method-Grease:**
   1. **Requirements**
      1. Establish Customer Requirements by defining how the product is applied:
         * Classification (type) of grease or dispensed materials
         * Drawing for location and amount with tolerances of grease or dispensed materials
         * Application grease or dispensed materials selection per component mix
           + For applications that have electronics, a non-silicone grease must be used to prevent electronic bridging
   2. **Grease dispencer system selection**
      1. Preferred Brands

*Selection outside the preferred brand requires approval by the Advanced Process Engineer and Global Standards Team*

* GP Reeves
* Abnox
* Nordson
* Lincoln
* Loctite
  + 1. Selection shall be based upon cost and accuracy to customer requirements.
    2. High Pressure dispencing (greater than 10:1)
       - Lincoln – Large, high pressure, high volume application
         * Lincoln reservoir/pump
         * Lincoln injector – nozzle
       - Abnox – Precision, high pressure, singular application
         * Lincoln reservoir/pump
         * Abnox metered pump
         * Abnox injector, with pull-back feature, needle nozzle
    3. Low Pressure dispencing (lower than 10:1)
       - GP Reeves – Low pressure, singular application
         * GP Reeves reservoir

Optional: Manifold

* + - * + GP Reeves pump

Optional: GUS

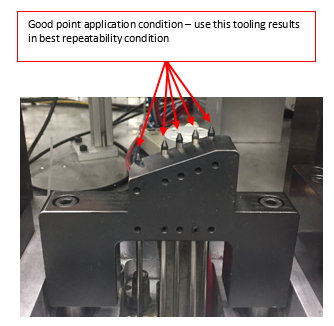
Optional: Recirculator

* + - * + GP Reeves injector needle nozzle

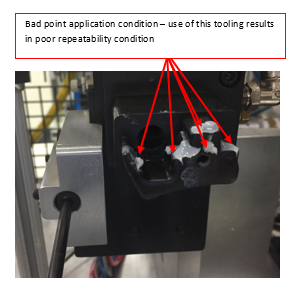
Optional: Snuff-Back feature

* 1. **GHSP standard production greases**
* Nye – Rheosil 500F
* Nye – Nyogel 774-VLF
* NPC – Permalube – CGN-3
* Molykote – YM-103
* Tribolube – 33T
* Nippon Koyu Permalub EJN-14
* Klübersynth LI 44-22
  1. **Dispensing method of grease from OEM container to grease reservoir**
     1. Standard off the shelf pressurized grease pump must be used for the removal of grease from OEM container. Note: Container sizes are not universal – OEM pump supplier should be contacted for proper equipment.
* NPC Permalub CGN-3
  + 16kg (35lb) metal pail
* Nippon Koyu Permalub EJN-14
  + 16kg (35lb) metal pail
* Molykote YM-103
  + 16kg (35lb) plastic pail
  + 181kg (400lb) metal drum
* Nye-Rheosil 500F
  + 16kg (35lb) plastic pail
  + 181kg (400lb) metal drum
* Nye-Nyogel 774VLF
  + 16kg (35lb) plastic pail
  + 181kg (400lb) metal drum
* Tribolube-33T
  + 16kg (35lb) plastic pail
* Klübersynth LI 44-22
  + 16kg (35lb) pail
    1. High pressure steel pipe or Hydraulic rated supply line – 3/4” or 19 mm minimum diameter must be used.
    2. Grease pump and supply lines will have high pressure shut off valves with lock out capability.
  1. **Production equipment grease reservoir/pump**
     1. All production equipment must have off the shelf pressurized grease reservoir/pump system that supplies grease to the machine nest/injector/metering device.
     2. All grease reservoirs will be plumbed with proper fitting and will be filled directly from the pressurized pump described in section 5.3
     3. Grease reservoirs will have low level detection sensors wired to the PLC. When low grease level is detected the machine will signal operator to have technician fill the grease reservoir.
  2. **Manual filling of grease reservoirs**
     1. All grease reservoirs will be marked with upper and lower fill lines. Upper line is green in color and lower line is red in color.
     2. Green line will be placed on reservoir below weep hole.
     3. Red line will be placed roughly 2 inches above bottom of reservoir.
     4. When follower is close to red line the grease reservoir needs to be filled. Fill reservoir until follower is at green line.
     5. Grease reservoir to be filled by Process Technician or certified operator.
     6. Grease valve to be placed in a position after fill of reservoir to avoid accidental bumping and over filling of reservoir.
  3. **Automated filling of grease reservoirs**
     1. Greaase reservoirs will have low and high level detection sensors wired separately or to the PLC.
     2. When the low grease level is detected, the machine will automatically or manually refill the grease reservoir according to the following methodologies:
        + Automatic refill will occur at low level indication and auto refill from plant/pump supply loop until high level detection sensor is activated.
        + Manual refill requirement (following section 5.6) will be activated by the PLC.
          - PLC will stop machine function and communicate requirement on HMI for operator or technician to refill the reservoir.
  4. **Grease injectors**
     1. Grease injector type and size is determined by type / volume of grease and number of application points per GHSP / Customer production drawings.
     2. All grease injectors will be adjustable for tuning in the volume of grease with the capability to lock the injector at the specified volume
     3. Grease injectors supply line will be plumbed directly to the reservoir / pump. Note: Low pressure can be hard plastic supply line. For high pressure pumps greater than 10:1 the grease supply line must be a high pressure steel or Hydraulic pressure rated hose.
     4. Grease injectors should be located as close as possible to the grease application point(s) to minimize the supply line length between the injector and application tooling.
     5. Grease flow / air detection sensors (Keyance flow monitor) will be used between the injector and the grease application tooling. The flow sensor will be located as close as possible to the grease application point. The purpose is to detect air in the grease line and minimize the time for the technician to clear any air pocket from the line.
     6. The grease flow detection sensor will be wired to the PLC and fault the machine if grease flow is not detected. Grease flow faults require a keyed reset.
  5. **Grease supply line requirements – Injector to application tooling**
     1. The grease supply line between the injector / flow detection sensor and application tooling should be as short as possible per equipment / application tooling design constraints.
     2. The grease supply line material selection should have minimal expansion characteristics. Best practice examples include – copper, steel or heavy wall hard plastic tubing.
     3. Grease supply line minimum diameter (O.D.) should be chosen based on grease properties, volumes, tooling restrictions, etc.
* Best practice examples = Minimum O.D.
  + Nye-Rheosil 500F = 1/8” / 3mm O.D.
  + NPC Permalube CGN-3 = 1/8” / 3mm O.D.
  + Nippon Koyu Permalub EJN-14 = 1/8” / 3mm O.D.
  + Molykote YM-103 = 1/8” / 3mm O.D.
  + Klübersynth LI 44-22 = 1/8” / 3mm O.D.
  + Nye-Nyogel 774-VLF = 1/4" / 4mm O.D.
  + Tribolube-33T = 5/16” / 8mm O.D.
  1. **Grease application tooling to production components**
     1. Grease application tooling will be designed to apply grease to the specific location per GHSP/Customer production drawings.
     2. Examples of grease application tooling:
* Steel nest with application ports
* Poured urethane nest with application ports
* Plastic or steel grease needles
* Steel rod with grease ports used for greasing the I.D. of tubes, cylinders, pivot holes, etc.
  + 1. Tooling design best practices – Attention to tool design is critical to grease application repeatability in production manufacturing.
* **Point Application (Primary option**) - Where possible design of tooling must use needle type application as shown in Fig. 1 - good point application below. Surface area of application tooling at point of use should be minimized and or reduced below surface area of the part grease is being applied to. This will create greater surface tension on the part and reduce residual grease retention on tooling.

**Fig. 1** - Example of good point application tooling design



**Fig. 2** - Example of poor point application tooling design



* **Surface Application (Secondary option)** – Where point application is not possible or full surface coverage is required use of this application method is allowable. Surface area of tooling at point of use should be sized according to application area design requirement. Distance between tooling and part should be minimized to ensure even distribution of grease to area required. This will create a tighter tolerance between the tooling and the part reducing residual grease retention on tooling.
  1. **Grease specification & verification method**
     1. Grease weight/volume capability studies will be performed per GHSP and/or customer quality requirements at time of tooling design and development prior to tooling acceptance by production.
* Process capability to be verified using volumes representing intended single shift production volume equal to Maximum Capacity Requirement of Program.
* Part quantities for final validation testing to be determined based on signal shift production volume + 20% (Maximum Capacity Requirement) by project.
  + 1. Where applicable, gross grease weights should be verified during production line start up at the beginning of each shift.
    2. Study should be performed on a scale with a minimum accuracy of 0.000g.
    3. Grease weight validation studies should be performed to meet specific customer requirements annually.
       - Grease validation will be entered in to GHSP PM System.
  1. **GHS Requirements**
     1. Grease reservoir must have a properly filled out GHS label attached to reservoir above the fill point.

1. **Method-Conformal Coating:**
   1. **Confiormal Coating dispencer system selection**
      1. Preferred Brands

*Selection outside the preferred brand requires approval by the Advanced Process Engineer and Global Standards Team*

* + - * Nordson
      * PVA
      * IJ Fisner
  1. **Conformal Coating is used to cover the electronics boards.** 
     1. GHSP and/or customer quality requirements at time of tooling design and development prior to tooling acceptance by production.
        + Process capability to be verified using the tools and standards established for visual inspection and keep out areas per the print.
        + Process should have flow sensors for material dispensing.
        + Where possible this will defined on the print or startups for the process.

1. **Method-RTV/Potting:**
   1. **RTV/Potting dispencer system selection**
      1. Preferred Brands

*Selection outside the preferred brand requires approval by the Advanced Process Engineer and Global Standards Team*

* + - * Graco
      * GP Reives
      * PVA
  1. **RTV/Potting dispencing for materials to set a seal or bond products.**
     1. GHSP and/or the customer quality requirements at the time of tooling design and development prior to tooling acceptance by production.
        + Process capability to be verified using the tools and standards established for visual inspection and keep out areas per the print.
        + Process should have flow sensors for material dispensing.
        + Studies will be completed for placement and measurements for the product to the process.
        + Where possible this will defined on the print or startups for the process.

1. **Method-Thermogel:**
   1. **Thermogel dispencer system selection**
      1. Preferred Brands

*Selection outside the preferred brand requires approval by the Advanced Process Engineer and Global Standards Team*

* + - * PVA
  1. **Thermogel dispencing for materials to allow heat to be disapated from the boards.**
     1. GHSP and/or the customer quality requirements at the time of tooling design and development prior to tooling acceptance by production.
        + Process capability to be verified using the tools and standards established for visual inspection and keep out areas per the print.
        + Process should have flow sensors for material dispensing.
        + Studies will be completed for placement and measurements for the product to the process.
        + Where possible this will defined on the print or startups for the process.

1. **Records:** N/A