# Quality Inspection

## Inspection Lot Processing

The quality inspection plays a major role within the framework of quality management. Supported by the information provided by quality planning, the quality inspection in turn supplies important data for quality control purposes. Quality inspections are carried out for individual inspection lots containing specific materials. The existence of an inspection lot indicates that a specific quantity of material is being presented for a quality inspection.

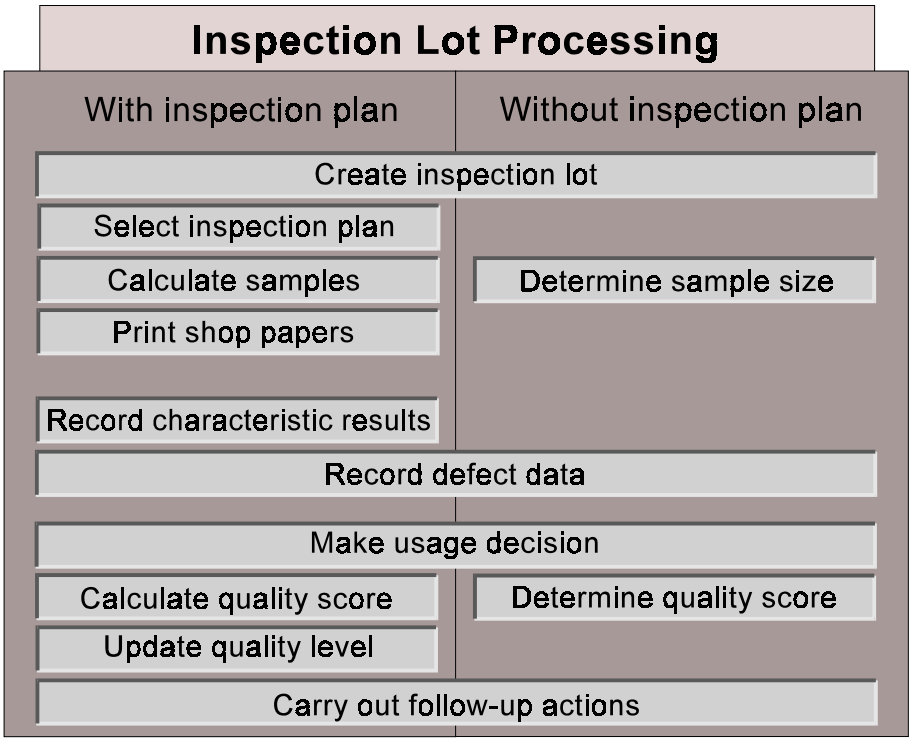


**Figure 5-1: Variations in the Inspection Process**

This request to carry out a quality inspection is documented in the SAP System by a data record that contains all information related to the processing of the inspection lot: origin, scope, processing status, etc. The inspection lot also serves as the basis for managing the inspection specifications, inspection results, inspection costs, and usage decision. The individual steps in the inspection process are defined in the material master at the plant level based on inspection type. For the most part, these steps can be automated.

Because the inspection lot uses the general status management for logistics objects, it is linked to the message control and the SAP Workflow component. Depending on the status of the inspection lot, the user can instruct the system to transmit selected messages to predefined distribution lists and to trigger certain tasks for further processing.

This chapter describes how to process general inspection lots of different origins. For an inspection in production, the inspection lot may assume special attributes. Additional information on this matter is provided in Chapter 3 under the heading “Production.”

## Inspection Lot Creation

**Automatic Inspection Lot Creation**

Inspection lots can be created manually or automatically by the system as a result of the following activities:

- Goods movements in the materials management system
  - goods receipt
  - goods issue
  - stock transfer
- Creation of deliveries in sales and distribution

An inspection lot can be created manually for a released production order. Furthermore, the system can create an inspection lot record for a production order with the special attributes mentioned above.

Other activities can cause an inspection lot to be created automatically.

Once the inspection lot has been created, a number of additional, automatically executed steps may follow as part of the inspection lot processing sequence. The QM inspection data contained in the material master determines whether or not these steps will be carried out and how they will be carried out. In addition, the inspection plan specifications and the quality level may also affect this process.

**Inspection Plan Selection**

**Sample Calculation**

For inspection types with an inspection plan, the system selects the inspection plan that fits the material and the inspection lot origin. If a material specification is available, the system can use the specification to define the inspection specifications independent of the inspection plan. If the inspection results are to be recorded on the basis of characteristics, the system will use the quality level to determine the sample sizes for all inspection characteristics in the plan.

**Shop Papers**

The inspection specifications that have been obtained provide the basis for printing the shop papers and recording the inspection results at a later time. The following are examples of shop papers that are normally required:

- instructions for taking and managing samples (sample drawing instruction)
- inspection instructions

With the help of the SAPscript forms, the user can design such shop papers according to his needs.

**Sampling**

Once the shop papers have been printed, the responsible persons can take the samples required for the inspection according to the sample drawing instructions. These samples must then be delivered to the work centers specified for each operation. The inspection may now begin; the inspectors must carry out the steps outlined in the inspection instruction. The inspection instruction describes the test equipment and inspection characteristics for each inspection operation, as well as the inspection methods, specifications, and sample size for each inspection characteristic. The inspector can record the inspection results on the inspection instruction form, provided the form was designed to accommodate this information. The system waits for the confirmation of the inspection results in a specific format. Refer to the paragraph titled “Inspection Results” for detailed information on this subject.

## Inspection Lot Completion

**Inspection Completion**

**Usage Decision**

If the material master specifies that characteristic results are to be recorded, the inspector must valuate all inspection characteristics once the results have been recorded. The system then compares the recorded characteristic values with the quantitative or qualitative specifications and the sampling plans and decides whether an acceptance or rejection is in order. After the results have been recorded or the inspection has been aborted, the inspector or another authorized individual must make the usage decision for the inspection lot. Once this has been done, the inspection results cannot be changed anymore. If none of the inspection characteristics were rejected, the system can make the usage decision automatically.

If a usage decision is made for a material that requires documentation, the decision must include an explanation under the following circumstances:

- if the inspection was aborted
- if the usage decision does not conform to the inspection results; for example, if the lot was
  - accepted, although an inspection characteristic was rejected
  - rejected, although all inspection characteristics were accepted

It is possible to change the usage decision at a later time, however, all changes will be documented by the system in the form of change documents.

**Quality Score**

When the usage decision is made, the system calculates a quality score for the inspection lot according to an algorithm defined in the material master. Several different functions can be used. For example, the quality score can determined on the basis of the

- usage decision code
- share of defects in the lot
- share of defects for the weighted characteristics

If necessary, the user can implement his own calculation functions.

**Quality Level**

The system updates the quality level for the affected material according to the valuation of the inspection characteristics and the inspection lot. The quality level is a data record that defines the inspection stages for all of the characteristics in the next inspection lot, based on the dynamic modification rule specified in the inspection plan. The quality level record is updated in reference to the material and the inspection plan that is associated with the inspection lot. Depending on the origin of the inspection lot, the quality level record can also be updated in reference to other criteria such as vendors.

Once the usage decision has been made, the system updates the summarized data in the Quality Management Information System. Additional information on the Quality Management Information System is contained in Chapter 6, “Quality Control,“ under the heading “Evaluations.“

**Follow-Up Actions**

The usage decision may trigger a series of automatic follow-up actions that can be programmed by the user. For example, if a lot is rejected, the system can send a message to the purchasing department and print out a notification of defects.

**Skip-to-Stock**

If a skip-lot and an automatic usage decision is allowed for a material, the system can process the inspection lots automatically without any operator involvement, providing the quality level will permit this to occur. Within a limited period of time, however, the user can intervene in this automatic process and make his own usage decision. For inspection lots that were created as a result of goods movements, the system will immediately post the inspection lot quantity in the unrestricted-use stock (skip-to-stock).

**Inspection processing can be planned individually for each material. For the most part, the system carries out the individual steps automatically.**

Which steps are carried out automatically by the system when an inspection lot is created?

Assuming the basic data is preset accordingly, the system can

- ❑ create inspection lots of different origins
- ❑ select inspection plans
- ❑ calculate samples
- ❑ print shop papers

Which steps does the system carry out automatically when the inspection lot is closed?

Assuming the basic data is preset accordingly, the system can

- ❑ valuate inspection results
- ❑ calculate the share of defects in the lot
- ❑ determine quality scores
- ❑ update the quality level
- ❑ make usage decisions if results are acceptable
- ❑ release stocks
- ❑ trigger follow-up actions

## Inspection Results

Inspection results are recorded in reference to an inspection lot. The QM module recognizes inspection results in two different forms: the inspector can confirm results for planned or unplanned inspection characteristics or he can merely record the defects that were found. If defects were found, the system can automatically supplement characteristic results with defect data records. To be able to record characteristic results, the user must have assigned an inspection plan to the inspection lot and a sample calculation must have been carried out. These two steps are not required for defects recording.

### Recording Characteristic Results

Characteristic results are recorded and valuated according to the specifications in the inspection plan. Additional characteristics that first became apparent during the inspection, and were not included in the inspection plan, can be defined during results recording. Conditional characteristics must only be inspected if the associated controlling characteristic was accepted or rejected. Inspection results can also be recorded for optional characteristics or skipped characteristics. There are also special types of characteristics known as calculated characteristics. The results for calculated characteristics are not recorded. Instead, the system calculates the results for these characteristics on the basis of the results obtained from other characteristics.

**Characteristic Types**

Inspection results can be confirmed for the following types of characteristics:

- quantitative characteristics (recording of measured values)
- qualitative characteristics with attributes (recording of attribute codes)
- alternative characteristics (recording an acceptance or rejection)

**Recording Types**

There are several recording types to choose from, depending on how detailed the inspection results are to be recorded:

- summarized values for each inspection characteristic
- classed results of several measurements for each characteristic (number of values within value classes)
- single values obtained from several measurements for each inspection characteristic. If necessary, the measured values can be assigned the serial numbers of the units being inspected.

After the results have been recorded, each inspection characteristic is valuated as accepted or rejected and then closed. As long as no usage decision

has been made for the inspection lot, changes can still be made to the characteristics that have been closed. The system will document all changes with change documents.

**Independent Multiple Samples**

Results can also be recorded for a number of samples for each inspection characteristic, if the sampling procedure has provides for this. During results recording, it possible to draw more samples than the number specified in the sampling procedure.

**Valuation Modes**

The following valuation modes can be used at the characteristic value and value class level:

- manual valuation
- decision based on the tolerance range of quantitative characteristics
- decision based on the attribute codes of qualitative characteristics

There are additional valuation modes that can be used at the characteristic level. They are used to represent the sampling plans for

- a variable inspection with single-sided or double-sided tolerance limits
- an attributive inspection based on the number of nonconforming units or number of defects

Characteristics with independent multiple samples require an additional valuation rule at the sample level. In the standard system, this is the valuation according to the worst sample using the worst-case principle.

Valuation rules developed by the customer can be integrated into the system without any program modifications.

**Defect Shares**

Once the results have been recorded, the system determines the share of nonconforming units for all characteristics and uses this information to calculate the share of nonconforming units in the inspection lot. These defect shares can be used to determine the quality score for the inspection lot.

## Defects Recording

The use of the defects recording function does not depend on the existence of an inspection plan. If an inspection plan is available, the recorded defects can be assigned to an inspection operation or inspection characteristic contained in the plan. It is also possible, however, to record defects for an inspection that does not use an inspection plan.

Since it is possible to record both defects and characteristic results in an inspection with an inspection plan, the results for an inspection lot may include confirmed characteristic results and confirmed defect data.

The defect data records can include information about the:

- defect type
- defect location
- defect cause
- corrective action
- defect valuation

With help of cataloged terminology, this information is described in clear terms and is supplemented by text. The unit of measure for valuating the defects can be individually defined.

The information that is actually contained in the defect data records is determined by report categories, which the user defines for different types of inspections.

There are two basic methods of recording defects, depending on how detailed the defect information must be:

- summarized recording of the number of defects for each defect type
- individual recording of all single defects with the serial numbers of the units being inspected

It is usually not desirable to mix systematic and consequential defects with defects that were caused randomly. The system therefore differentiates between these three defect categories.

If desired, defect data records can be processed in the form of quality notifications. If an especially troublesome defect has occurred, a quality notification should be created immediately in results recording. Detailed information on quality notifications are contained in Chapter 6, “Quality Control.”

**Inspection characteristic values and defect data records document the quality of the inspected material.**

What purpose does the recording of characteristic results serve?

Characteristic results provide the basis for creating batch specifications and certificates of analysis.

What is the purpose of defects recording?

Defects recording generates valuable information for quality control and for the optimization of the processes.

# Subsystems

**Open Interface to Subsystems**

The R/3 System has a number of open interfaces that can be linked to external subsystems. In addition to the interfaces provided by the logistics system, the QM module has an interface that can be used to exchange inspection data, in particular the inspection specifications and inspection results. This open interface uses remote function call technology and is primarily intended to be used for the automatic transfer of measured values from subsystems.

If a work center referenced in an inspection plan or routing is connected to a subsystem over this interface, this subsystem can request the operations and all specifications for the inspection characteristics that have to be processed in the affected work center. While the subsystem processes an inspection operation, the same operation will be blocked for processing in the QM module. When processing has been completed, the subsystem records the inspection results, converts the data into the required transmission format, and confirms it back to the QM module over the interface.

The interface program checks the consistency of the confirmed data with the specifications from the inspection lot and stores them in the QM module files. There the operations are processed further within the scope of inspection lot processing. Additional technical information is contained in the system description “Communication Module for Linking Subsystems to R/3-QM.”

**The QM module has an open interface for the automatic transfer of inspection results from CAQ subsystems.**

How does the communication between the R/3 System and the subsystem work?

The CAQ subsystem requests the specifications for an inspection operation from the QM module and transmits the inspection results back to the QM module. The subsystem retains the active role during this communication process.