QuEST Forum

TL 9000
Quality Management System

Measurements Handbook

R5.7 Point Release

For information about TIA,
visit the TIA website (tiaonline.org).

For TL 9000 specific information,
visit the TL 9000 website (tl9000.org).

Throughout this document the term 'Measurements Handbook' refers to *TL 9000 Quality Management System Measurements Handbook, Release 5.7*, namely this volume. The term 'Requirements Handbook' refers to the latest version of the *TL 9000 Quality Management System Requirements Handbook.* The term 'ISO 9001' refers to ISO 9001:2015.

Any errors identified after printing will be posted to the TL 9000 website. See the Measurements Handbook Errata link at tl9000.org/links.html

This material replaces pages 3-5, 3-6, 4-3, 4-4, 7-1, 7-2, 7-5, 7-6, and 8-5 through 8-8 in the R5.6 TL 9000 Quality Management System Measurements Handbook. The changes in Sections 3, 4, and 7 clarify existing requirements. The change in Section 8.2 introduces a measure, eSPR, which replaces the existing SPR measure in its entirety. The combination of the existing unchanged material in the R5.6 Handbook, along with the material herein constitutes the full R5.7 Handbook.

Approved and Adopted
by TIA QuEST Forum
Effective

30 June 2020

h) submit a minimum of three consecutive months of measurement data for products that expand the organization's TL 9000 scope into new product categories, receiving TL 9000 Data Submission Receipts acknowledging valid submissions prior to scope expansion,
NOTE: Scope changes can be made only in conjunction with assessment by the Certification Body.

i) compare internal measurements to the available industry performance data reports and take steps to improve products and processes as appropriate,

j) provide regular TL 9000 Quality Management System Measurements reports to its responsible management,

k) correct any data errors and resubmit corrected data for any month with erroneous data submitted within the previous 24 months.
Data is in error if one or more of the following conditions apply and the error results in a material difference.

   1) The measurement did not meet the requirements in force at the time of the submission,
   2) data acquisition or validation procedures in use at the time were not followed,
   3) data acquisition scripts or tools contained errors, or
   4) changes to the source data are identified after the most recent submission.

   A material difference occurs when the recalculated TL 9000 monthly measurement deviates more than 1% from the previously calculated value. That is, the recalculated TL 9000 measurement value is greater than the submitted TL 9000 measurement value multiplied by 1.01 or the recalculated TL 9000 measurement value is less than the submitted TL 9000 measurement value multiplied by 0.99.

   This requirement also applies to the required three months of data submitted prior to certification.

l) resubmit corrected data not later than the 2nd data submission after identifying the problem when it is determined that a data resubmission is required,

m) investigate any advisories received on submitted data, correct any data errors found, and resubmit data as appropriate,

n) provide its suppliers all necessary information it possesses to allow those organizations to generate their TL 9000 measurements, and

o) use the available standardized data templates located on the TL 9000 website (tl9000.org/links.html) when the organization has the responsibility to provide that data to its suppliers.

NOTE: For those organizations using automated data collection data systems, validation of the data collection system is not required on a monthly basis. However, if there is any manual input of data to or from the automated system, the organization is still required to verify the data values.

3.5.3 Customer Responsibilities

The customer shall

a) provide the necessary information to allow organizations to generate the TL 9000 measurements using the standardized templates located on the TL 9000 website (tl9000.org/links.html),

b) utilize defined processes to capture and validate applicable measurement data,
c) use the TL 9000 measurements definitions for standardizing the performance review process of the organization, for example, report cards, etc.,
d) establish joint improvement teams and objectives based on TL 9000 measurements and other required performance objectives, and
e) consider using TL 9000 measurements as an input when determining life cycle costs.

3.5.4 QuEST Forum Responsibilities

The QuEST Forum shall

a) publish and administer the Measurements Handbook,
b) ensure that the Measurements Handbook is publicly available,
NOTE: Publication, distribution and maintenance of the handbook is performed under the direction of the QuEST Forum, which retains its copyright,
c) assure the availability of appropriate training in all regions to help users correctly and consistently interpret the TL 9000 requirements and report the TL 9000 measurements,
d) provide measurements process oversight,
e) address all issues and concerns relating to the measurement process and provide a summary and recommendations to the appropriate QuEST Forum work group,
f) assure TL 9000 data submission methods are made available to registering organizations,
g) proactively inform impacted parties such as QuEST Forum members, organizations with TL 9000 certified registrations, Certification Bodies, Accreditation Bodies, and sanctioned training providers about new information available on the TL 9000 (tl9000.org) and QuEST Forum (questforum.org) websites via appropriate means, and
h) review proposed aggregation of various TL 9000 release submissions.

3.5.5 Certification Body Responsibilities

During each audit the Certification Body auditor shall

a) assure all of the organization's responsibilities are met,
b) fulfill all the auditor requirements defined in the document 'Qualification and Experience Requirements for TL 9000 Certification Body Auditors' available on the TL 9000 website (tl9000.org/links.html),
c) verify all measurement process non-conformances are corrected within the auditor-specified timeframe, and
d) verify and update, if needed, the registration records on the TL 9000 website (tl9000.org).

3.6 Information and resources

3.6.1 Information and Resources

Organizations should leverage the experience and knowledge provided by QuEST Forum. The resources listed below provide guidance and examples to assist both beginners and advanced users in maximizing the potential of their TL 9000 Quality Management System and measurements reporting.

There are two elements to this support: Links, which deal with specific TL 9000 certification support; and the Supplemental Measurements Library, which provides examples and support material designed to maximize the potential of the organization's Quality Management System and measurements submission.

methods from one data submission to the next, the organization shall account for any resulting overlap or gap in the data. The same method, calendar or fiscal, does not have to be used for all measurements within a data submission.

The term ‘month’ throughout this handbook refers to the reporting period for the data, whether calendar or fiscal.

The organization shall use calendar days for the measurements that involve number of days.

4.2.4 Reporting of Compared Data and Research Data

The organization shall report data for all applicable measurements defined in this handbook to the TL 9000 Administrator according to the counting rules. This reporting requirement applies whether the measurement includes the designation ‘compared data’ or ‘research data.’ See the Measurements Summary Listing, Appendix A, Table A-6.

NOTE: The designation ‘compared data’ in the Appendix A, Table A-6, means that industry performance data reports may be available from the TL 9000 Administrator. However, the designation ‘research data’ indicates that no comparable industry performance data reports are available, and the TL 9000 Administrator will report analyses of industry performance data reports only to the appropriate QuEST Forum working group(s).

4.2.5 Product Exclusions

The organization shall exclude data for products that are no longer fully supported for its general customer base. This exclusion shall apply only after formal notification has been made to the customers. This includes any product or service on Additions and Maintenance (A&M), Manufacturing Discontinued (MD) status, New Service Supply Discontinued Status, End of Support (EOS), or End of Life (EOL).

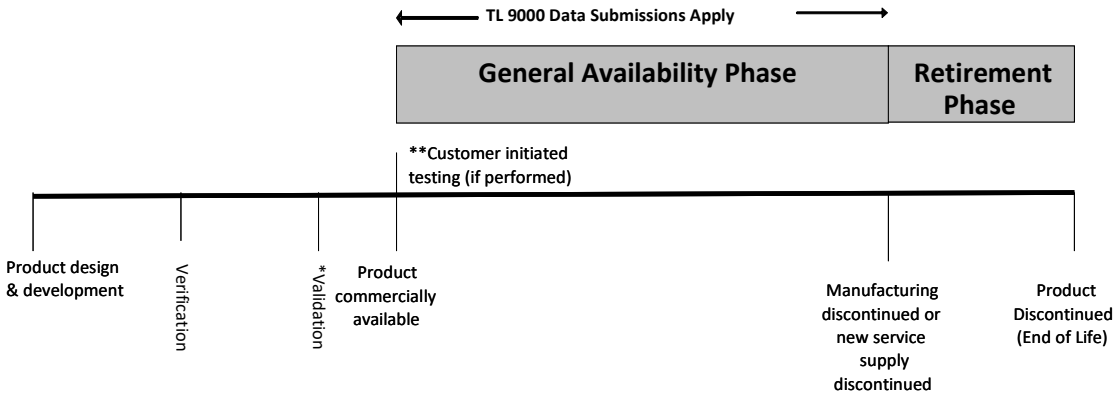
For software related products or services, the exclusion applies to generic releases as well as specific software releases. It also applies to any software product where new software feature releases are not deployed.

This exclusion does not apply to individual Field Replaceable Units which are part of a product in general availability that have been made obsolete by a later version unless those units are completely recalled from the field.

4.2.6 Product Measurement

Unless otherwise stated, measurements shall apply to products only during the General Availability Phase of their life cycle. The terms General Availability and Retirement Phase are defined in the glossary. To assist in a common understanding of a product’s life cycle, see Figure 4.2.6-1.

The organization shall retain the capability to report all applicable TL 9000 measurements during the product’s or service’s Retirement Phase.



*External testing initiated by the organization that is deemed necessary to qualify the product would be included during Validation and executed prior to General Availability, and therefore would not be included in measurement reporting.

**Testing initiated by the customer that occurs after the start of General Availability phase would be included in measurement reporting. Examples of customer-initiated testing include customer acceptance testing, field trials, and First Office Applications (FOAs).

Figure 4.2.6-1 Product Life Cycle and TL 9000 Data Submission

4.2.7 Calculation of Normalization Units

Where the normalization unit is traffic capacity based, such as DS1, OC-1, DSL or Terminations, the calculation shall be based on the true usable traffic capacity. Equipment within the system used to provide protection for the main traffic path shall not be included, as it does not add usable capacity to the system. See Transmission Standard Designations and Conversions, Appendix A, Table A-4 for conversion factors from various traffic capacities to the normalization units.

Where the normalization factor contains the word 'shipped,' the quantity shipped in the 12 months ending with the month being reported shall be used.

4.2.8 Data Submission and Exemptions

Data shall be submitted according to the format provided by the TL 9000 Administrator. When resubmitting corrected data, the organization must use the product category table in effect at the time the data was originally submitted. The following measurements and all their sub-measurements may not be exempted: NPR, FRT, OFR, OTD, SFQ, eSPR, and SQ. The following rules apply to those special cases where, even though there is deployed product, there may be no data to report.

a) If there is simply no data to report, such as no faults identified, no defects reported, no outages, etc., then a value of zero is entered. This can apply to both the numerators and the denominators.
b) In certain special instances, an organization may claim exemption from providing data for a required measurement. In this case, the word 'EXEMPT' is entered in place of the required data. The organization shall document a valid reason for this exemption for review and approval by its certification body and update its TL 9000 registration profile to show the exemption for

Section 7 Hardware Measurements

7.0 Return Rates

7.0.1 Purpose

This section contains return rate measurements for two types of products:

1) products whose reliability is tracked throughout their general availability phase.
2) products where returns or requests for replacements can only be tracked during the initial usage of the product.

7.1 Field Replaceable Unit Returns (FR)

7.1.1 General Description and Title

FR is comprised of three return rate measurements that cover the general availability of a product. These are:

1) Early Return Index (ERI) – a measure of the returns of units during the first six months after initial shipment. This is not a true return rate; see note in 7.1.3 below.
2) One-Year Return Rate (YRR) – return rate of units shipped seven to eighteen months prior to the reporting month.
3) Long-Term Return Rate (LTR) – return rate of units shipped nineteen or more months prior to the reporting month.

7.1.2 Purpose

The measurement

– provides a quantification of the quality of the product as initially received by all customers including equipment manufacturers and/or end-customers, and during subsequent in-service operations,
– determines areas needing corrective action or most likely benefiting from continual improvement activity, and
– provides input data needed to calculate equipment operational costs.

7.1.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A-2. In general, these measurements apply to

– any system comprised of field replaceable units (FRUs),
– a system which is an FRU, or
– the individual FRUs.

The FR measurements apply to equipment whose reliability needs to be tracked throughout its general availability. These measurements apply equally to any FRU shipped either in a system or separately. These measurements are not intended for items shipped in bulk such as

– cable and optical fiber, or
– mechanical hardware such as metallic connectors, optical connectors, conduit, mounting hardware, labels, etc.

NOTE: The Early Return Index is used as a surrogate for the installation reject rate, including Dead On Arrivals (DOAs), because the quantity of units shipped is

known whereas the number of units actually installed is not readily determined. The Early Return Index measurement for items warehoused outside of the organization's control for an extended period before placement in service may not accurately reflect the actual returns for product in service. This may also be true of items sold through distributors.

NOTE: Early in a product's life, when shipments are low, the ERI may be unstable month-to-month and higher due to any returns against small volumes. This may also occur as the product matures and shipments begin to decline.

NOTE: Long-Term Return Rates may become inaccurate for older products as units are taken out of service without the knowledge of the organization.

NOTE: The return rate for low cost items after the expiration of any warranty period is likely to be inaccurate if purchasing a new item is no more expensive than repairing the failed one.

7.1.4 Detailed Descriptions

a) Terminology

The Glossary includes definitions for

- Afactor (Annualization Factor)
- Basis Shipping Period
- Field Replaceable Unit
- Return

b) Counting Rules

The following rules shall apply when counting returns and shipments for the return rate measurements:

1) All returns except as noted in 7.1.4 c), Counting Rule Exclusions, are counted.
2) Only returns from the basis shipping period corresponding to the specific measurement shall be counted.
3) Customer returns are counted when received by the selling organization or third-party repair/logistics agency.
4) The organization shall document the method of determining which of the returns are from which of the corresponding original basis shipping period. This determination shall be based on the initial shipment to the field of the individual returned unit. This may be determined by
   - serialized shipment records of the returned unit,
   - shipment or warranty start date code marked on the unit,
   - shipment date associated with a customer order, or
   - manufactured date associated with a lot number.

   NOTE: The last method requires the determination of an accounting for a standard time delay between the date of manufacture and shipment.
5) Units that fail due to a problem corrected by a recall before they can be rotated are counted as returns.
6) Units damaged during normal shipping or handling where the container is not damaged due to abnormal shipping conditions are counted as returns.
7) No trouble found units, that is, returned units determined by the organization to meet its specifications, are counted as returns.
8) The date of original shipment to the end customer shall be used for determining the basis shipping period.

7.1.5 Sources of Data

As a part of its data systems, the organization should have available the information listed above needed to calculate these measurements. This includes:

a) FRU shipping records – These are required to determine which units received for repair are early returns, one-year returns, or long-term returns and to determine the respective populations.

b) FRU return records – The organization's return records shall include the identifiers necessary to match returns with shipment records.

c) Third-party return records – Units returned to a third-party repair agency by the customer or repaired by the customer itself shall be included in the return counts when available. To have accurate measurements, it is necessary for the customer to include a contractual requirement of their third-party repair agencies to supply this data to the original equipment manufacturers.

7.1.6 Examples

Examples for applying the FR measurement are located on the TL 9000 website (tl9000.org/links.html).

7.2 Basic Return Rate (BRR)

7.2.1 General Description and Title

This section defines the return rate measurement used for equipment and services where returns and/or replacements are not tracked past the initial usage of the item. The Basic Return Rate (BRR) is measured for identified product categories where normal FRU returns over the full general availability phase do not apply. The measurement tracks returns during the first eighteen (18) months after shipment from the organization.

7.2.2 Purpose

This measurement provides insight into the quality and reliability of equipment and services where long-term tracking is not practical or expected.

7.2.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A-2.

7.2.4 Detailed Descriptions

a) Terminology

The Glossary includes definitions for

- Afactor (Annualization Factor)
- Basis Shipping Period
- Field Replaceable Unit
- Return

b) Counting Rules

The following rules shall apply when counting returns and shipments for the return rate measurements:

1) Counting rules 1, 2, 3, 5, 6, 7, 9, and 10 in Section 7.1.4 b) shall be applied.
2) The organization shall document the method of determining which of the returns are within the eighteen-month basis shipping period. This determination shall be based on shipment of the FRU to the customer. This may be determined by
   - serialized shipment records of the returned unit,
   - shipment or warranty start date code marked on the unit,
   - shipment date associated with a customer order, or
   - manufactured date associated with a lot number.

   NOTE: The last method requires the determination of an accounting for a standard time delay between the date of manufacture and shipment.
3) The date of shipment to the customer shall be used for determining the basis-shipping period.
4) Units which are replaced in the field rather than returned shall be counted in the month the replacement request is received.

c) Counting Rule Exclusions

1) All of the counting rule exclusions in Section 7.1.4 c) shall apply.

8.2 Early Software Problem Report (eSPR)

8.2.1 General Description and Title

The early Software Problem Report (eSPR) measurement tracks the software problems that are found and reported by a customer's early deployment of a software release, just after General Availability. The problem reports included in eSPR are a subset of those in NPR (see Section 5.1), but the problem reports shall also be counted, tracked, and reported separately in order to focus effort on addressing the software component of these problem reports early in the deployment phase.

8.2.2 Purpose

The measurement in this section is provided to aid the customer and the organization in understanding the quality of software that is deployed in the field and the risk of introducing a software fault into their network.

This measurement is used to evaluate the number of customer originated software problem reports that are indicative of the software quality of the product delivered during the early part of the operating life cycle of that product. Software problem reports may have a negative impact on the organization (e.g. rework), on the customer (e.g. scheduling repeat site visits) and may reduce end-user loyalty. This measurement is intended to stimulate ongoing improvements resulting in a reduction of the number of software problem reports, associated costs, and potential revenue losses.

8.2.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A 2.

8.2.4 Detailed Description

a) Terminology

- eSPR-Period: The eSPR-Period includes the month in which a software release is declared GA plus the eleven following months.
- eSPR-Customer: A customer that has reported at least one problem report within the eSPR-Period for that software release.

The Glossary includes definitions for

- Afactor (Annualization Factor)
- General Availability Phase
- Normalization Factor
- Problem Report
- Problem Report – Critical
- Problem Report – Major
- Problem Report – Minor
- Software Problem Report
- Software Release
- Software Update

b) Counting Rules

The counting rules in 5.1.4 b) apply in counting software problem reports for the eSPR measurement, with the following clarifications:

1) Only software problem reports that are reported during the eSPR-Period shall be counted.
2) For the purposes of eSPR reporting, a software problem reported in a software release or a subsequent software update for that release shall be attributable to the software release.
3) In cases where the software release or software update cannot be determined, the software problem report shall be attributed to the most recent software release.
4) Problem reports where the reported problem is suspected to be software related, but cannot be reproduced during subsequent investigations, shall be counted.
5) Multiple reports of the same software problem from the same customer for the same release or a subsequent software update shall be counted as a single problem report in the first month in which the problem is reported.
6) For the eSPR denominator, customers are only counted if they have reported at least one problem report for the release within the eSPR-Period.
7) For the eSPR denominator, a customer is counted once for each release for which it has reported at least one problem within the release's eSPR-Period.

c) Counting Rule Exclusions

The counting rule exclusions in 5.1.4 c) apply in counting software problem reports for the eSPR measurement, with the following clarifications:

1) A problem report that is determined to be a hardware problem shall not be counted even if the design solution or workaround is implemented in software.
2) Problem reports due to faults in input data are excluded.
3) Software problem reports against a software release or associated software update that fall outside of the eSPR-Period for that software release are excluded.
4) If the organization cannot confirm the exact software release or software update to which the problem report is reported, but the organization knows that the problem in question has already been fixed in all software releases or software updates that were released in the previous 12 months, then the problem report in question is excluded.
5) A problem report raised after a software release or software update is withdrawn or no longer supported is excluded.

d) Calculations and Formulas

The applicable eSPR measurements are calculated monthly as shown in Table 8.2-2.

Table 8.2-1 eSPR Notation

Identifier	Definition
Afactor	Number of calculation periods in a year
eSPs	Total number of customers that have reported at least one problem since the start of the software release's eSPR-Period for each distinct software release(s) or associated software updates
eSp1	Total number of Critical software problems reported for the month for software releases within their eSPR-Periods
eSp2	Total number of Major software problems reported for the month for software releases within their eSPR-Periods
eSp3	Total number of Minor software problems reported for the month for software releases within their eSPR-Periods

Table 8.2-2 eSPR Measurement Identifiers and Formulas

Identifier	Title	Formula
eSPR1	Critical early software problem reports per customer-release	eSp1 x Afactor / eSPs
eSPR2	Major early software problem reports per customer-release	eSp2 x Afactor / eSPs
eSPR3	Minor early software problem reports per customer-release	eSp3 x Afactor / eSPs

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of the current TL 9000 Measurements Handbook.
2) The eSPR measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 8.2-3.
3) The eSPR measurement shall be reported by summing software problem reports for each software release (including its associated updates) where the reporting month falls within the release's eSPR-Period.

Table 8.2-3 eSPR Data Table

Identifier	Value
MeasurementID	eSPR
eSPa	Afactor
eSPs	Normalization Factor
eSp1	Number of critical early software problem reports
eSp2	Number of major early software problem reports
eSp3	Number of minor early software problem reports

8.2.5 Sources of Data

Data for the eSPR measurement are derived from information provided by customers and from analysis by the organization.

a) Customers
   1) report software problems to the organization,
   2) confer with the organization to establish severity of each problem report, and
   3) confer with the organization to establish the software release or software update of each problem report.

b) Organizations
   1) count number of reported software problems by product category according to the applicable counting rules,
   2) calculate the normalization factor based on the number of customers reporting at least one software problem report for the release (within the eSPR-Period), counting once for each customer/release combination,
   3) confer with the customer to establish severity for each problem report, and
   4) confer with the customer to establish the software release or software update of each problem report.

8.2.6 Examples

Examples for applying the eSPR measurement are located on the TL 9000 website (tl9000.org/links.html).