Infor LN Quality User Guide for Quality Inspection

Publication Information

Document code	qmqualinspug (U9805)
Release	10.5 (10.5)
Publication date	February 6, 2024

Table of Contents

About this document

Objectives

The objectives of this book are to describe the purpose of inspection orders, and how to create and use master data.

Intended Audience

This book is intended for those who want to learn how to use inspection orders, generate storage inspection, and how set-up master data for inspections in the way that best serves their purposes. Both end users and users on administrator level will find the information they require.

Assumed Knowledge

Familiarity with the business processes involved in handling inspections, and general knowledge of the Infor LN functionality will help you understand this book. In addition, Quality training courses are available to give you a headstart.

Document summary

The first chapter, *Introduction*, describes the purpose and the general characteristics of quality inspections.

The following chapters deal with the master data setup, describe how inspection orders are created.

This guide describes procedures that users carry out using inspection order, and storage inspection provides some information on the underlying processes that Infor LN carries out. The most important session windows and fields involved are discussed, but a full description of all software components is outside the scope of this guide. For details, refer to the online Help.

How to read this document

This document was assembled from online Help topics. As a result, references to other sections in the manual are presented as shown in the following example:

Please refer to the Table of Contents to locate the referred section.

Underlined terms indicate a link to a glossary definition. If you view this document online and you click on underlined text, you jump to the glossary definition at the end of this document. Non-underlined references do not represent a link to glossary definitions or other elements.

Comments?

We continually review and improve our documentation. Any remarks/requests for information concerning this document or topic are appreciated. Please e-mail your comments to documentation@infor.com .

In your e-mail, refer to the document number and title. More specific information will enable us to process feedback efficiently.

Contacting Infor

If you have questions about Infor products, go to Infor Concierge at https://concierge.infor.com/ and create a support incident.

If we update this document after the product release, we will post the new version on the Infor Support Portal. To access documentation, select **Search Browse Documentation**. We recommend that you check this portal periodically for updated documentation.

If you have comments about Infor documentation, contact documentation@infor.com .

Chapter 1
Introduction

1

Quality Management helps manufacturing and process industries to monitor and improve the quality of their products. The Quality Management helps industries perform regular inspection procedures to attain the required quality. In every company, products, including raw materials, end products, and products in between manufacturing steps, are regularly inspected to ensure that procedure runs smoothly, to review what went wrong, or to determine what could go wrong during production, distribution, or in the time that products are in inventory. Quality uses logistical flow of products to schedule inspections.

Infor LN Quality supports quality management throughout the entire company. Quality manages the activities that are required to control the flow of products selected for inspection. It also supports the quality control of intermediate products and end products.

Quality Management is linked to other Infor LN modules and packages at various points in the production process to provide extensive quality checks.

Chapter 2
Master Data set-up for Inspections

2

This chapter explains the data set-up that is required to execute the inspection processes.

Master data set-up for inspections

The master data set-up is used to create a standard test procedure, that is a Test Plan used for an item or a group of items. A standard test procedure consists of a combination of one or more characteristics (a specific quality (like weight, length) that must be tested/ measured) and the tests that must be executed to determine the quality. The quality of an item can be inspected using various procedures: selling an item (Sales (SLS)), purchasing (Purchase (PUR)), producing (Routing (TI)), releasing a produced item to a warehouse (Production (JSC)), and transferring from one warehouse to another. Effectively, for an item, more than one standard test procedure can be defined because different characteristics are relevant for different procedures.

In the Master Data you can enter data such as:

- Standard test procedure: A link between the item that must be inspected and the master data that determines what is tested for an item.
- Testing combinations: The conditions that determine the generation of inspection orders, and how the inspections are carried out.
-

Define the characteristic(s)

A characteristic is a reference to a particular quality or distinctive mark of an item or an item part/component. For example, diameter, length, weight. A characteristic determines what features or properties of an item must be tested.

Use the Characteristics (qmptc0101m000) session to define the characteristic(s) of a product.

You must specify the following:

- Characteristic Type
  - Fraction: A number with decimals, for example, 3.145.

- Integer: An exact whole number as opposed to a number with decimals, for example, 1, 2, or 3.
- Option: Values (options) for a characteristic that must be defined (for example, blue or red).

You must specify the following:

- Method
  - Algorithm: The characteristic value is calculated by means of an algorithm, using the inspection results of variable or fixed characteristics.
  - Fixed: The characteristic value is determined once and can be entered in the Fixed Characteristic Value field in the Standard Test Procedure Characteristics (qmptc0115m000) session. LN uses this value to compare with the results entered in the Inspection Order Test Data (qmptc1115m000) session.
  - Variable: The characteristic value is measured immediately by means of an instrument. The results are entered in the Inspection Order Test Data (qmptc1115m000) session or the Inspection Order Lots / Serials / Stock Point Details (qmptc1131m000) session.

Define an aspect and link characteristic.

Aspects are used to reflect the various parts of an item for which the same characteristic is used. By means of which the same characteristic can be used more than once for the same item. For example, cylindrical shape.

Use Aspects (qmptc0102m000) session to define an aspect and Aspect (qmptc0602m000) or Aspect-Characteristics (qmptc0103m000) session to link characteristic.

Example

A bolt can have aspects head and tail. An aspect can have one or more characteristics.

A head can have a diameter and a length, and a tail can have a diameter and a color.

Define algorithm variables and link it to an algorithm

An Algorithm is a formula used to calculate the results of a test and determine whether or not the item is acceptable. Often other characteristics are measured and used to calculate the value of the characteristic with the method Algorithm.

- Define an algorithm in the Algorithms (qmptc0121m000) session.
- If you have not defined any variables, define the variables of the expression in the Algorithm Variables (qmptc0123m000) session.
- Link the variables to the algorithm in the Algorithm Variables (qmptc0122m000) session.
- Select the algorithm to which you want to link an expression in the Algorithms (qmptc0121m000) session, and fill out the Expression field.

Define the test(s)

A test is an inspection of the characteristics. You can link one or more tests to a characteristic.

Use the Tests (qmptc0106m000) session to define the tests. An examination or check done on a characteristic.

Define the instruments and test areas

Tool that is used during quality tests to measure particular characteristics of an item. Test area is the location where a product is inspected. A test area can be a work center, a warehouse, or an inventory location in a warehouse.

Use the Instruments (qmptc0108m000) session to define a tool that is used during quality tests to measure particular characteristics of an item. Use Test Areas (qmptc0107m000) to define the physical location where tests take place.

Link the tests and characteristics in the Characteristic Tests (qmptc0105m000) session. Specify the result type (Quantitative or Qualitative) and instruments to execute the tests.

Define code letter tables

Use the Code Letter Tables (qmptc0161m000) session to create and maintain code letter tables. You can link the tables to the inspection level and the letters. Letters are used to determine the various code letters that are applicable for a sampling rule.

Define inspection levels

Define the level at which inspections must be conducted. Use the Inspection Levels (qmptc0164m000) session to define inspection level.

Define inspection standard

Define standards (For example, ISO, DIN, MIL and so on) used to test one or more characteristics of a product, and determine if conformity is achieved for each characteristic. Use the Inspection Standards (qmptc0174m000) session to create inspection standards applicable for the sampling plan and sampling rule.

Define sampling plan

Sampling plan is used to define, sample (quantity or size) to be tested, inspection standard, the severity of the inspection, the acceptable quality level and sampling plan matrix. Use the Sampling Plan (qmptc0670m000) session to create a sampling plan.

Define sampling rules

Sampling rules that are based on sampling plans. The rules define how and when samples are taken and the sample and accept/reject criteria. Use the Sampling Rules (qmptc0160m000) session to define sampling rule that are used for a standard test procedure.

Define test procedures

A Standard Test Procedure is a grouping of quality standards and tests. The data included in a particular Standard Test Procedure includes all guidelines relative to extracting samples, performing tests and comparing the test results to acceptable limits for the specified characteristics.

Use the Standard Test Procedures (qmptc0110m000) session to define test procedures. You must specify the effective and expiry date of the standard test procedure.

Link the characteristic, test group, and test group characteristics. Use the Standard Test Procedure (qmptc0110m100) session to link the characteristic, test group, test group characteristics, where-used standard test procedure to the defined standard test procedure.

- Use the Standard Test Procedure Characteristics (qmptc0115m000) to link multiple characteristics or aspect/characteristics combinations to a standard test procedure. You can add properties for a standard test procedure like test, norm, limits method, and effective date. You must define the upper and lower limits and tolerance data for the tests attached to the aspect/ characteristic combinations that are linked to a standard test procedure.
- Use the Test Groups (qmptc0136m000) session to link the test group to the specified standard test procedure. You must select method by which the samples are taken from the order quantity.
  - 100 : All items are inspected. The sample size and the order quantity have the same value.
  - Single Sampling: One sample out of the entire order quantity is inspected.
  - Continuous Sampling: This type of sampling only takes place in case of mass production and is used to control processing.
  - Sampling Rule: A specific rule that states how and when a sample must be taken and the related inspection standard.
- Use the Test Group Characteristics (qmptc0137m000) session to link groups of characteristics to a test group. Specify the sequence in which the characteristics are tested.

Define testing combinations

Testing combinations define what, when, and how inspections are to be carried out. Testing combinations link an origin, an item or quality group, and a standard test procedure.

Use the Testing Combinations (qmptc0119m000) session to define testing combinations which, comprises of:

- The origin of the inspections.
- The item or quality group that applies to the combination.
- The quality ID that applies to the combination.

Algorithms

Quality inspections are not always simply a matter of taking measurements. Based on measurements, complex calculations must sometimes be performed, and these calculations may or may not include product specifications as part of the calculation. For this purpose, algorithms are used.

Example

By measuring the amount of sugar in wine, you can determine the amount of alcohol the wine is going to contain.

To define algorithms

Step 1:

Define the algorithm in the Algorithms (qmptc0121m000) session.

Note: You must wait until step 4 before you can enter an expression in the **Expression** field yet.

Step 2:

Define the variables of the expression in the Algorithm Variables (qmptc0123m000) session.

Step 3:

Link the variables you want to use in the algorithm to the characteristics or aspect/ characteristic combinations in the Algorithm Variables (qmptc0122m000) session. The used characteristics must be of characteristic type Fraction or Integer, and the method must be set to Algorithm (see the Characteristics (qmptc0101m000) session).

Step 4:

In the Algorithms (qmptc0121m000) session, select the algorithm to which you want to link the expression, and enter the expression (composed of the linked variables) in the **Expression** field. You can use standard mathematical expressions (logarithms, sine, cosine, and so on) in algorithms. For more information, refer to *Syntax for expressions (p. 14)*.

The result of calculating an algorithm is entered in the Inspection Order Test Data (qmptc1115m000) session. In the Specific menu, click Evaluate Algorithm to calculate the algorithm.

Syntax for expressions

The following subjects are mentioned below with regard to the syntax for expressions:

- Variables, for example, Voltage
- Operators, for example, Multiplication
- Functions, for example, Rounding
- Examples

VARIABLES

Variables are defined in the Algorithm Variables (qmptc0123m000) session and can be linked to characteristics in the Algorithm Variables (qmptc0122m000) session.

Variables are case sensitive and must be entered in uppercase to be regarded as proper variables.

Example

Correct	1D, TA, V1, and so on
Incorrect	1d, Ta, ta, v1, and so on

OPERATORS

Arithmetic operators:

* / + -	multiplication/ division/ addition/ subtraction
\	remainder after division
&	linking strings (alphanumeric arrays)

Logical operators

or, and, not

Logical operators are used in Boolean expressions. These expressions are either true or not true. The logical value true corresponds to value 1 and the logical value not true corresponds to 0.

Relational Operators:

=	equal to
<>	not equal to
>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to

Assignment commands are recorded by means of :=

Priority in expressions:

- Arithmetic operators have priority over relational operators
- Relational operators have priority over logical operators
- The priority sequence for arithmetic operators is: * / \ + -
- The priority sequence for logical operators is: not, and, or

Note

These sequences can be modified by means of round brackets.

Example

```
3 + 4 * 5 = 23   (3 + 4) * 5 = 35
```

FUNCTIONS

Arithmetic functions:

round(X,Y,Z)	round off X value
-	Y the number of decimals
-	Z rounding method (down = 0, normal = 1, up = 2)
abs(X)	absolute value of X (abs(-10.3) = 10.3)
int(X)	full value of X (int(11.6) = 11)
pow(X,Y)	involution (pow(10,2) = 100)
sqrt(X)	root of X (sqrt(16) = 4)
min(X,Y)	smallest values of X and Y (min(6,10) = 6)
max(X,Y)	largest values of X and Y (max(6,10) = 10)
pi	constant with PI value (3.1415926...)

Goniometric functions:

sin(X), cos(X), tan(X)	sine, cosine, or tangent of X (radians)
asin(X), acos(X), atan(X)	arcsine, arccosine, or arctangent of X
hsin(X), hcos(X), htan(X)	sine-, cosine-, or tangent-hyperbolicus of X

Logarithmic functions:

exp(X)	e-power of X
log(X)	natural logarithm of X with base e

log10(X)	logarithmic value of X with base 10
time	current time
date	current date
date(d,m,y)	date expressed as day, month, and year

For example, date(1,5,1991) = May 1 1991

Date functions:

time	current time
date	current date
date(d,m,y)	date expressed as day, month, and year

For example, date(1,5,1991) = May 1 1991

exp(X)	e-power of X
log(X)	natural logarithm of X with base e
log10(X)	logarithmic value of X with base 10

Example

```
5 IN [12,30] = 0 15 IN [12,30] = 1
```

Standard test procedure and testing combinations

A standard test procedure is the link between the item that must be inspected and the master data that determines what is tested for an item. Using a standard test procedure you can modify the master data for each new inspection. Moreover, a standard test procedure enables you to use one characteristic multiple times with different limits.

Procedure to create standard test procedure

Step 1:

Create the standard test procedure in the Standard Test Procedures (qmptc0110m000) session.

Step 2:

Link characteristics to the standard test procedure in the Standard Test Procedure Characteristics (qmptc0115m000) session. This link determines the item qualities that must be measured.

Step 3:

Link test groups to the standard test procedure using the Test Groups (qmptc0136m000) session. This link determines the test type and the sample size of the test.

Link characteristics to the test groups using the Test Group Characteristics (qmptc0137m000) session. This link determines which characteristics must be tested in what way.

Examples of the Acceptable Quality Level (AQL)

Example

Acceptable Quality Level	60 %
Sample Size	30 pieces
Single Sampling	

AQL 60 % means that 60% of the sample can be defective and the sample would be rejected only if the rejected piece is more than 60%.

Sample	Sample Quantity	Result
1	5 pieces	Good
2	10 pieces	Bad
3	15 pieces	Good

Actual Quality Level = [10 / (5+10+15)] x 100% = 33.33 %

The actual defective level is much lesser than the Acceptable Quality level. Consequently, the order quantity or the sample is accepted.

Acceptable Quality Level	60 %
Order Quantity	300 pieces
Frequency	100 pieces
Sample size	10 pieces

Continuous Sampling

Sample no	Sample Size	Actual Quality Level
1	10 pieces	70 % bad
2	10 pieces	50 % good
3	10 pieces	80 % bad

Compare the results to the Acceptable Quality Level.

Sample	Quality Level		Quantity	
-	Actual	Acceptable	Accepted	Rejected
1	70 %	60 %	0	100 pieces
2	50 %	60 %	100 pieces	0
3	80 %	60 %	0	100 pieces
-	-	Total	100 pieces	200 pieces

Calibrations

The instruments for quality inspections have to be calibrated from time to time. Continuos use of instruments can lead to a decrease in the exactness of measurements. If instruments are not calibrated the inspection results can be misleading. The time of calibration depends on the values you enter in the **Interval Type** field and the **Interval [Days/Times Used]** field in the Instruments (qmptc0108m000) session.

To configure calibrations in Quality:

1. Use the Calibrate Instruments (qmptc3201m000) session to select the instruments that must be calibrated. Instruments are selected only if the time interval or times used interval defined in the Instruments (qmptc0108m000) session has elapsed. These instruments will be blocked for calibration. Consequently the **Blocked for Calibration** check box in the Instruments (qmptc0108m000) details session is selected.

2. The Instrument Calibration Dates (qmptc3202m000) session displays the instruments that are blocked for calibration. After the instruments are calibrated, you must enter the calibration date in this session. You can unblock the instruments for which a calibration date is specified.

For each instrument, a history of calibration dates is maintained in the Instrument Calibration History (qmptc3500m000) session, based on the instrument and/or the date. This calibration history can be deleted based on instruments and dates in the Delete Calibration History (qmptc3200m000) session.

Units and quantities

Units

Units must have the same physical quantity, for example " **Length** ":

- **Characteristic Unit**
- **Test Unit**
- **Least Measurable Quantity Unit** (of the instrument used to test the characteristic)

Example

The quality of item "Tube" is determined by checking the following characteristics:

- Length
- Diameter
- Volume

Characteristic	Length
Characteristic Unit	m (meter)
Test Unit	cm (centimeter)

Quantities

- **Order Quantity**
  The quantity for which the inspection is required. Consequently, the result of the inspection order determines the quality of this quantity.
  Based on the order origin, the applicable quantity can be:
  - Sales order quantity
  - Purchase order quantity (the delivered quantity)
  - Production order quantity
  - Production batch quantity
- **Sample Size**
  The sample size is the total quantity of samples that must be tested from the order quantity, expressed in the unit of the sample size. The sample size can be specified in numbers or as a percentage of either the order quantity or the frequency.
- **Sample Quantity**
  The actual quantity which is drawn from the total quantity. Each sample quantity can be divided into smaller or test quantities.

- **Test Quantity**

  The test quantity is a part, an exact factor of the sample size, which is tested each time, and is expressed in the same unit as the sample size. For each test quantity, the result of the test can be specified in Inspection Order Test Data (qmptc1115m000) session.

Example

Inspection Order Quantity	1000 pieces
Test Type	Single Sampling
Sample Size [%%]	50%
Sample Size	500 pieces (1000 * 50% = 500)

For this sample size, three samples are drawn:

Sample	Test Quantity	Sample Quantity
1	50 pieces	200 pieces
2	50 pieces	200 pieces
3	50 pieces	100 pieces
-	Total	500 pieces

Test results:

```
Sample SerialNumber Result  1
```

First Article Inspection

First Article Inspection is a functional inspection process to verify if the engineering and specification requirements are met during the production, and avoid scrap or rework at a later stage.

FAI can be implemented partially or completely (full FAI). Full FAI is applicable when a new product is introduced.

Partial FAI is applicable if:

- a feature of a product is added or modified
- changes occur in the production process (e.g. tooling, machines, or staff)
- changes occur in the production documentation
- If a change occurs at the supplier location

This Partial First Article Inspection requires only a FAI report for the modified feature or the changes made to the production process or documentation process.

FAI is applicable for orders originating from:

- Purchase
- Purchase Schedules
- Production

Master Data setup

The master data set-up is used to enable FAI feature for an item, and create a FAI rule that is used to link an item to a specified business partner, ship to ware house and a standard testing procedure. In Infor LN the fields— item, revision, effectivity unit, business partner, ship to warehouse, and planned receipt date are referred to, as a combination.

Step 1:

In the **First Article Inspection Document Series** field in the Quality Management Parameters (qmptc0100m000) session, specify a value. The FAI document numbers start with this series.

Step 2:

In the Items - Quality Data (qmptc0118m000) session, define the item for which you want the FAI to be enabled and select the **First Article Inspection Required** check box. You can also specify the owner of the FAI rule, in this session.

Note To enable FAI for an item group, you can select the **First Article Inspection Required** check box in the Items - Quality Defaults (qmptc0117m000) session.

Step 3:

In the Testing Combinations (qmptc0119m000) session, link the item with the standard test procedure. The item can also be linked to a quality group.

Step 4:

In the First Article Inspection Rules (qmptc0116m100) session, create a first article inspection rule for **Purchase**/ **Purchase Schedule**/ **Production (JSC)** origin and the specified combination data.

Note A First Article Inspection Rule acts as a trigger to create the FAI document.

Chapter 3
Inspection Process

3

This chapter provides a detailed explanation about the inspection processes executed for the various order types. The First Article Inspection process used to verify and confirm the engineering and specification requirements during the production, is also explained.

Order inspections

Order Inspections comprises of inspection orders that are used to structure the inspection of products that are purchased, produced, transferred, or sold. For products in inventory, a storage inspection order instead of a standard inspection order is used.

The standard inspection process:

1. Inspection orders are created automatically by means of predefined testing combinations, but you can also manually add, delete, or maintain inspection orders based on the origin of the order (refer to the Order Inspections (qmptc1120m000) session).

2. For each inspection order, you can create different samples with different sample sizes and different dates and time in the Inspection Order Samples (qmptc1110m000) session. Infor LN checks if the total of all samples matches the sample size.

3. Enter the test data in the Inspection Order Test Data (qmptc1115m000) session (by characteristic). The session in which you enter the test data depends on the settings in the Quality Management Parameters (qmptc0100m000) session. When the test data is entered, the Infor LN generates the overall results defined for that specific characteristic.

4. Complete Inspection collectively by order, origin, or storage using the Complete/Process Order Inspections (qmptc1202m000) session. If an inspection order is completed, Infor LN checks if the test data is specified. If not, the inspection order cannot be completed.

5. Inspection orders can be processed by inspection order, by origin, and by storage inspection. Infor LN determines the pass and the fail pieces in the sample size. Based on this evaluation, Infor LN calculates the actual accepted and rejected quantities. These accepted and rejected quantities are compared with the acceptable quality level (AQL) specified in the Test Groups (qmptc0136m000) details session. If the percentage of accepted quantity is less than the AQL, the entire order or lot is rejected. In case of continuous sampling, the part of the order displayed in the **Frequency** field is rejected.

If an algorithm is defined for a characteristic, this algorithm is calculated during inspection. Each algorithm is calculated only when the variables (characteristics) required for that algorithm are specified.

Storage inspections

Storage inspections are quality inspections for items in inventory. If a storage inspection is generated for the selected items, these items are blocked for use and are regarded as inventory on hold.

Procedure for storage inspections

Step 1:

Generate storage inspections in the Generate Storage Inspections (qmptc2220m000) session. You can generate storage inspection orders based on item, warehouse, location, lot, business partner, and date. Infor LN uses the testing combination and standard test procedure for the default inspection data.

Step 2:

Use the Storage Inspections (qmptc2120m000) session to view the storage inspections that you generate in the Generate Storage Inspections (qmptc2220m000) session.

Step 3:

Use the Storage Inspection Inventory (qmptc2130m000) session to allocate the lot(s), the warehouse(s), and the items that must be inspected for this inspection order.

Step 4:

Use the Storage Inspections (qmptc2120m000) session to display the storage inspection orders that are created by default. In this session you can also modify storage inspection orders or create new storage inspection orders.

Step 5:

Use the Inspection Order Lines (qmptc1101m000) session to display, modify, or create inspection order lines. The inspection order lines indicate how an item is tested.

Step 6:

Use Inspection Order Samples (qmptc2110m000) session to create different samples with different sample sizes and different dates and times for each inspection order . Infor LN checks if the total of all the samples matches the sample size.

Step 7:

Enter the test data in the Inspection Order Test Data (qmptc1115m000) session by characteristic. When the test data is specified, Infor LN generates the overall results defined for that specific characteristic.

Step 8:

Process the inspection orders using the Complete/Process Order Inspections (qmptc1202m000) session. ERP determines the 'good' and the 'bad' pieces in the sample size. Based on this, ERP calculates the actual accepted and rejected quantities. These accepted and rejected quantities are compared with the acceptable quality level (AQL), entered in the Test Groups (qmptc0136m000) session. If the percentage of accepted quantity is less than the AQL, the entire order or lot is rejected.

Step 9:

Use the Close Storage Inspections (qmptc2221m000) session to close the orders with the status processed. ERP checks for all processed storage inspections and unblocks all inventory.

Integration with JSC

Quality can be used to inspect the quality of

- Materials for production orders
- Intermediate products between operations (subassemblies)
- Finished goods of production orders

In Quality you specify the required tests and the quality standards.

You can control the inspections by means of inspection orders. Infor LN creates the inspection orders when you release a production order. The inspection orders for materials and end products are based on the warehouse orders by which you move the items from and to the warehouse.

An inspection order can in some cases (depending on the parameters) block a production order, until the inspections have finished. You can override these parameters for individual production orders, operations, or materials, by means of the Order Specific Test Procedures (qmptc0149m000) session.

Quality sends the results of the inspections of subassemblies and end products back to the Job Shop Control module. These results determine how much of a product you can report completed or rejected.

Using QM for manufacturing operations

Quality control of operations

If you use Quality for operations in the Job Shop Control module, LN creates inspection orders for each operation. These inspection orders specify the tests for the subassemblies produced.

You can choose between four methods which determine the interactions between the Job Shop Control module and Quality with respect to the routing operations:

- The subassemblies are inspected, but the operations are in no way affected by the inspection orders (method A).
- You must inspect the subassemblies, before you can report an operation completed. However, you are free to report any quantity completed or rejected, regardless of the results of the tests (method B).
- You must inspect the subassemblies, before you can report quantities completed or rejected. The inspections result in recommendations for the quantities completed and rejected (method C).
- You must inspect the subassemblies, before you can report quantities completed or rejected. The results of the inspections determine the quantity completed and rejected. You cannot modify these quantities (method D).

Consequences for reporting completed

The chosen method determines the use of the following fields in the Report Operations Completed (tisfc0130m000) session:

- **Quantity Completed**
- **Rejected**
- **QuantityTo Inspect**

You must enter the data in the **Quantity Completed** field and the **Rejected** field, except when you chose method C or D (as mentioned before).

If the subassemblies must be inspected before reporting quantities complete or rejected (method C and D), the following happens:

- The **Quantity Completed** field and the **Rejected** field are blocked.
- You can enter the data in the **QuantityTo Inspect** field.
- Quality adds the results of the inspections to the **Quantity Completed** field and **Rejected** field, when it processes the inspection order.

If you apply method C, you can still modify the **Quantity Completed** field and **Rejected** field, after you close the inspection order.

Note

If you chose method A, and you try to change the quantities completed or rejected, after you closed the inspection order, LN will ask you if the inspection order must be reopened.

If you chose method B, C, or D, and you try to change the quantities completed or rejected, after you closed the inspection order, LN will generate a new inspection order.

- *To set up inspection methods for operations (p. 29)*

To set up inspection methods for operations

If the **Routing (TI)** check box in the Quality Management Parameters (qmptc0100m000) session is selected, you can use Quality to check the products of operations.

You can start the Order Specific Test Procedures (qmptc0149m000) session from the Production Planning (tisfc0110m000) session.

You can define the quality requirements for each operation.

The following fields determine which of the methods mentioned in Manufacturing operations section can be used:

- **Blocking Method for Inspections**
- **QM OnlyRecommends**

These fields are available in the Order Inspections (qmptc1120m000) session.

- Infor LN uses method A, if the following conditions are met:
  - **Blocking Method for Inspections** = **Continue**
  - The **QM OnlyRecommends** check box is selected
- Infor LN uses method B, if the following conditions are met:
  - **Blocking Method for Inspections** = **Block on Completed Operation**
  - The **QM OnlyRecommends** check box is selected
- Infor LN uses method C, if the following conditions are met:
  - **Blocking Method for Inspections** = **Block on Operation**
  - The **QM OnlyRecommends** check box is selected
- Infor LN uses method D, if the following conditions are met:
  - **Blocking Method for Inspections** = **Block on Operation**
  - The **QM OnlyRecommends** check box is cleared

Infor LN determines the value of these fields on the basis of the data you enter in the following sessions:
- Quality Combinations (qmptc0111m000)
- Order Specific Test Procedures (qmptc0149m000)

Quality control of materials

If the Quality package is implemented for materials used for production orders, Infor LN creates inspection orders for each estimated material.

Possible scenarios to implement quality for the materials:

- The materials are inspected, but the inspection orders have no direct impact on the production orders (method A).

■   You must inspect the materials, before you can issue them to a production order (method B).

Inspection methods for materials

If the **QM Implemented Material (BOM)** check box in the Quality Management Parameters (qmptc0100m000) session is selected, you can use Quality to check the materials for production orders.

You can define the quality requirements for each material.

If you select the **Material (BOM)** check box in the Quality Management Parameters (qmptc0100m000) session, you can open the Order Specific Test Procedures (qmptc0149m000) session from the Estimated Materials (ticst0101m000) session.

Possible scenarios to implement quality for the materials:

■   The materials are inspected, but the inspection orders have no impact on the production orders (method A).

■   You must inspect the materials, before you can issue them for a production order (method B).

The **Blocking Method for Inspections** field in the Order Inspections (qmptc1120m000) session determines method that you can use.

Infor LN uses method A, if the **Blocking Method for Inspections** field has the value **Continue**.

Infor LN uses method B, if the **Blocking Method for Inspections** field has the value **Block**.

Infor LN determines the value of these fields on the basis of the data you enter in the following sessions:

■   Testing Combinations (qmptc0111m000)

■   Order Specific Test Procedures (qmptc0149m000)

Quality control of end products

When you implement Quality for the end products of production orders, Infor LN creates inspection orders for each production order. These inspection orders specify the tests for the end products of the production order.

Possible scenarios to implement quality for the end products:

■   The products are inspected, but the inspection orders have no direct impact on the production orders (method A).

■   You must inspect the products, before you can report a production order completed. However, you can report the quantity to delivered or rejected, irrespective of the test results (method B).

Note

If you want to block the production order until the inspections have determined the quantity to deliver and quantity rejected, you can define inspections for the last operation. For more information, see *Using QM for manufacturing operations (p. 27)*.

If you select method A, and you modify the finished quantities, after you close the inspection order, Infor LN asks you if the inspection order must be reopened.

If you select method B, and you try to modify the finished quantities, after you close the inspection order, Infor LN generates a new inspection order.

- *Inspection methods for end products (p. 31)*

Inspection methods for end products

If the **QM Implemented Production (JSC)** check box in the Quality Management Parameters (qmptc0100m000) session is selected, you can use Quality to check the end products of production orders.

You can define the quality requirements for each manufactured item in Quality.

If you select the **Specific Inspections Production (JSC)** check box in the Quality Management Parameters (qmptc0100m000) session, you can start the Order Specific Test Procedures (qmptc0149m000) session from the Production Orders (tisfc0501m000) session.

The **Blocking Method for Inspections** field in the Order Inspections (qmptc1120m000) session determines the method that can be used.

Infor LN uses method A, if the **Blocking Method for Inspections** field has the **Continue** value.

Infor LN uses method B, if the **Blocking Method for Inspections** field has the **Block** value.

Infor LN determines the value of these fields on the basis of the data you enter in the following sessions:
- Testing Combinations (qmptc0111m000)
- Order Specific Test Procedures (qmptc0149m000)

Inspections for purchased items

When you use the inspection functionality to purchase items, Infor LN creates inspection order for each receipt. You can use inspection orders to define the data for testing the quality of the items purchased.

Parameters to set up inspection data

Use the Quality Management Parameters (qmptc0100m000) session to define the parameters for the quality inspection. In this session:

- Select the Purchase (PUR) check box in the QM Implementation group box.
- Select the Purchase (PUR) check box in the Specific Inspection group box. If this check box is selected, Infor LN does not modify the order-specific inspection data even if the master data of the related purchase order is modified.
- Select the Purchase (PUR) check box in the QM Only Recommends group box, the Infor LN allows you to overwrite the recommended inspection results.

To initiate inspection order from the procurement

Step 1: Create a purchase order

Purchase orders can be created in the Purchase Order - Lines (tdpur4100m900) session:

- Automatically, from a various sources, such as EP, Sales, Service, and so on.
- Copied from an existing order in the Copy Purchase Order (tdpur4201s000) session.
- Manually

Step 2: Approve purchase order

Approve the order using the approve option in the Purchase Order - Lines (tdpur4100m900) session. Purchase order approval is a mandatory step in the purchase order procedure. The execution of the order procedure activities starts when a user approves the order.

Step 3: Release purchase order to warehouse

Release the purchase order to Warehousing in the Release Purchase Orders to Warehousing (tdpur4246m000) session.

Step 4: Maintain receipts

Enter the receipt data in the Warehouse Receipt (whinh3512m000) session.

Step 5: Confirm receipts

Confirm receipts using the Confirm option in the Warehouse Receipt (whinh3512m000) session.

Step 6: Review generated inspection order

Review the standard inspection order generated in the Orders Inspections (qmptc1120m000) session. The inspection order can be maintained in this session only until the inspection is processed.

Step 7: Maintain inspection order lines

Maintain inspection order lines using the Inspection Order Lines (qmptc1101m000) session. For each combination of an aspect and a characteristic, an inspection line is defined. The data related to the characteristics can be changed for a specific inspection order.

Step 8: Review samples

Review different samples with different sample sizes and different dates and times for each inspection order using the Inspection Order Samples (qmptc1110m000) session. Infor LN checks if the total of all samples matches the sample size.

Step 9: Enter test data

Enter the test data in the Inspection Order Test Data (qmptc1115m000) session (by characteristic) or the Sample - Test Data by Serial Number (qmptc1116m000) session (by serial number). The session in which you must enter the test data depends on the settings in the Quality Management Parameters (qmptc0100m000) session. Infor LN generates the results for that specific characteristic.

Step 10: Complete order inspections

Complete the inspection process by order, origin, or storage using the Complete/Process Order Inspections (qmptc1202m000) session. After the inspection order is set to completed, LN checks if all the test data is defined. If not, the inspection order cannot be completed.

LN allows you to complete the inspection process of the order only after the test data is defined.

Step 11: Process order inspection

Process the inspection orders by inspection order, by origin, and by storage inspection using the Process Inspection Orders (qmptc1204m000) session.

Step 12: Approve or reject the purchase items

Evaluate the good and the bad pieces in the sample size. Based on this evaluation, LN calculates the actual accepted and rejected quantities. These accepted and rejected quantities are compared with the acceptable quality level (AQL) specified in the Test Groups (qmptc0136m000) details session. If the percentage of accepted quantity is less than the AQL, the entire order or lot is rejected. In case of continuous sampling, the part of the order displayed in the Frequency field is rejected.

The inspection results are displayed in the Warehouse Inspections Overview (whinh3122m000) session. You can use the Warehouse Inspections (whinh3122m000) session to approve, reject, or destroy goods.

Step 13: Review the actual inspection results

Review the actual inspection results using the Orders Inspections (qmptc1120m000) session. The recommended quantities displayed in the Recommended Quantity Accepted (Accepted Quantities) field

and the Recommended Quantity Rejected (Rejected Quantities) field will be stored after the inspection order is processed.

Step 14: Close the inspection order

Close the inspection order using the Order Inspections (qmptc1120m000) session. Select the origin order which must be closed. From specific menu close the inspection order. LN sets the status to processed.

Inspections for sales item

If you implement the Quality functionality for sales in the Sales module, Infor LN creates inspection orders for each shipment. These inspection orders specify the tests for the items to be sold.

Parameters to set up inspection data

Use the Quality Management Parameters (qmptc0100m000) session to define the parameters for the quality inspection. In this session:

- Select the Sales (SLS) check box in the QM Implementation group box.
- Select the Sales (SLS) check box in the Specific Inspection group box to use order-specific inspection data for Infor LN Sales. If this check box is selected, Infor LN does not modify the order-specific inspection data even if the master data of the related sales order is modified.
- Select the Sales (SLS) check box in the QM Only Recommends group box, the Infor LN allows you to overwrite the recommended inspection results.

To initiate inspection order from the sales

Step 1: Create the sales order

Sales orders can be created in the Sales Order - Lines (tdsls4100m900) session:

- Automatically, from a various sources, such as Contracts, Quotations, EDI, and so on.
- Copied from an existing order in the Copy Sales Order (tdsls4201s000) session.
- Manually

Step 2: Approve the sales order

Approve the order using the approve option in the Sales Order - Lines (tdsls4100m900) session. Sales order approval is a mandatory step in the sales order procedure. The execution of the order procedure activities is initiated when a user approves the order.

Step 3: Release the sales order to warehouse

Release the sales order to Warehousing in the Release Sales Orders to Warehousing (tdsls4246m000) session.

Step 4: Generate outbound advice

Generate outbound advice for the goods that you want to issue from the warehouse using the Generate Outbound Advice (whinh4201m000) session, select the order lines that lists the goods that you want to issue and click Advise. Alternatively, you can generate outbound advice for individual outbound order lines using the Outbound Order Lines (whinh2120m000) session or the Outbound Line Status Overview (whinh2129m000) session.

Step 5: Release outbound advice

Release the outbound advice After the outbound advice is generated to indicate that the goods are ready for inspection, if the warehousing procedure includes inspections.

After the outbound advice is released, the related outbound order lines and handling units obtain must be inspected.

If outbound inspections are included in the outbound warehousing procedure defined for the outbound order lines, the items requires outbound inspections.

Step 6: Review generated inspection order

Review the standard inspection order generated in the Orders Inspections (qmptc1120m000) session. The inspection order can be maintained in this session only until inspection is processed.

Step 7: Maintain inspection order lines

Maintain inspection order lines using the Inspection Order Lines (qmptc1101m000) session. For each combination of an aspect and a characteristic, an inspection line is defined. The data related to the characteristics can be changed for a specific inspection order.

Step 8: Review samples

Review different samples with different sample sizes and different dates and times for the inspection order using the Inspection Order Samples (qmptc1110m000) session. Infor LN checks if the total of all the samples matches the sample size.

Step 9: Enter test data

Enter the test data in the Inspection Order Test Data (qmptc1115m000) session (by characteristic) or the Sample - Test Data by Serial Number (qmptc1116m000) session (by serial number). The session in which you enter the test data depends on the settings in the Quality Management Parameters (qmptc0100m000) session. Infor LN generates the overall results defined for that specific characteristic.

Step 10: Complete order inspection

You can complete the inspection process by order, origin, or storage in the Complete/Process Order Inspections (qmptc1202m000) session. After the inspection order is set to completed, Infor LN checks if all the test data is defined. If not, the inspection order cannot be completed.

Infor LN allows you to complete the inspection process of the order only after the test data is defined.

Step 11: Process order inspection

Process the inspection orders by inspection order, by origin, and by storage inspection.

Step 12: Approve or reject the sales item

Infor LN determines the good and the bad pieces in the sample size. Based on this evaluation, Infor LN calculates the actual accepted and rejected quantities. These accepted and rejected quantities are compared with the acceptable quality level (AQL) entered in the Test Groups (qmptc0136m000) details session. If the percentage of accepted quantity is less than the AQL, the entire order or lot is rejected. In case of continuous sampling, the part of the order displayed in the Frequency field is rejected.

The inspection results are reported in the Warehouse Inspections Overview (whinh3122m000) session. You can use the Warehouse Inspections (whinh3122m000) session to approve, reject, or destroy goods.

Step 13: Review the actual inspection results

Review the actual inspection results using the Orders Inspections (qmptc1120m000) session. The recommended quantities displayed in the Recommended Quantity Accepted (Accepted Quantities) field and the Recommended Quantity Rejected (Rejected Quantities) field will be stored after the inspection order has been processed.

Step 14: Close the inspection order

Close the inspection order using the Order Inspections (qmptc1120m000) session. Select the origin order which must be closed. Using specific menu close the inspection order. Infor LN sets the status to processed.

Implementing First Article Inspection

An FAI document contains the data required to carry out the first article inspection for a specific item. A FAI document is a unique number linked to a specific combination of data (item, revision, effectivity unit, business partner, ship to warehouse, and planned receipt date) which is used by Infor LN to complete the inspection for the item.

An FAI document can be created manually. The FAI document is created manually if the inspection required is beyond the pre-defined rules. When a new FAI document is created, Infor LN sets the FAI document **Status** to **Required**.

When a purchase order/ production order/ purchase contract is created, Infor LN verifies if the item requires First Article Inspection.

Infor LN verifies the combination data specified for the purchase order or purchase contract with the data in the First Article Inspection Rules (qmptc0116m100) session.

Infor LN uses the following sequence for validation in the First Article Inspection (qmptc2150m900) session:

- If an FAI document exists for this combination.
- If the valid till date of the combination is applicable

If the criteria is found, Infor LN defaults the value of the **Conformance Reporting** field in the First Article Inspection Rules (qmptc0116m100) on to the purchase order or purchase contract. The supplier can view the conformance documents linked to this code from the purchase order/contract.

Note

In production, if the matching criteria is found, Infor LN sets the FAI flag on the production order .

Infor LN creates a new FAI document, when the purchase order is approved or if the purchase contract is set to Active, if the record that meets either of the above mentioned criteria is not found.

Note

LN creates a new FAI document for the origin type, **Production (JSC)**, when the production order is Released and if the record that meets either of the criteria is not found.

There is no FAI flag specified in the warehousing module. During the confirmation of the warehouse receipt data, verification is done if QM inspection is required and if the flag is yes, an order inspection is created. If QM inspection is required, Infor LN checks for the FAI document, again. If:

- THE document exists, the document status is set to **In Process**.
- The FAI document does not exist, LN checks if a FAI inspection is required for this transaction based on the FAI rules. If this criteria is met, a FAI Inspection document is created with **In Process** status and the order inspection created references this FAI document.

You can view the FAI documents created for a specific item in the First Article Inspection Documents (qmptc2151m000) session.

Implementing FAI

Step 1:

In the Inspection Order (qmptc1100m100) session:

- Review the Inspection Order lines. **Note** LN defaults the Standard test procedure defined in the First Article Inspection Rules (qmptc0116m100) session.
- Specify the test data results
- Complete the inspection order.

Step 2:

In the Order Inspection (qmptc1620m000) session:

- Set the order status to complete.
- Infor LN sets the status of FAI document to **Approved** if the order inspection is processed. **Note** If the order inspection is either **Partially Accepted** or **Rejected**, FAI status is set to **Failed**, and Infor LN generates a new FAI sequence number.

Step 3:

Process and close the order inspection in the Order Inspection (qmptc1620m000) session.

Nominal Values

In a production process, a nominal size or an actual size is specified, for an item. However, there can be a slight but accepted deviation. This deviation is referred to as tolerance.

Nominal value, in Quality, is specified to provide tolerance limits for a nominal size, accommodating deviations, if any.

Earlier, it was possible to only measure values between the **Norm** and the **Upper Limit** and **Lower Limit** of inspection orders. The upper limit always had to be greater than the norm and the lower limit always had to be less than the norm.

Using the nominal value functionality, you can specify a tolerance range for a nominal value. You can specify a pre-defined nominal table based on accepted engineering standards.

In some cases, the tolerance level must be greater or lesser than the nominal values. For example, matching the diameter of the shaft with that of the hole. The upper and lower limits specified for the diameter of the hole must be greater than the nominal value, while the upper and lower limits specified for the diameter of the shaft must be lesser than the nominal value.

This functionality can also be used to process inspection orders.

Master Data:

As a part of the master-data set up, you must define:

- A specific nominal range value for the item characteristic
- A corresponding tolerance range for the item characteristic

To set up the master data:

Step 1:

In the Nominal Value Chart Name (qmptc0181m000) session, specify a chart name. The nominal value range is specified for this chart name.

Step 2:

In the Nominal Value Chart Type (qmptc0182m000) session, specify a **Chart Type**.

Step 3:

In the Nominal Value Tables (qmptc0185m000) session, for a chart name and chart type, specify the **Nominal Unit of Measure** and a **Tolerance Unit of Measure**.

Step 4:

In the Nominal Table (qmptc0685m000) session:

- In the Nominal Size tab, define a range of nominal values for which tolerance values are specified.
- In the Tolerance Limit tab, specify the Tolerance Standard.
- In the Tolerance Matrix tab, specify the lower and upper tolerance limits for the corresponding nominal size range.

Note The tolerance values can be negative, and correspond to the tolerance unit of measure.

Step 5:

In the Standard Test Procedures (qmptc0110m000) session, specify a characteristic, for the specified standard test procedure.

Step 6:

In the Standard Test Procedure Characteristics (qmptc0115m000) session, in the Limits Tab:

- Set the **Value Type** to nominal. If the value type is not nominal, the fields—chart name, chart type, nominal value, and tolerance standard are disabled.
- Specify the Chart name and the associated chart type.
- Specify the required tolerance standard.
- Specify a nominal value. LN defaults the Upper Limit and Lower Limit fields based on the tolerance values specified in the Nominal Table (qmptc0685m000) session.

To implement the nominal value and the tolerance functionality:

Step 1:

Create an inspection order for a related order of any origin, containing a standard test procedure with nominal value and tolerance limits specified.

Step 2:

In the Inspection Order (qmptc1100m100) session, on the lines tab, select the inspection order line to view the inspection line details in the Inspection Order Lines (qmptc1101m000) session.

Step 3:

In the Inspection Order Lines (qmptc1101m000) session:

- Click the limits tab.
- Review the test data (the chart name, chart type, tolerance limit, the nominal value and the upper and lower tolerance limits) that Infor LN defaults from the specified in the Standard Test Procedure Characteristics (qmptc0115m000) session.

Step 4:

In the Inspection Order (qmptc1100m100) session, In the test data tab, specify a measurement value that lies between the upper and lower tolerance limits.

Step 5:

Infor LN sets the result of the inspection in the Inspection Order (qmptc1100m100) session to **Pass**.

Note If a value above or below the range is specified, the test result is set to **Fail**.

Step 6:

Compete and process the inspection order and the order inspection.

Step 7:

Review the result data and the impact of the inspection process in the related origin order sessions.

Inspection of Lots and Serials

In a production process, quality inspections are used to certify that the manufactured products are compliant with the required specifications. Based on the result of the quality test, the production process is either blocked or released.

Usually every single item in the batch is not tested. Often only a few items have to be tested to determine if all the items in the batch are approved or rejected.

Infor LN supports this functionality based on sampling and sample rules.

Note

It is also possible to create one inspection order for serialized items (In Inventory items and Not In Inventory items).

Inspection of Lots and Serials for order with Routing Origin

Inspection by Serials

Select the **Inspection by Serials** check box in the Testing Combinations (qmptc0119m000) session to ensure that inspection is performed by serials for serialized items.

Note

This check box is applicable only for Routing Origin.

Inspection of Lots and Serials for Order Inspections via Warehouse Inspections

Parameters

Consolidate Stock Points in one Warehouse Inspection in Inventory Handling Parameters (whinh0100m000) session.

If this check box is selected, lot or serialized items, LIFO/FIFO items, or items contained in multiple handling units, are consolidated into a single inbound or outbound inspection.

The consolidation depends on:

- Warehouse inspection is required for these items.
- **Inbound**
  The items are listed on receipt lines or inbound advice lines whose inbound order lines match. If the warehouse is location controlled, the advised inspection locations must also match.
- **Outbound**
  The items are listed on outbound advice lines whose outbound order lines match. If the warehouse is location controlled, the advised staging locations must also match.

Process for routing and end item inspection

Step 1:

Create production order for a serialized item. Use the Production Order (tisfc0101m100) session to create a production order for a serial and lot in inventory item.

Step 2:

Release the production order. Click Release Order to release the order.

Step 3:

Order Inspection is created. An order inspection is created for the Routing origin.

Step 4:

Specify the quantity to be inspected. In the Production Orders (tisfc0501m000) session, click Actions and select Report Operations Completed. In the Report Operations Completed (tisfc0130m000) session, open the operation lines and specify the quantity to be inspected in **To Inspect** field.

Step 5:

Select the serial numbers for inspection. In the Report Operations Completed (tisfc0130m000) session, click **Select Serials** and select the serial numbers for inspection.

Step 6:

Order Inspection is updated. To view the order inspection, in the Report Operations Completed (tisfc0130m000) session, select References menu and click Order Inspections. Open the order inspection, select References menu and click Lots/ Serials/ Stock Point Details. A single order inspection is created for all the serials with routing origin.

Step 7:

Specify the test results. In Order Inspection (qmptc1620m000) session, open the inspection order. In the Inspection Orders (qmptc1100m000) session, select Test Data tab and specify the measurement value. Infor LN updates the Result field with value Pass or Fail.

Step 8:

Complete the test procedure. In the Inspection Orders (qmptc1100m000) session, select the Lines tab and click Set to Completed. The inspection order is completed. To view the details of the serials that are rejected, in the Test Data tab, select Reference menu and click Inspection Order/ Lots/ Serials/ Stock Point Details. The Inspection Order Lots / Serials / Stock Point Details (qmptc1131m000) session opens.

Step 9:

Complete and process the order inspection. In the Order Inspection (qmptc1620m000) session, select Complete. The status of the order inspection changes to complete. Select the Actions menu and click Process Order Inspection. The status of the order inspection changes to closed. **Note** You can also generate NCR report for the rejected quantity. In Report Operations Completed (tisfc0130m000) session, click NCR. The Non-Conformance Report (qmncm1100m000) session opens, specify the description and save the NCR. Infor LN defaults the origin order and the lots and serials details. Click Lots and Serials to view the lots and serial details of the rejected item.

After the order inspection is closed, Infor LN updates the completed and rejected quantities in Report Operations Completed (tisfc0130m000) session.

The rejected quantity can be either scrapped or moved to quarantine.

Step 10:

Complete the operation. In Report Operations Completed (tisfc0130m000) session, specify the reason for rejections in Reason field of Rejects group box. Click Complete. The status of the operation is set to Completed.

Step 11:

Complete the production order. In the Production Order (tisfc0101m100) session, select Actions menu and click Report Orders Completed. The Report Orders Completed (tisfc0120s000) session opens. Specify the number of accepted serials in the Additional Quantity to Deliver field and click Select Serial to open the Serial End Item - As-Built Headers (timfc0110m000) session. Select the serials that are accepted, to report the order complete.

If item is lot controlled, Infor LN prompts you to confirm the generation of the lot code. Click Yes, Infor LN displays a confirmation message for automatically confirm receipt when activating warehouse order inbound line. Click Yes and complete the receipt. The Goods Received Note by Order and Warehouse report is displayed.

Step 12:

Check the production warehouse order. In Report Orders Completed (tisfc0120s000) session, select the References menu and click Production Warehouse Orders. In Production Warehouse Orders (timfc0101m000) session, Infor LN sets the status of the production warehouse orders to "To be inspected" as the end item is received in the finished goods warehouse

Step 13:

Check the order inspection. In the Production Warehouse Orders (timfc0101m000) session, select References menu and click Warehouse Order – Status Overview. The Inbound Line Status Overview (whinh2119m000) session opens. Go to Actions menu and open Warehouse Inspections. In Warehouse Inspection session, select References menu and open Order Inspection session. You can view the order inspection generated for the end item.

Chapter 4
Inspection Statistics

This chapter explains the various charts such as distribution histograms, non-conformance, process capability and parts per millions that generate and display inspection statistics for sampling plans and non-conformance.

To create process capability control charts

Process control capability charts are used to ascertain if the variation in process related characteristic is under statistical control, by creating a chart which contains both a calculated and target based upper and lower control levels.

To plot this chart you must select the combination of item or item/supplier, inspection order source, aspect/characteristic as well as the relevant time period. This chart is based only on actual inspection results.

The upper plotting area is used to monitor the process mean and the lower plotting area is used to monitor the process deviation from the mean.
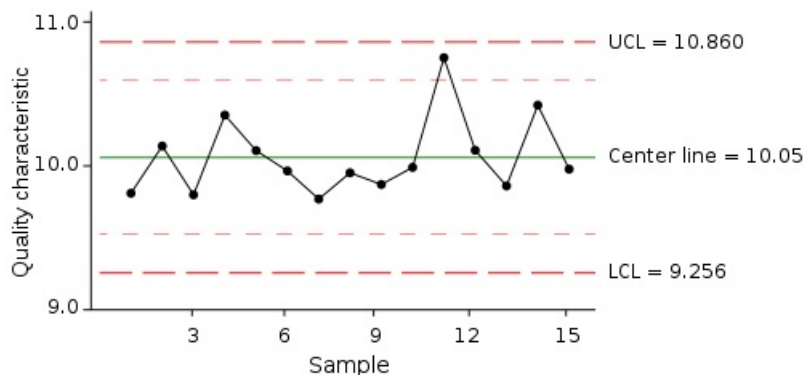
The three most commonly used chart types are:

- *To create Xbar and R control charts (p. 46)*

- *To create Xbar and S control charts (p. 49)*
- *To create Xm and R control charts (p. 51)*

To create Xbar and R control charts

Control charts are used to regularly monitor and control a process.

This combination of charts is used where the characteristic of interest sample size is stable, fixed and between 2 to 15 units. The upper plotting area of the chart is the average (Xbar) measured value per sample and the x-axis represents time. The lower plotting area of the chart displays the range (R) of measured values for each sample. The R chart that is created first is reviewed to ensure the statistical control of the sample variability. The Xbar chart is displayed in the upper part of the screen and the R chart is displayed in the lower part of the screen.

To generate an Xbar and R Control Charts, complete the following steps:

For inspection orders where the item characteristic is a stable sample size, you must consider each individual sample as a sub-group.

Calculate the average of measured value for each sub-group.

$$\bar{X} = \frac{X_1 + X_2 + X_3 + \dots X_n}{n}$$

Where: $\bar{x}$ = The average of the measurements within each subgroup

x_i = The individual measurements within a subgroup

n = The number of measurements within a subgroup

Calculate the range of measured value for each sub-group:

```
Range(sub-group) = Largest Measured Value (sub-group) - Smallest Measured
Value
     (sub-group)
```

Calculate the mean of each subgroup's average. The mean of each subgroup's average is the centerline for the upper plotting area of the chart.

$$\bar{\bar{X}} = \frac{\bar{X}_1 + \bar{X}_2 + \bar{X}_3 + \dots \bar{X}_k}{k}$$

Where: $\bar{\bar{x}}$ = The grand mean of all the individual subgroup averages

$\bar{x}$ = The average for each subgroup

k = The number of subgroups

Calculate the average of Ranges sub-group. The average of all sub-groups is the centerline for the lower plotting area of the chart.

$$\overline{R} = \frac{R_1 + R_2 + R_3 + ... R_k}{k}$$

Where: R_i = The individual range for each subgroup

$\overline{R}$ = The average of the ranges for all subgroups

k = The number of subgroups

Calculate UCL and LCL for averages of subgroups. Use the following formula to calculate the limits plotted in the upper plotting area:

$$UCL_{\overline{X}} = \overline{\overline{X}} + A_2 \overline{R}$$
$$LCL_{\overline{X}} = \overline{\overline{X}} - A_2 \overline{R}$$

The above limits are calculated based on A2 value (from Factors for Control Limits) for the corresponding sub-group (sample) size N. In case the sample size is not constant, to determine the average sample size, use this as the input to determine value of A2. When the (average) sample size exceeds 15 units, the control limits are not calculated and a warning is displayed on the charts.

The range limits are calculated using D3 & D4 values for corresponding sub-group size N. These limits are plotted in the upper plotting area. Calculate the control limits for the Ranges, using this formula:

$$UCL_{\overline{R}} = D_4 \overline{R}$$
$$LCL_{\overline{R}} = D_3 \overline{R}$$
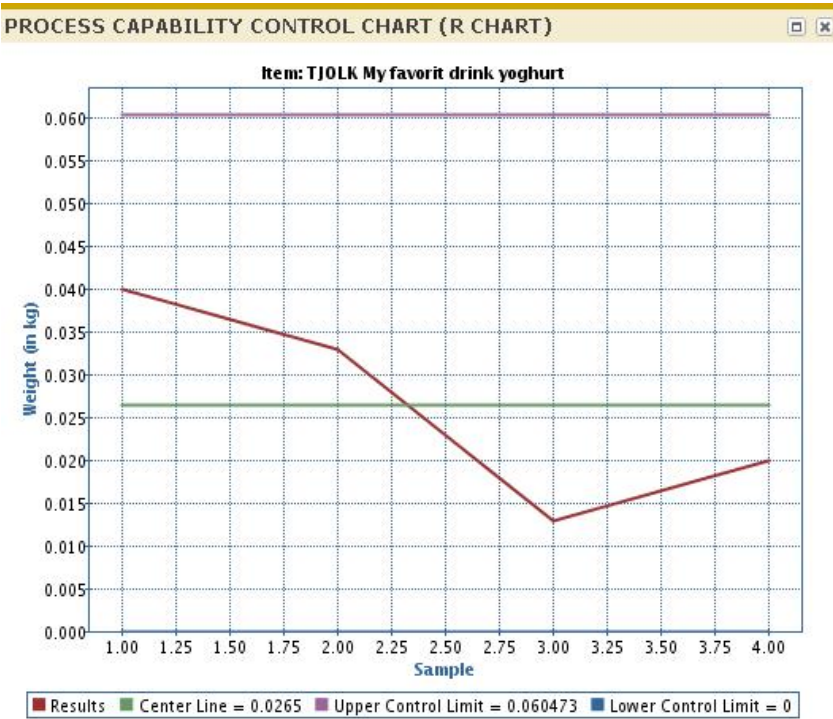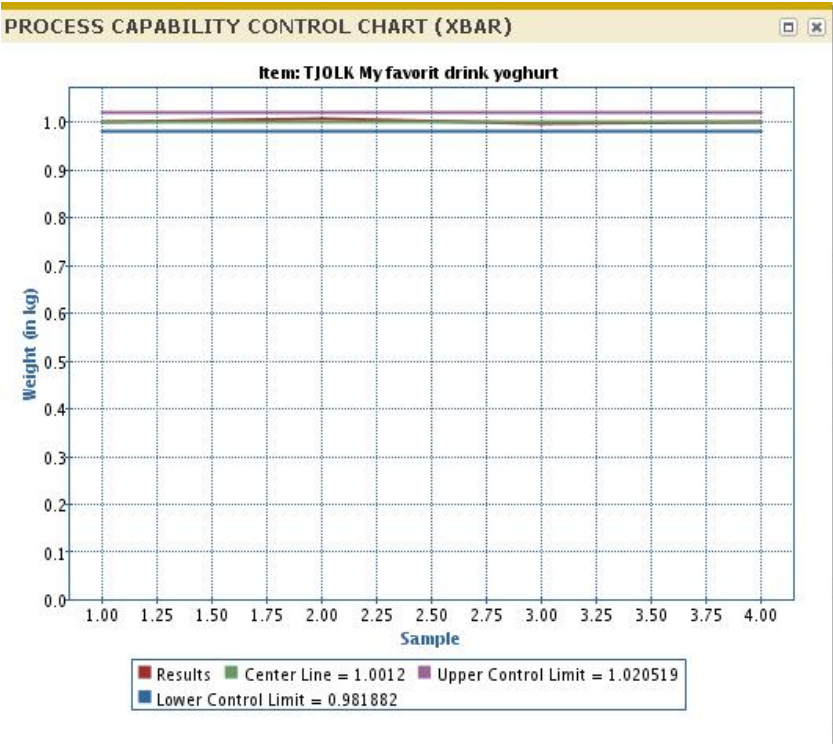
PROCESS CAPABILITY CONTROL CHART (XBAR) ☐ ☒

PROCESS CAPABILITY CONTROL CHART (R CHART) ☐ ☒

To create Xbar and S control charts

Control charts are used to regularly monitor and control a process.

The lower plotting area of the chart is the standard deviation (S) of the measured values for each sample. The S chart is created first to ensure the statistical control of the sample variability.

To generate an Xbar and S Control Charts, complete the following steps:

Consider each sample as a subgroup. Calculate the average of measured value for each sub-group.

$$\overline{X} = \frac{X_1 + X_2 + X_3 + \ldots X_n}{n}$$

Where: $\overline{x}$ = The average of the measurements within each subgroup
x_i = The individual measurements within a subgroup
n = The number of measurements within a subgroup

Calculate the standard deviation S for each subgroup.

$$\sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \overline{x})^2}$$

Calculate the mean of all the values. All values must be cumulated and divided by the total number of values. The calculated mean becomes the center line for the upper plotting area of the chart.

Calculate the average of sub-group ranges. The average of all sub-groups becomes the centerline for the lower plotting area of the chart.

Calculate UCL & LCL for averages of subgroups. Use the following formulae to calculate the limits, these limits are plotted in the upper plotting area:

$$UCL = \overline{\overline{x}} + 3\frac{\overline{s}}{c_4\sqrt{n}}$$

$$LCL = \overline{\overline{x}} - 3\frac{\overline{s}}{c_4\sqrt{n}}$$

The range limits for the standard deviations are calculated using the following formulae. These limits are plotted in the lower plotting area.

$$UCL = \bar{s} + 3\frac{\bar{s}}{c_4}\sqrt{1 - c_4^2}$$

$$LCL = \bar{s} - 3\frac{\bar{s}}{c_4}\sqrt{1 - c_4^2}$$
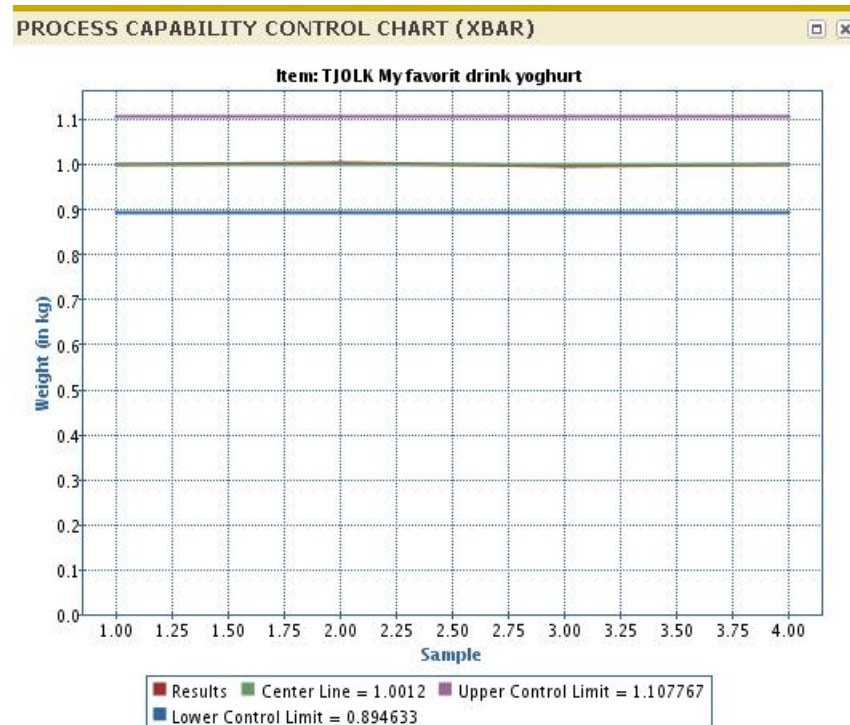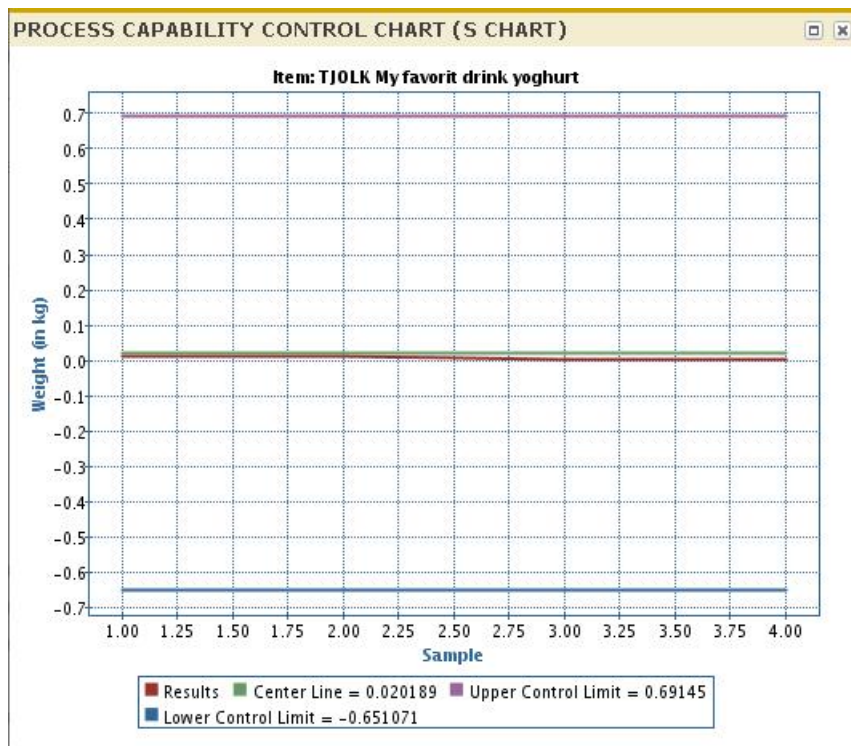
PROCESS CAPABILITY CONTROL CHART (XBAR)

Item: TJOLK My favorit drink yoghurt

Results ■ Center Line = 1.0012 ■ Upper Control Limit = 1.107767
Lower Control Limit = 0.894633

To create Xm and R control charts

Control charts are used to regularly monitor and control a process.

This combination of charts is used where the characteristic of interest sample size is more dynamic and varied. The XmR chart analyzes every sample and is a combination of two charts; the individual X chart is displayed in the upper part of the screen and the moving Range chart is displayed in the lower part of the screen.

The upper plotting area of the chart displays the measured values of all instances within a sample with the x-axis representing time dimension. The lower plotting area of the chart displays the moving spread/range (R) of the measured values compared to the preceding measurement.

To generate the chart

Each sample measured value is plotted as individual X points. Considering Xi represents the measured value of an individual sample, individual Xi values are plotted on the x-axis.

Calculate the Moving Range values between two successive Xi data points using the following formula. The Moving Range mRi is plotted on x-axis. The brackets (| |) represent the absolute value of the number inside the brackets.

$$mR_i = |X_{i+1} - X_i|$$

Where: X_i = Is an individual value

X_{i+1} = Is the next sequential value following X_i

Calculate the overall average of the individual Xi data points. The average of Individual X values becomes the centerline for the upper plot.

$$\overline{X} = \frac{X_1 + X_2 + X_3 + \ldots X_n}{k}$$

Where: $\overline{x}$ = The average of the individual measurements

x_i = An individual measurement

k = The number of subgroups of one

Calculate the average of the moving ranges. The total average of all moving ranges becomes the centerline for the lower plotting area.

$$\overline{mR} = \frac{mR_1 + mR_2 + mR_3 + \ldots mR_n}{k-1}$$

Where: $\overline{mR}$ = The average of all the Individual Moving Ranges

mR_n = The Individual Moving Range measurements

k = The number of subgroups of one

Calculate the upper and lower control limits for the individual X values for the upper plotting area. Use the following formula for the computation.

$$UCL_x = \overline{X} + (2.66)\overline{mR}$$
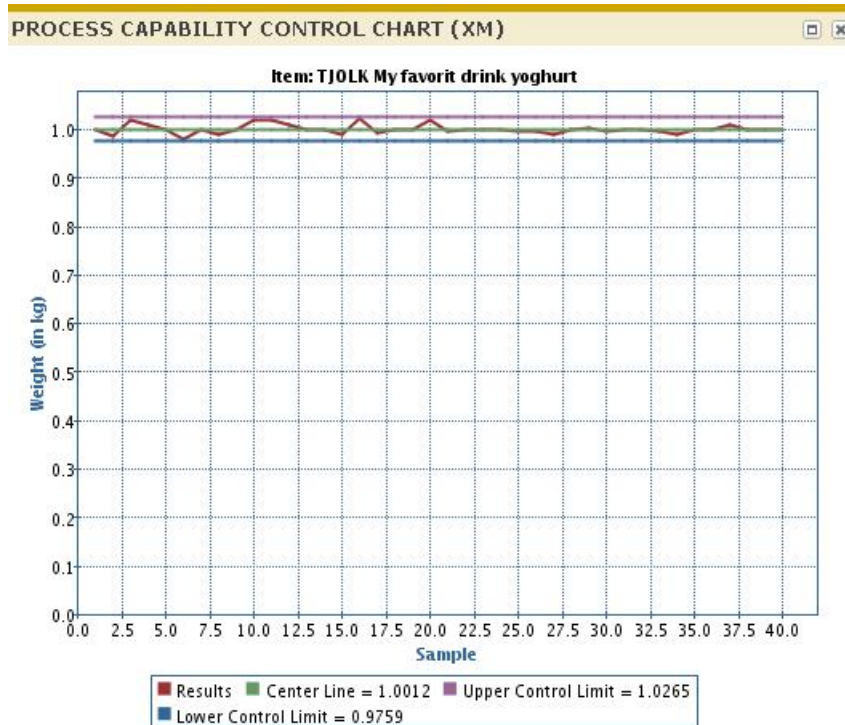$$UCL_y = \overline{X} - (2.66)\overline{mR}$$

Calculate the upper control limit for the moving ranges for the lower plotting area. There is no lower control limit for the moving Ranges. Use the following formula.

$$UCL_{mR} = (3.268)\overline{mR}$$
$$UCL_{mR} = NONE$$

Note

The above calculated data of XmR for the given range of test results will be displayed on a Chart Object.

To create distribution histograms

Distribution Histograms are used to ascertain the variation by displaying a standard distribution curve of measured values for an item.

To plot this chart you must select the combination of item or item/supplier, inspection order source, aspect/characteristic as well as the relevant time period. This chart is based only on actual inspection results.

The centre line of the distribution curve is the LN calculated mean (μ). The over/under tolerance limits of the process are the limits within which the process is capable of producing parts of an acceptable quality. These tolerance limits are generally expressed as the process mean plus or minus 3 standard deviations (σ) that can capture 95 percent of the normal variance spread.

To plot this type of chart, complete the following steps:

1. Calculate measured values for a range of periods.

2. Determine the spread R of the measured values: $R = X_{max} - X_{min}$

3. Determine the class width: $W = R\ /\ SQRT\ (\text{number of measurements})$

4. Compose the classed: Class 1 Lower Tolerance (or Xmin in case Xmin < Lower Tolerance) then Class2 = Class1 + W and so on

5. Populate the classes based on the measured values. Determine the frequency within each class.

6. Calculate the arithmetic means of the measured values.

7. Calculate the standard deviation

8. Plot the histogram based on the classes calculated.

Example

Assume that 5 inspection orders are processed, each with 1 sample, resulting in one sample group for each order. All 5 inspection orders have a sample size of 10 pieces and a test quantity of 1 piece. The following results are displayed in the test data table:

Sample Group	Sample Number	Measured Value
1	1	1
1	2	1
1	3	1.002
1	4	0.997
1	5	1
1	6	1.001
1	7	1
1	8	1
1	9	1
1	10	0.999
2	1	1
2	2	0
2	3	0
2	4	0
2	5	0
2	6	0
2	7	0
2	8	0
2	9	0
2	10	0

3	1	1.001
3	2	1
3	3	0.9
3	4	0.988
3	5	1.001
3	6	1.004
3	7	0.999
3	8	0.989
3	9	1.012
3	10	1.03
4	1	1.001
4	2	1
4	3	0.9
4	4	0.988
4	5	1.001
4	6	1.004
4	7	0.999
4	8	0.989
4	9	1.012
4	10	1.03
5	1	1.001

5	2	1
5	3	0.9
5	4	0.988
5	5	1.001
5	6	1.004
5	7	0.999
5	8	0.989
5	9	1.012
5	10	1.03

Calculate the spread

Determine the spread of the measured values. The highest measured value is 1.03 (Sample Group 1, Sample Number 10). The lowest measured value is 0.9 (Sample Group 1, Sample Number 3).

$$R = x_{max} - x_{min}$$

```
Spread = 1.03 - 0.9 = 0.13
```

Calculate the class width:

$$W = \frac{R}{\sqrt{n}}$$

The class width is 0.13 / √50 = 0.0205548047910944656579928080388. This value is rounded off to 0.02.

Compose the classes

The classes are composed as follows *Class 1 Lower Tolerance (or Xmin in case Xmin < Lower Tolerance) then Class2 = Class1 + W and so on*. The following classes are generated:

Class 1	0.900000
Class 2	0.920000
Class 3	0.940000
Class 4	0.960000
Class 5	0.980000
Class 6	1.000000
Class 7	1.020000

Populate the classes

The values of the different measurements can be grouped into a class, if the value is greater or equal to the class value, and less than the class value + the class width. The result is:

Class	Number of measurements
1	1
2	0
3	0
4	0
5	12
6	36
7	1

Calculate the mean

For every measurement, the difference to the mean is calculated and the square of the differences is added together. If the first sample number has a measurement value of 1:
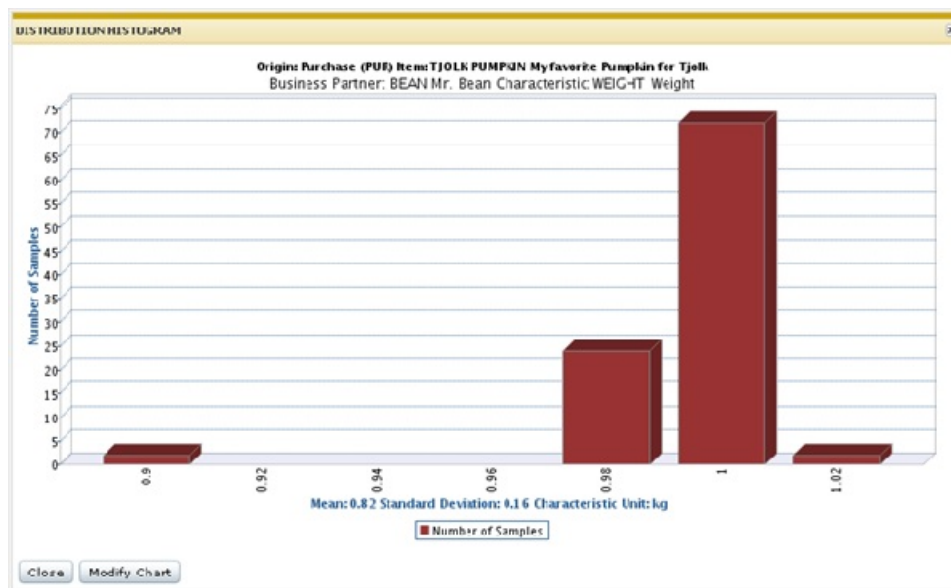
```
(1 - 0.995850)² = (0.00415)² = 0.0000172225
```

The square of the differences are calculated and summed together to form a total square difference. For the above example the total is 1.311734.

```
Mean = Standard Deviation -   1.311734 /
    50 = 0.160000
```

Plot the chart

The following figure displays the chart plotted with the above data:

On the X-Axis the characteristics unit is displayed. It is however possible that for a specific standard test procedure or for an inspection order line, the measurement value is expressed in a different unit that are later converted to the characteristic unit.

To create pareto charts

Pareto charts are used to identify the item characteristics that contribute most to non-conformance, and therefore require more improvement.

To plot this chart you must select the combination of item or item/supplier, inspection source, aspect/characteristic and the relevant time period. This chart is based only on actual inspection results.

Example:
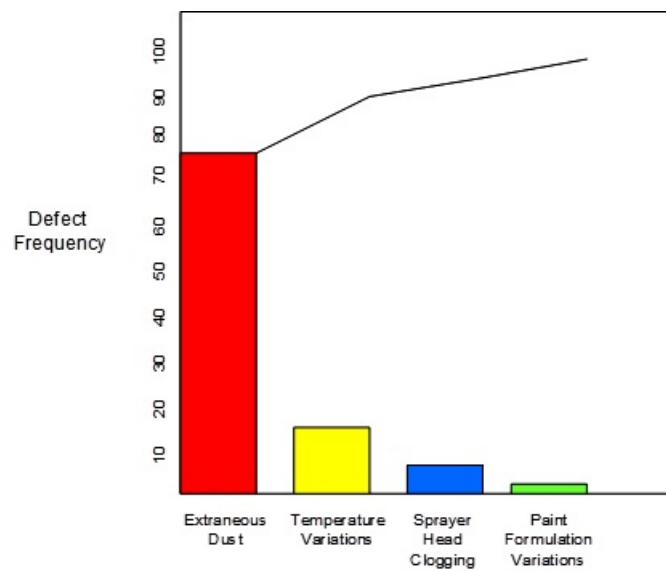
The total percentage is not 100 percent. Example 3 Characteristics with all the same number of rejects will be 3 times 33 percent. However, it is not possible to round off one result to 34 percent

Pareto chart data
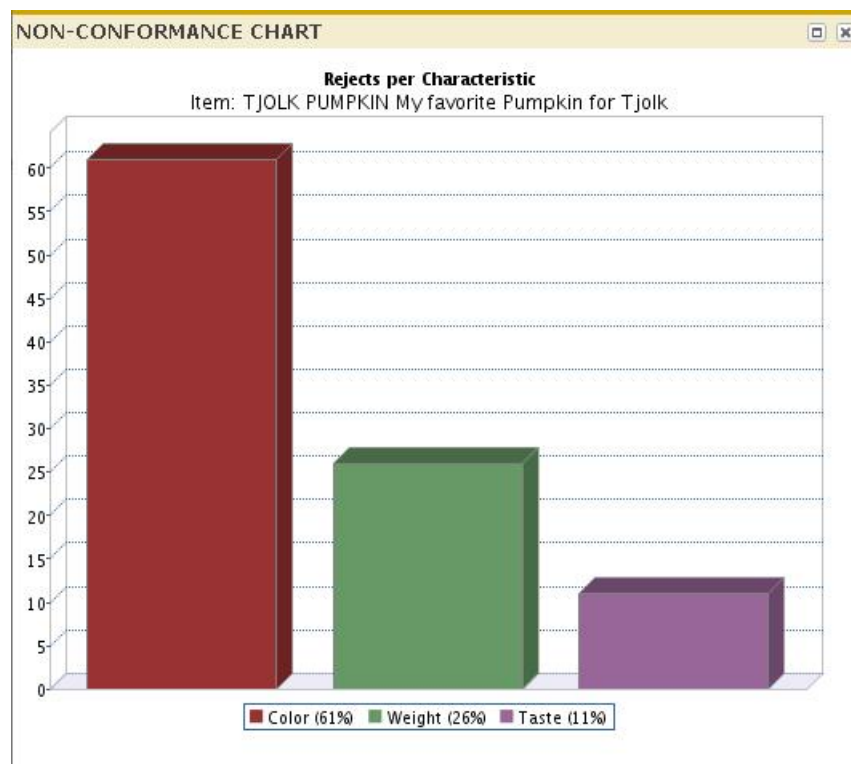
The data is saved in the Reject Statistics by Characteristic (qmptc1545m000). You can modify/create data based on the following rules:

- Create/Update a record only when there is a recommended reject quantity for the order inspection.
- Create/Update the entire reject quantity. When the result of the inspection order line is rejected for a characteristic, the total order quantity is considered as reject quantity.

The below example explains how data is entered in the Reject Statistics by Characteristic (qmptc1545m000) session.

Batch	Batch Qty	Rejected Qty	Characteristic	Sample	Sample Good	Sample Bad	Pareto Analysis
1	1000	1000	C1	10	7	3	75% (3/4)
			C2	10	10	0	0% (0/4)
			C3	10	9	1	25% (1/4)
2	1000	0	C1	10	10	0	0% (0/1)
			C2	10	8	1	100% (1/1)
			C3	10	5	0	0% (0/1)
Total	2000	2000	C1	20	17	3	60% (3/5)
			C2	20	18	1	20% (1/5)
			C3	20	14	1	20% (1/5)
		4000		60	49	5	

- For Batch 1, the results are: C1 - 75%, C3 - 25%, C2 - 0% (batch 1 rejected)
- For Batch 2, the results are: C2 - 100%, C1 - 0%, C3 - 0% (batch 2 accepted)
- For the item (total in the period), the results are: C1 - 60%, C2 - 20%, C3 - 20% (total of both batches).

Order Inspection	Item	Recommended Accepted Quantity	Recommended Rejected Quantity
ORD001	Item001	100	0
ORD002	Item002	0	100
ORD003	Item003	80	20

The inspection orders and lines data is:

Order Inspection	Inspection Order	Line	Aspect/Characteristic	Result
ORD001	INS001	10	Width	Accepted
ORD001	INS002	20	Weight	Accepted
ORD002	INS003	10	Width	Accepted
ORD002	INS004	20	Weight	Rejected
ORD003	INS005	10	Width	Accepted
ORD003	INS006	20	Weight	Rejected

Note

When the accepted and rejected quantity is entered for Order Inspection ORD003, the Standard Test Procedure option can be set to either Continuous or 100 percent.

The following reject statistics is generated:

Item	Aspect/Characteristic	Rejected Cumulative
Item002	Weight	100
Item003	Weight	20

Note

Statistics is not generated for item001 because there is no reject quantity for the item.
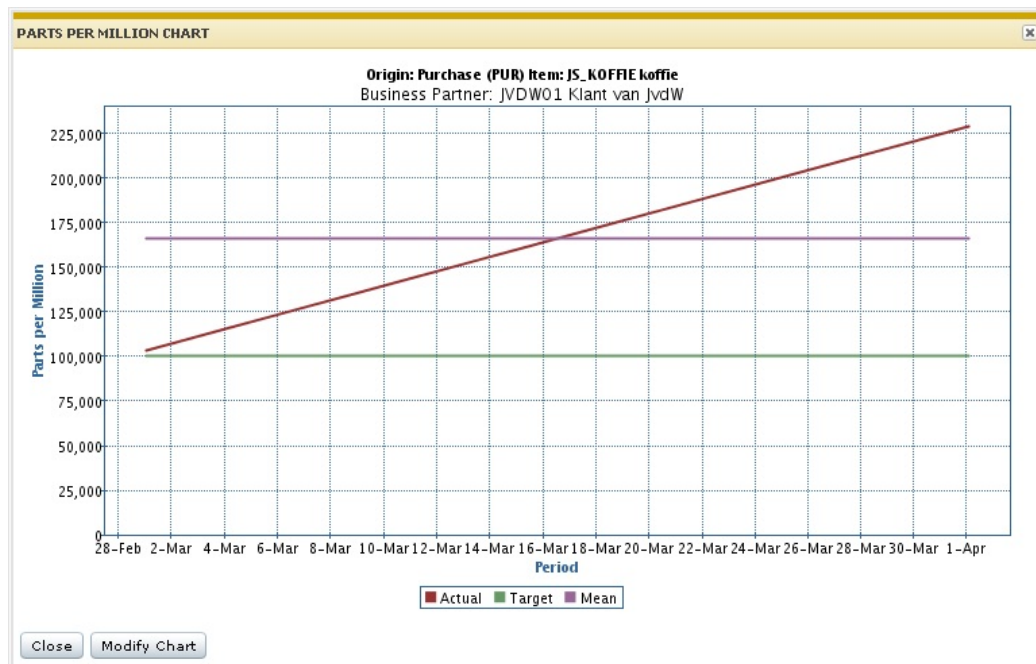
To create parts per million charts

This chart is used to compare the actual Parts per Million (PPM) quality performance of an item against a target and mean measurement (for a month/year). The chart is drawn from the actual inspection results for a user defined period.

Example
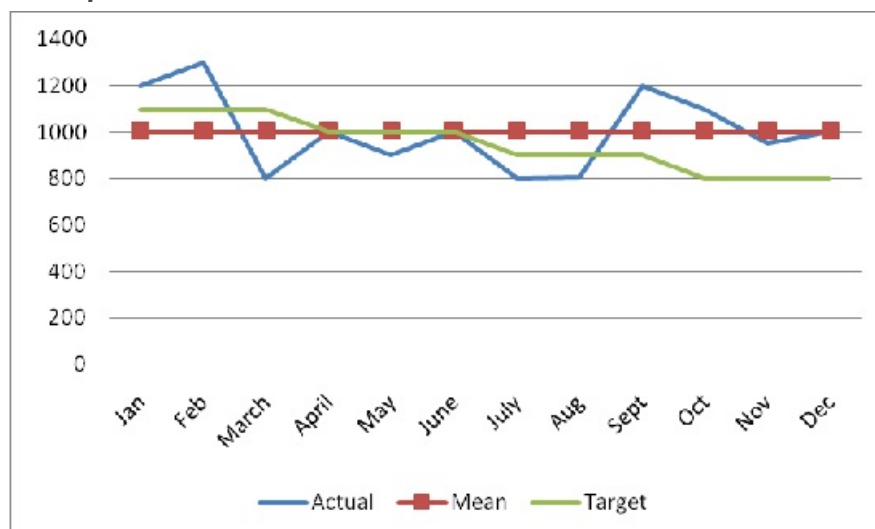
The part per million charts is created based on the data in the Item Quality Statistics (qmptc1140m000) session. Example:

The chart is plotted, based on the following rules:

- PPM values are determined for every order origin, item or item/supplier, year and period.
- Assume that every unit of an inspected item is an opportunity.
- Determine the total number of units inspected in the period, that is, the total opportunities per period.
- Determine the total numbers of units rejected in the period, that is, the total defect per period.
- Defects per Opportunity represents the number of defects divided by the number of opportunities in the period. *Defects per Opportunity per Period = Total Defects per period Total Opportunities per period.*

- Defects per Million Opportunities represents the defects per period times a million. *Defects per million Opportunities per month = Defects per Opportunity per month x 1000000*
- Defects per Million per Year is similarly calculated using the total number of opportunities and the total number of defects in the year.
- The calculated data of Defects per Million Opportunities per period is displayed. Each period is represented by an individual point on the chart.
- The Defects per Million Opportunities per year can be plotted as a calculated mean across all periods in the year or for each quarter.

How it works in LN

You can access the PPM chart from the Item Quality Statistics (qmptc1140m000) session. The chart is created for the display fields in the session, for all the periods of the selected year. When multiple periods are selected, the range is extended based on the selection.

Note

If you select periods 3 and 5, period 4 is also displayed to maintain consistency.

When the chart is initially started, the defaults are saved in the Parts Per Million Chart (qmptc1740m000) session. Click Modify Chart to change the values.

The following are the options to modify the PPM chart:

Include Skip Lot Accepts:

This flag determines if accepted batches for skipped order inspections must be included in the data used to generate the chart.

Re-Inspection:

Use the Excluding Re-Inspection and Including Re-Inspection options to determine the data used to generate the chart. The following example describes how data is plotted in the chart for the selected option.

Example

The following orders are defined for a period:

Unit	Sample	Characteristic 1	Characteristic 2	Characteristic 3	Result
1	1 unit	Pass	Fail	Fail	1 sample failed
2	1 unit	Pass	Pass	Pass	1 sample passed
3	1 unit	Fail	Fail	Fail	1 sample failed
4-5000	4996 units	Pass	Pass	Pass	4996 samples passed

- The result is 2 failures out of a sample of 5000 or 2/5000 *1,000,000 or 400 ppm.

Order Inspection	Order Quantity	Sample Quantity	Accepted / Rejected	Re-inspection Order
1	100	100	Accepted	
2	200	200	Rejected	3
3	200	200	Rejected	
4	200	200	Rejected	
5	200	200	Accepted	
6	200	200	Rejected	7
7	200	200	Rejected	8
8	200	200	Accepted	

The cumulative results are:

- Quantity Accepted excluding Re-Inspection: 300 (order 1 and 5).
- Quantity Rejected excluding Re-Inspection: 600 (order 2, 4 and 6).
- Quantity Accepted including Re-Inspection: 500 (order 1, 5 and 8).
- Quantity Rejected including Re-Inspection: 400 (order 3 and 4).

The results are displayed in the Item Quality Statistics (qmptc1140m000) session:

Accepted excluding re-inspection	Rejected excluding re-inspection	Accepted including re-inspection	Rejected including re-inspection	Quantity skipped
300	600	500	400	0

If you select the Exclude Re-Inspection option, the data on the chart is plotted as:
- Accepted - 300
- Rejected - 600

If you select to Include Re-Inspection option, the data on the chart is plotted as:
- Accepted - 500
- Rejected - 400

To define adjust targets when copying targets

To define the methods to adjust targets when copying existing targets for new time periods.

The method to adjust the target for defined periods are:

The possible values of Adjust Targets are:
- **Tighten**: The targets must be decreased.
- **Release**: The targets must be increased
- **No**: No changes in the targets

Enter the percentage to be adjusted.

Note

The percentage field is disabled when the Adjust Targets value is set to No.

Define the method to implement the percentage.

The possible values are:
- **Single**
- **Growing**
- **Growing (Progressive)**

How to use the methods:

Example The following periods and targets are present in the Item Quality Statistics (qmptc1140m000) session:

Period	Description	Target
1	January	100
2	February	100
3	March	100
4	April	100

Example If the targets must go down, you set the Adjust Targets status to Tighten. The percentage is defined as 10% for the next 3 periods and the source period is January. For each method the results will be as follows:

Single - The target will be:

Period	Description	Target
1	January	100
2	February	90
3	March	90
4	April	90

The base period is January and hence not updated. Based on the defined percentage, all the selected periods get the value 90. This is a one time calculation and the value is implemented for all the periods within the selection.

Growing - If the targets must down by 10% for every period, the target will be:

Period	Description	Target
1	January	100
2	February	90
3	March	80
4	April	70

The base period is January and hence not updated. This is a one time calculation and the value is implemented for each consecutive period. The previous period is used as base point, so when calculating for the period March, the target of period for February is used, which is 90 – 10 = 80.

Growing (Progressive) - the target will be:

Period	Description	Target
1	January	100
2	February	90
3	March	81
4	April	72.9

January is the current period and hence the target is not impacted. For the next period, February, the calculation is 100 * 0.9 = 90. And, for the next period, March, the output of the target for February is used, that is 90 * 0.9 = 81. This algorithm will be used for every next period within the selection.

Note

The same calculation is applicable when the Adjust Target value is set to Release.