QUALITY MANUAL

PART I

QUALITY MANAGEMENT SYSTEM

Issue 2.4

DOCUMENT DETAILS

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2.1	2 March 2019	Multiple	Change of references to Works Director to Works Manager
2.2	2 October 2020	Paragraph 2.5	Addition of repeat work as part of performance metrics
2.3	9 March 2021	Paragraphs 2.1 & 2.2	Reversal of paragraphs and expansion of paragraph 2.2 (Applicable Standards) to include particulars of ISO 9001 certification
2.4	15 November 2023	Multiple	Change of references to Works Manager to Works Director
		3.1	Expansion of organisational organogram by addition of Technical Director and Internal Audit, change of reporting line of Design Office from Managing Director to Technical Director and inclusion of additional reporting lines
		3.3.1	Addition of reference to Technical Director
		3.3.2	Addition of role description of Technical Director
		3.5	Addition of references to Deputy Internal Auditor

		3.6 6.3.5	Addition of Technical Director as a member of the Quality Review Committee and reference to Deputy Internal Auditor as secretary to the Quality Review Committee Addition of reference to Deputy Internal Auditor

INDEX:

Foreword

We at Thomas Keating recognise that our survival and success depend on our ability to satisfy our customers' technical and delivery requirements. We want to be recognised as world-class for our technical innovation and quality of manufacture and as an organisation that our customers and suppliers enjoy working with.

The ability to maintain or improve quality standards whilst pushing the frontiers of technology is a major factor in maintaining and growing our business. Our activities are focused on achieving real customer satisfaction and continual improvement and the effectiveness of our quality management system plays a key part in supporting these endeavours.

This new edition of our Quality Manual reflects the continuing development of our scientific instrumentation business for customers across the industrialised world and the associated evolution of our quality management system. It is intended clearly to demonstrate our continuing quality profile, our commitment to maintaining improvement in the effectiveness of our internal processes and above all our ability consistently to provide product that meets customer and regulatory requirements.

Richard Wylde PhD FREng
Managing Director

November 2018

1. Introduction

Thomas Keating Ltd (**Thomas Keating** or the **Company**) is a trading subsidiary of Churchwood Trust Ltd, a private limited company (registered in England and Wales no. 00298734). Building on over 75 years of high precision engineering, the Company designs and builds microwave and THz scientific instrumentation and mould tooling and provides quality sub-contract machining, electroforming and CAD modelling to the highest possible standards to service research, aerospace and toolmaking customers worldwide in keeping with their needs and requirements. The Company ethos is one of continual improvement and customer support through all stages of design and manufacture and full support for training and development of its staff.

This Quality Manual documents the Company's quality management system. The Company is committed to the continuing development of its quality management system in line with customers' needs and expectations. The Company actively involves all its staff in assessing and refining the system and also takes prompt action on what it learns from them.

2. Structure of the quality management system

2.1. Scope

The Company's quality management system applies to all its business activities and embodies all of the requirements of BS EN ISO 9001:2015. A table showing the cross-referencing of the system to BS EN ISO 9001:2015 is set out in section 7 below.

The Company's business activities are located at Station Mills, Daux Road, Billingshurst, West Sussex, RH14 9SH, United Kingdom.

2.2. Applicable Standards

Thomas Keating has been certified under BS EN ISO 9001 and BS 5750, its predecessor standard, for more than 30 years. Its current certification is under BS EN ISO 9001:2015 and applies to its design and manufacture of moulds, press tools, jigs and fixtures, including millimeter and microwave equipment for the physics industry and satellite works for the space industry.

2.3. Methodology

The Company has adopted a process approach in establishing and implementing its quality management system and ensuring its continual improvement. For this purpose, the Company uses the definition of *process* referenced in BS EN ISO 9001:2015 (as updated from time to time, the **ISO Standard**), namely *a sequence of related tasks and decisions which act on inputs to add value to create outputs. It uses resources and is subject to controls.*

The Company's approach has included determining:

(a) the processes needed for the quality management system and their application throughout the business

(b) the inputs required and outputs expected from these processes, and

(c) the sequence and interaction of these processes.

The advantages of managing activities and resources as a process are:

(a) desired results are achieved more efficiently

(b) a process approach provides ongoing control over the linkage between the individual processes within the system as well as their combination and interaction, and

(c) control, monitoring and continual improvement of the system of processes ensures the continual optimisation of the business overall.

The overall process model is operated by application of the 'Plan-do-check-act' iterative method illustrated in Figure 1 below:

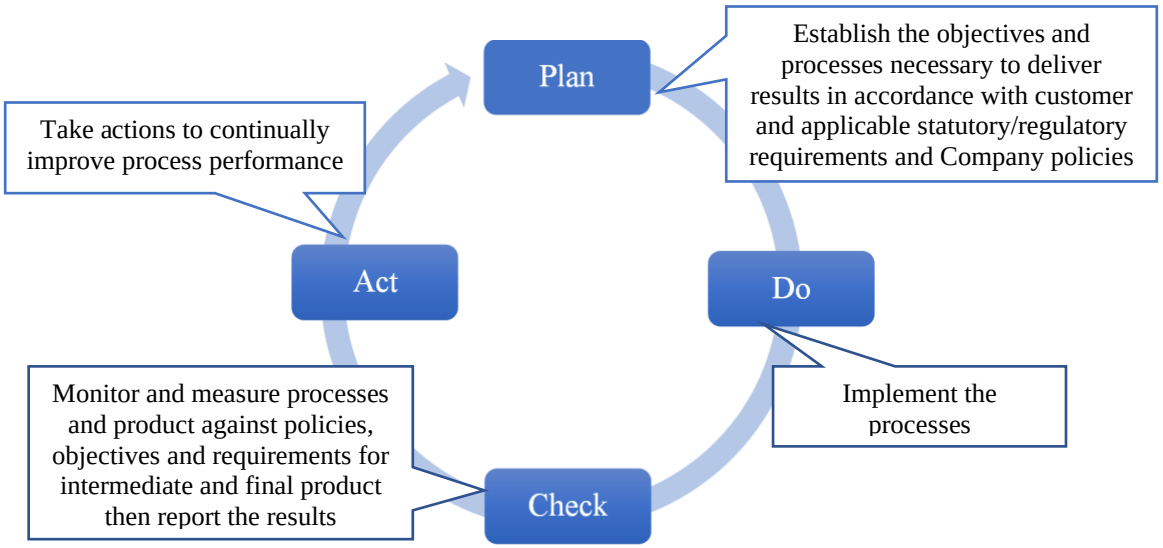


Figure 1: the "PDCA" cycle

Further information about the Company's processes, their sequence and interactions is set out in section 6 below.

2.4. Control and improvement

Control and improvement of the Company's quality management system processes is accomplished by a combination of:

(a) documented procedures and other supporting documentation

(b) auditing of processes to determine their effectiveness

(c) management review

(d) monitoring of risks and opportunities, and

(e) analysis of data.

Further information about these controls is set out in section 6.3 below.

2.5. Performance metrics

Virtually all of the Company's products and services are bespoke and therefore made or provided to order.

As a result, the Company uses the metrics shown in Figure 2 below to monitor the effective operation and control of its processes and through that the overall effectiveness of its quality management system:

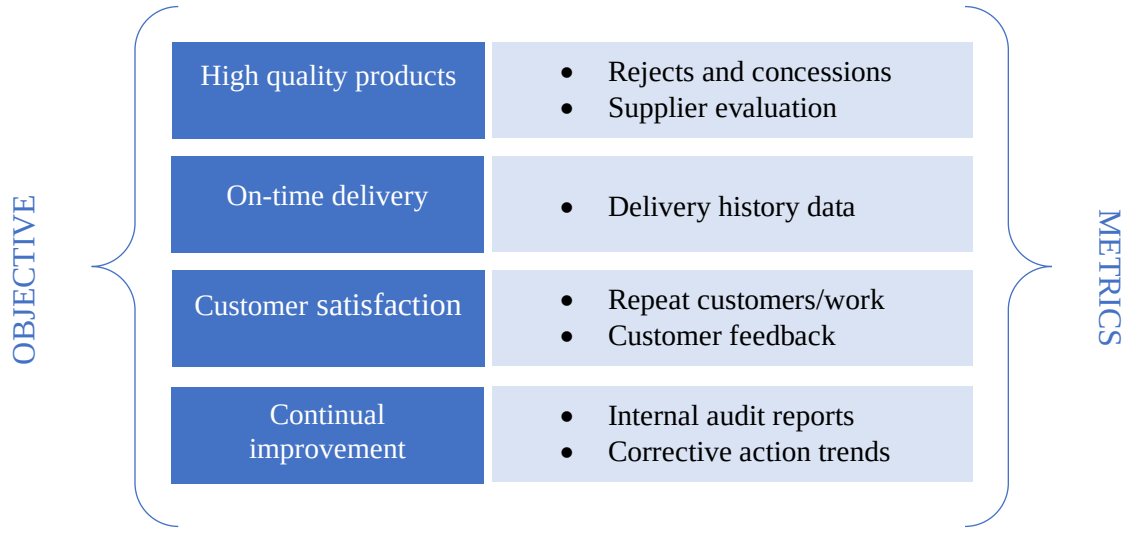


Figure 2: Thomas Keating's performance metrics

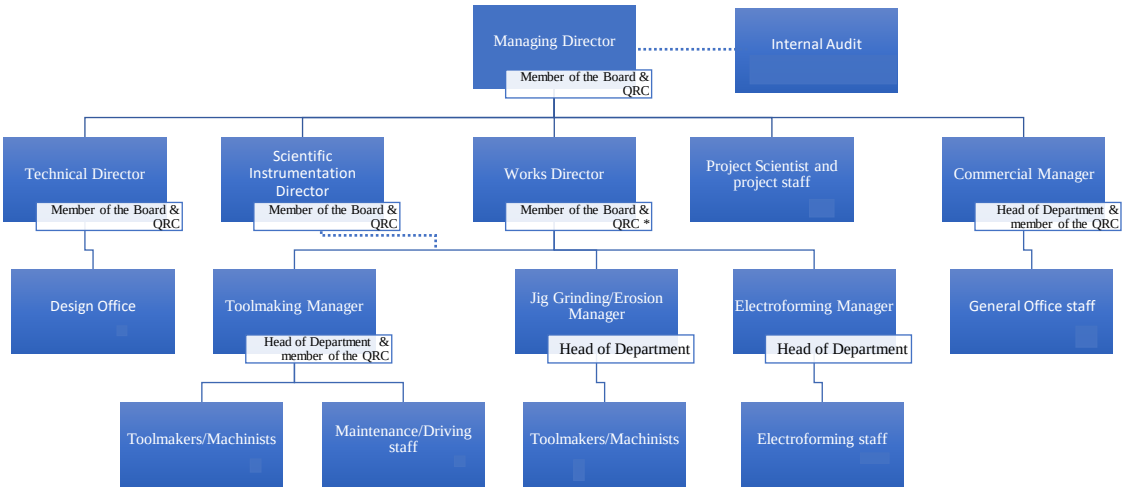
Customer feedback is received informally through written and oral communications from customers as well as from formal satisfaction surveys.

3. Governance of the quality management system

The Board of Thomas Keating (the **Board**) believes that no quality management system can be effective without a governance structure that fosters commitment to the system from the highest level in the organisation. This requires commitment to the allocation of proper resource and the creation of a culture focused at all levels on quality and continual improvement.

3.1. Organisational structure

The Company's organisational structure is set out in Figure 3 below:



* Also Quality Assurance Manager & Health and Safety Officer

Figure 3: Thomas Keating's organisational structure

3.2. Board

The Board is committed to the development, implementation and continual improvement of an appropriate and effective quality management system that complies with the ISO Standard and forms the basis for the efficient operation of its business, demonstrating the Company's ability to consistently provide products and services that meet customer and applicable statutory and regulatory requirements and enhance customer satisfaction.

In particular, the Board is committed to the continual improvement of the system's effectiveness by:

(a) ensuring the availability of appropriate resources

(b) communicating to the organisation the importance of meeting customer as well as statutory and regulatory requirements

(c) establishing and maintaining the Company's quality policy

(d) ensuring that quality objectives are set each year, and

(e) managing risk appropriately.

Further information on the Company's quality policy, objectives and approach to resourcing are set out in sections 4 and 5 below.

3.3. Senior management

The Board is committed to maintaining an appropriate senior management structure and culture to allow the effective operation of the quality management system and facilitate the communication of the general approach, objectives and ongoing development of the system. Senior management are expected to foster an environment that supports teamwork and allows individuals to develop their talents.

The roles and responsibilities of senior management take account of the Company's vertically integrated approach in which responsibility for developing and maintaining customer relationships is allocated to each of the Directors, the Project Scientist and the Heads of Department, who are supported centrally as required by the Design Office and the General Office. Those with responsibility for customer relationships deal with the entire sales process from discussing potential orders, issuing quotations in line with the Company's pricing policy, and checking and acknowledging orders through liaising with customers during the production process to handling post-completion issues and customer feedback. This ensures a continuing focus on determining and meeting customer requirements and enhancing customer satisfaction.

Effective communication with customers and prospective customers is achieved through provision of product information and advice, the handling of inquiries, contracts, orders and amendments, and appropriate response to customer feedback including any complaints. Methods of communication range from the Company's website, presentations at conferences, brochures and customer surveys to written and oral communications with individual customers. Website statistics are periodically monitored.

Senior management are also responsible for communicating internally about the quality management system. This takes a variety of forms depending on the nature and complexity of the message to be delivered and the target audience. Much is done orally or through emails but formal notices to staff and training materials are produced as necessary. Heads of Department are also responsible for cascading relevant information about the quality management system and its development to the staff they manage and for providing and encouraging feedback on its operation.

The principal functional roles and responsibilities of senior management are described below:

3.3.1. Managing Director

The role of the Managing Director is broad but covers areas such as:

- the formulation of all major policies
- identification and setting objectives for the Company
- approving the provision of adequate resources (staff, buildings, machinery and equipment, IT and finance) to allow the business to perform efficiently

- dealing with all corporate business matters such as tax, banking, insurance, pensions and legal requirements

- the formulation of general policies for pricing based on the current market position and to direct effort toward new market sectors

- the identification of skills required to address new markets and to satisfy new customers

- selection and promotion of senior members of staff and the overseeing of all appointments to the workforce, including apprentices

- dealing with all major personnel issues, including agreeing remuneration for staff and adjudicating in any serious matters of discipline, and

- evaluation of new manufacturing and computing techniques and allocation of the necessary capital expenditure.

In addition, the Managing Director leads the development of the Company's scientific instrumentation business in conjunction with the Technical Director, the Project Scientist and other scientific project and product assurance staff.

3.3.2. Technical Director

The role of the Technical Director includes:

- direct responsibility for the design and testing of all scientific instrumentation products

- assisting the Managing Director in the execution of their duties and assuming the responsibilities of the Managing Director in their absence

- attending management meetings

- participating in the selection and interviewing of new technical staff

- participating in the resolution of any technical production problems that involve techniques not previously used.

3.3.3. Scientific Instrument Director

The role of the Scientific Instrument Director includes:

- direct responsibility for the manufacture of all scientific instrumentation products, including acting as lead operator, and liaison with the Works Director accordingly

- generally assisting toolmakers and machinists with technical queries and drawing interpretation in relation to scientific instrumentation products

- assisting the Works Director in the execution of their duties and assuming the responsibilities of the Works Director and/or the Toolmaking Manager in their absence

- attending management meetings

- participating in the selection and interviewing of new staff, and

- participating in the resolution of any technical production problems that involve techniques not previously used.

3.3.4. Works Director

The role of the Works Director covers areas such as:

- leading on reviewing product realisation plans in light of changing business conditions such that future requirements for new processes, additional or replacement equipment and staff can be estimated

- scheduling all production, including liaising with toolmakers and machinists over the preferred method of manufacture and setting priorities and workloads

- liaising with customers with regard to technical questions about work in progress and delivery schedules

- overseeing the day-to-day running of the Company at shop floor level, including the procurement of raw materials and consumables and the maintenance of the Company's plant and machinery and operating environment

- conducting contract reviews for customer orders with the relevant sales person

- ensuring that all job folders are suitably prepared before jobs are issued to the shop floor

- ensuring that work is dispatched to customers on time, including overseeing daily delivery and collection schedules for the Company's transport

- ensuring all the requirements of the quality management system are correctly complied with as they relate to the shop floor

- assessing the quality, delivery and profitability of all major jobs following their completion in discussion with the Scientific Instrumentation Director, the Toolmaking Manager and/or other relevant staff as applicable

- attending management meetings

- chairing the Company's Health and Safety committee, ensuring the production environment is suitable for all staff and visitors and investigating all health and safety matters

- setting permissible overtime hours for shop floor staff and maintaining shop floor discipline

- leading on the resolution of any technical production problems that involve techniques not previously used, and

- participating in the selection and interviewing of new staff and overseeing the recruitment and training of apprentices.

3.3.5. Commercial Manager

The responsibilities of the Commercial Manager include:

- overseeing the day-to-day running of the General Office

- attending management meetings as requested

- ensuring the Works Director is advised of staff availability for the purposes of production planning

- the preparation of job folders and related records on receipt of customer orders

- arranging for the dispatch of finished items in conjunction with the Works Director and invoicing completed orders

- preparation of the final cost summaries of completed jobs

- ensuring all the requirements of the quality management system for which the General Office is responsible are correctly complied with

- checking and adjusting bank account levels on a daily basis

- issuing invoices and monthly statements to customers and chasing overdue accounts

- processing the Company's management accounts, and

- preparing all end-of-year accounts for the annual audit.

3.3.6. Toolmaking Manager

The role of the Toolmaking Manager covers areas such as:

- the formulation and maintenance of a strategy for the development of new business opportunities in connection with the Company's toolmaking activities
- attending management meetings as requested
- liaising with existing customers and designers to meet new tooling requirements, working with the designer and customer to achieve design approval
- submitting post-delivery and customer visit reports to the Works Director
- acting as assistant to the Works Director in the placing of jobs on the shop floor and as such being directly responsible to the Works Director and assisting the Works Director in the execution of their duties
- generally assisting toolmakers and machinists with particular emphasis on production, delivery and maintaining discipline
- assuming the responsibilities of the Works Director in their absence, and
- participating in the resolution of any technical production problems that involve techniques not previously used.

3.3.7. Jig Grinding/Erosion Manager

The role of the Jig Grinding/Erosion Manager covers areas such as:

- overseeing the jig grinding and erosion workshop, including liaising with customers
- attending management meetings as requested
- providing estimates of hours, deliveries and prices to customers for based on the Company pricing policy in conjunction with the Managing Director and Works Director
- maintaining dialogue with the customer throughout the production
- analysing customer feedback and responding accordingly
- acting as assistant to the Toolmaking Manager in the placing of jobs on the shop floor and assisting the Toolmaking Manager in the execution of their duties

- generally assisting toolmakers and machinists in the the jig grinding and erosion workshop with particular emphasis on production, delivery and maintaining discipline, and

- participating in the resolution of any technical production problems that involve techniques not previously used.

3.3.8. Electroforming Manager

The role of the Electroforming Manager covers areas such as:

- the formulation and maintenance of a strategy for the development of new business opportunities in connection with the Company's electroforming activities

- running the electroforming workshop with a particular emphasis on production and delivery and its safe operation

- attending management meetings as requested

- generally assisting machinists with technical queries, drawing interpretations, etc in relation to electroforming

- developing and supervising junior staff in relation to electroforming work

- requisitioning relevant raw materials and chemicals for stock or WIP orders in relation to electroforming business, and

- notifying the Commercial Manager when electroforming items are ready for dispatch.

3.4. Quality Assurance Manager

A key role within the senior management structure is that of the Quality Assurance Manager, who is responsible for ensuring quality remains at the heart of the Company's production activities.

With the support of the Managing Director, the Quality Assurance Manager has the responsibility and authority for structuring and improving the system that ensures compliance with all quality requirements, including:

(a) ensuring that processes needed for the quality management system are established, implemented and maintained

(b) reporting to the senior management on the performance of the quality management system and any need for improvement and leading on the implementation of improvements

(c) ensuring the proper functioning of the Quality Review Committee (see further section 3.6 below), and

(d) ensuring the promotion of awareness of customer requirements throughout the organisation.

3.5. Internal Auditors

The Company has appointed an internal auditor and a deputy internal auditor to audit compliance with the requirements of the ISO Standard and the effectiveness of the quality management system. As well as making formal findings, the Internal Auditors are encouraged to make suggestions for improvement of the system.

Only qualified personnel may perform internal auditing activities as Internal Auditors. Qualified personnel must have satisfactorily completed external IRCA-certificated training on the ISO Standard and on internal auditing techniques. Those conducting internal audits are also required to be independent of the process(es)/element(s) being audited to ensure the objectivity and impartiality of the audit process.

3.6. Quality Review Committee

The governance supporting the Company's quality management system is further strengthened by the Company's Quality Review Committee.

The members of the Quality Review Committee are as follows:

- Managing Director
- Technical Director
- Scientific Instrumentation Director
- Works Director/Quality Assurance Manager
- Commercial Manager
- Toolmaking Manager, and
- Internal Auditor.

The Deputy Internal Auditor acts as secretary to the Quality Review Committee.

The terms of reference of the Quality Review Committee include considering the impact of changes to the Company's external and internal environments, assessing risks and opportunities, considering the Company's quality policy and overall quality objectives and reviewing the effectiveness of the Company's quality management system and approving improvements to it. Further information about the role of the Quality Review Committee is given in section 6.3 below.

4. Quality Policy and Objectives

4.1. Policy aims

The Company's quality policy is framed as follows:

> *We at Thomas Keating recognise that our survival and success depend on our ability to satisfy our customers' technical and delivery requirements. We want to be recognised as world-class for our technical innovation and quality of manufacture and as an organisation that our customers and suppliers enjoy working with.*
>
> *The ability to maintain or improve quality standards whilst pushing the frontiers of technology is a major factor in maintaining and growing our business. Our activities are focused on achieving real customer satisfaction and continual improvement and we recognise that our quality management system plays a key part in supporting these endeavours.*
>
> *We are committed to designing and building microwave and THz scientific instrumentation and mould tooling and providing sub-contract machining, electroforming and CAD modelling to the highest possible standards and in keeping with our customers' and regulatory requirements. We are also committed to continually improving the effectiveness of our quality management system.*

The policy is published as a formal notice to all staff as well as on the Company's website.

4.2. Objectives

The Managing Director sets new business and quality objectives each year, which are reviewed by the Quality Review Committee before being communicated to all staff and published on the Company's website. The current objectives can be found on the Company's website at http://www.terahertz.co.uk/images/manuals/TK-Objectives.pdf.

5. Provision and Management of Resources.

As noted above, the Board is committed to determining and providing the internal resources required to implement, maintain and continually improve the effectiveness of the Company's quality management system and related processes. The primary aim of this approach is to enhance customer satisfaction by meeting explicit and implicit customer requirements.

5.1. Staff

The primary resource for achieving the Company's aims are its staff.

Senior management is committed to ensuring that all personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives. This is a fundamental part of the Company's ethos.

The quality management system also covers the recruitment of staff and their ongoing development. Staff may be promoted from within the Company or recruited externally, in which case the Company takes steps to assess the suitability of the candidate for the relevant role based on their qualifications and prior experience.

The Works Director also reviews the competence of all personnel at least annually based on their education, training, skills and experience as part of enhancing the Company's skills base in light of technological developments, disseminating internal know-how and expertise and ensuring appropriate staff development and succession planning. It is Company policy to take on at least one new apprentice each year and support them through formal training to GNVQ level or above. In addition, all staff carrying out tasks that require special skills and qualifications or that could be adversely affected by a lack of such skills or qualifications are supported through in-house or external training.

Further information about the Company's recruitment and training process and related procedures is set out in section 6.2.3 below.

5.2. Infrastructure

The Board is committed to determining, providing and maintaining the infrastructure required to effectively achieve conformity to product requirements. The Company's policy is therefore to make continuous investment through the business cycle in machinery, equipment and software that supports achievement of its business objectives. This includes:

(a) buildings, workspace and associated utilities

(b) machinery and equipment used in the design and manufacture of products, and

(c) supporting services such as IT and transport.

In order to ensure that the work environment continues to be suitable to achieve conformity to product requirements, due consideration is also given to quality requirements during the Company's regular health and safety workplace reviews. Any problem that is identified is promptly taken up and resolved by the Works Director or a person nominated by the Works Director after discussion with the Managing Director if capital expenditure is required.

6. Processes

The processes that the Company has determined are needed for its quality management system fall into three main types:

(a) those directly associated with product realisation

(b) those that indirectly support product realisation, and

(c) those that provide control, monitoring and improvement of the quality management system itself through addressing risks and opportunities, evaluating the processes in (a) and (b)

above and implementing any changes needed to ensure those processes achieve their intended results,

as illustrated in Figure 4 below.

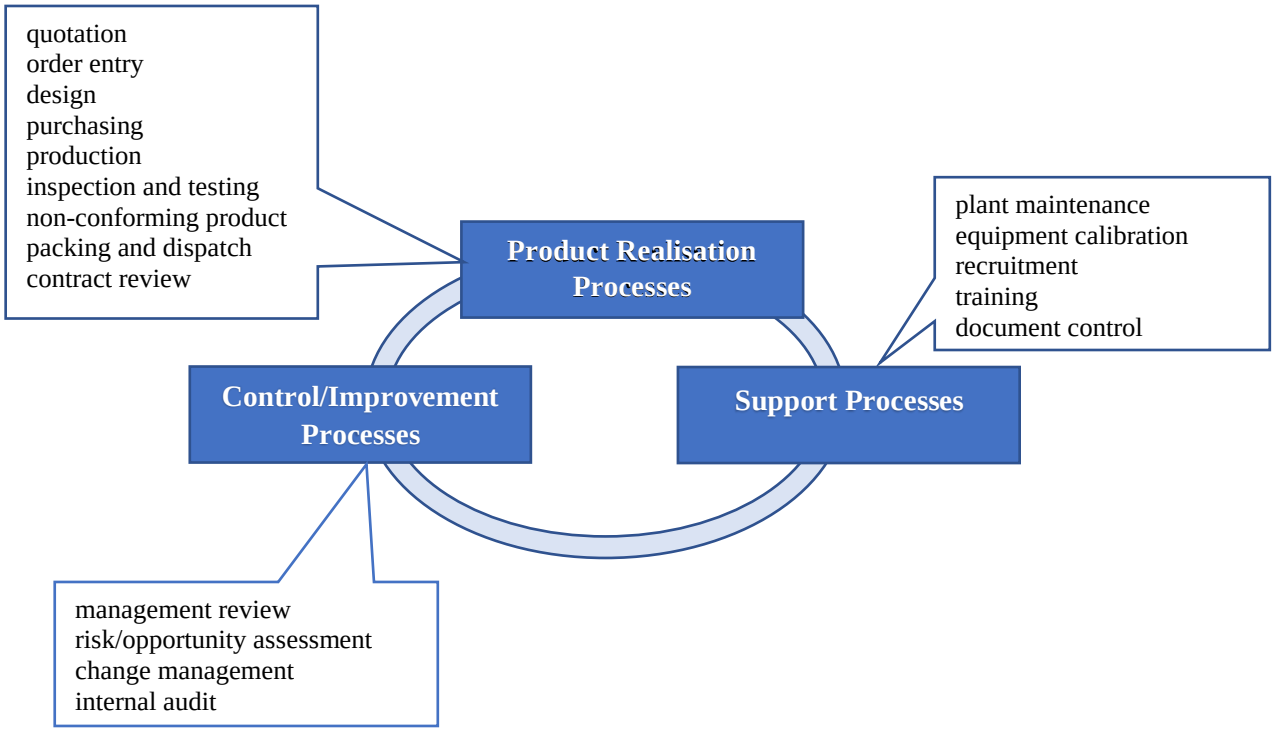


Figure 4: Scheme of Thomas Keating's quality management processes

The three different types of process are considered in turn in sections 6.1 to 6.3 below. In reality, however, there are substantial overlaps and linkages between the activities and decisions they embody and in the documented procedures that the Company has adopted to ensure their effective operation.

6.1. Product realisation processes

6.1.1. Overview

Figure 5 below illustrates the key elements of the Company's processes that directly relate to product realisation and the interactions between them:

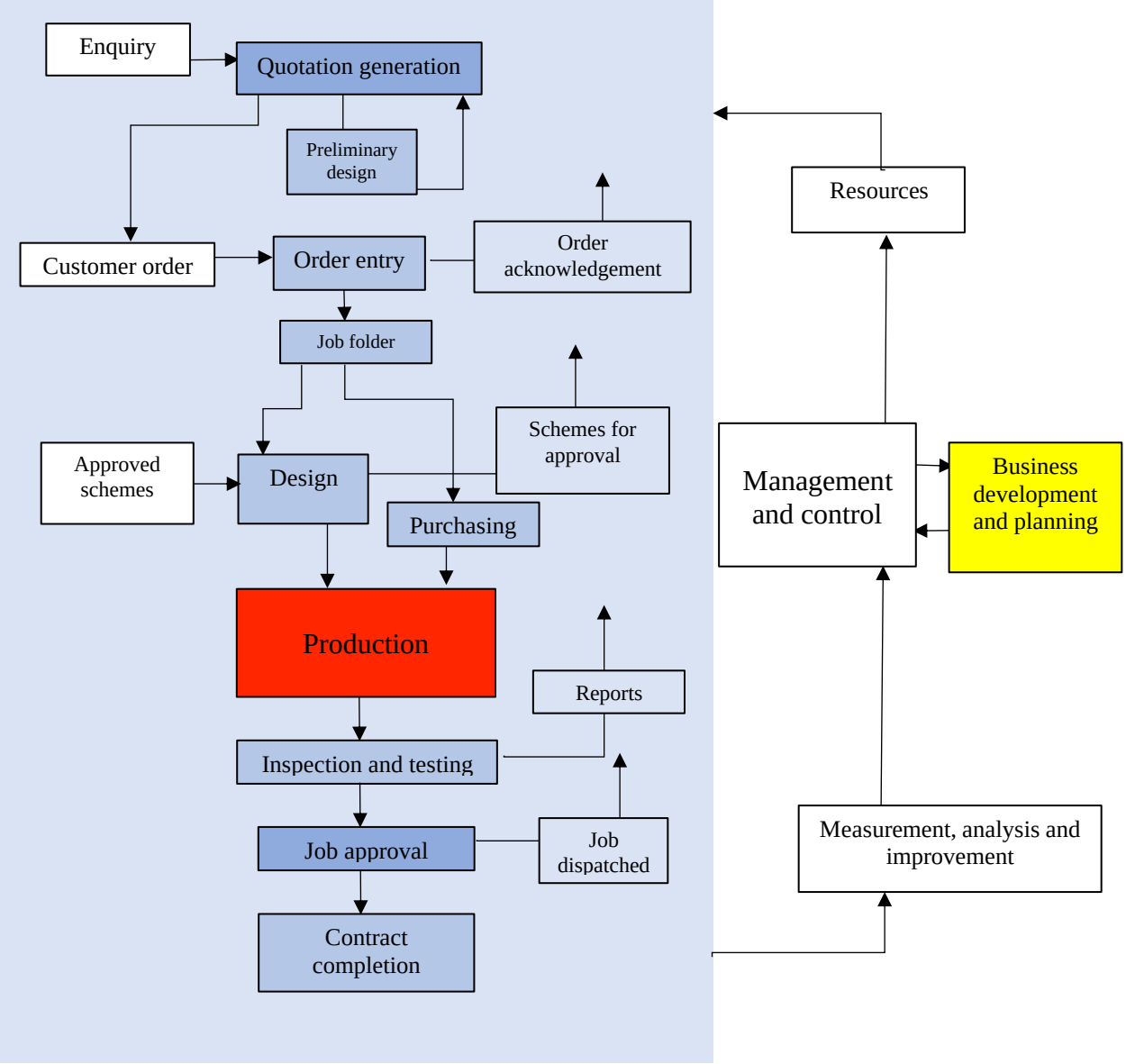


Figure 5: Overview of Thomas Keating's product realisation processes

These processes are supported by the following documented procedures:

Number	Title
TK-QP-001	Customer Enquiry, Order and Contract Completion Review Procedure
TK-QP-002	Design Control Procedure
TK-QP-003	Control of Externally Provided Goods and Services and Goods Inward Procedure
TK-QP-004	Control of Production Procedure
TK-QP-005	Monitoring, Measurement and Testing of Product Procedure
TK-QP-006	Non-Conforming Goods and Services, Customer Complaints and Corrective Action Procedure
TK-QP-007	Handling, Storage, Packing and Dispatch Procedure

6.1.2. Quotation process

A key purpose of the quotation process is to ensure that customer and applicable statutory and regulatory requirements are determined and met, including through the identification of any applicable risks. This is done by carrying out detailed reviews of the proposed contract documents, including the customer's specification and any customer drawings on which the design and manufacture of product or the provision of services will be based, and includes an assessment of risk. The relevant procedures are set out in Customer Enquiry, Order and Contract Completion Review Procedure TK-QP-001, which defines the controls required to:

(a) determine the requirements specified by the customer, including assurance requirements for delivery and post-delivery activities where appropriate.

(b) determine the requirements not stated by the customer but necessary for the specified or intended use where known

(c) identify any applicable statutory and regulatory requirements related to the product

(d) ensure that the Company has the ability to meet the defined requirements

(e) identify any potential problems that would limit the company's ability to deliver conforming product

(f) identify any changes in contract or order requirements as compared with previous communications

(g) ensure that effective arrangements for communicating with the customer are established, and

(h) ensure that intellectual property is protected.

The quotation process is illustrated in Figure 6 below:

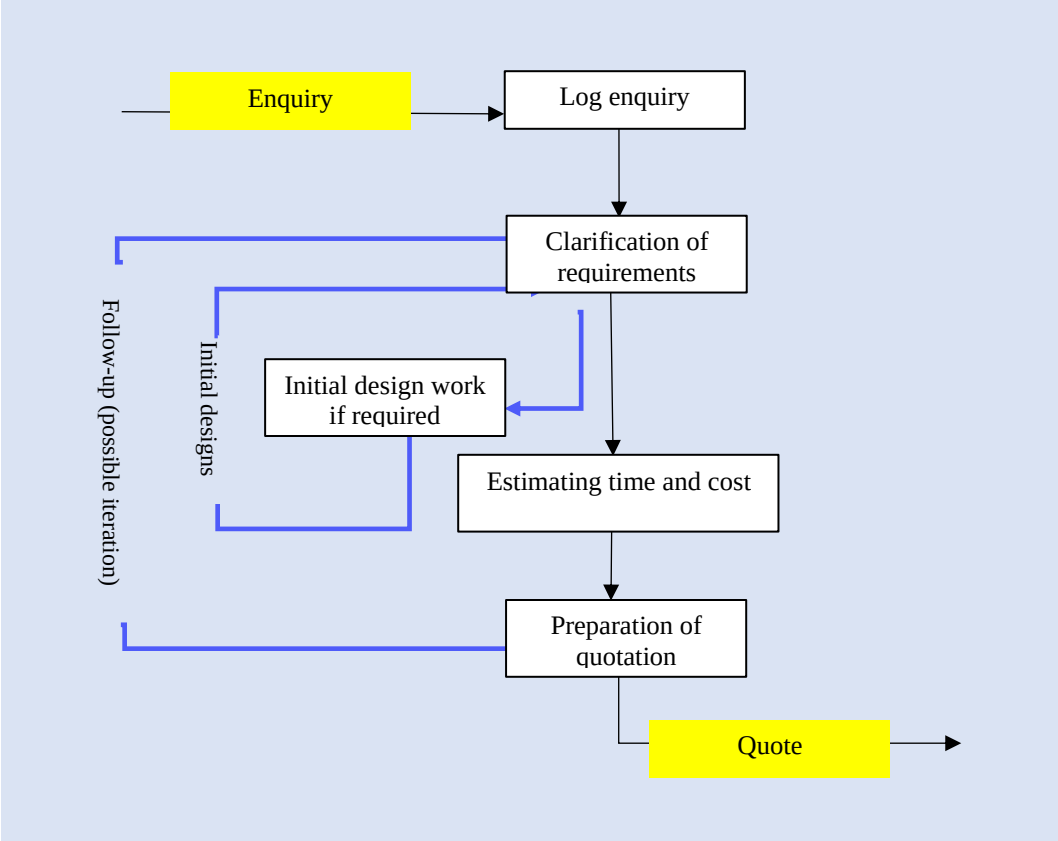


Figure 6: Thomas Keating's quotation process

6.1.3. Order entry process

The order entry process follows on from the quotation process and the associated procedures are also set out in Customer Enquiry, Order and Contract Completion Review Procedure TK-QP-001.

The purpose of the order entry process is to ensure that:

(a) any mismatches between quotation and customer order are promptly identified and clarified with the customer

(b) jobs are allocated a unique job number promptly after order receipt so that they can be accurately tracked through the production process, and

(c) the order particulars for each job are correctly captured in an associated job folder.

The Company has adopted a system whereby order particulars are subject to checks at different stages in order to ensure the accurate capture of customer requirements. Each sales person is responsible for checking orders they receive against quotations they have issued and for the accurate reflection of order particulars in the job folder by General Office staff. The Works Director subsequently double-checks these particulars by way of review of the customer's requirements before issuing the job folder to the shop floor for production, in particular to ensure any drawings provided by the customer as part of the specification have been correctly identified.

The order entry process is illustrated in Figure 7 below:

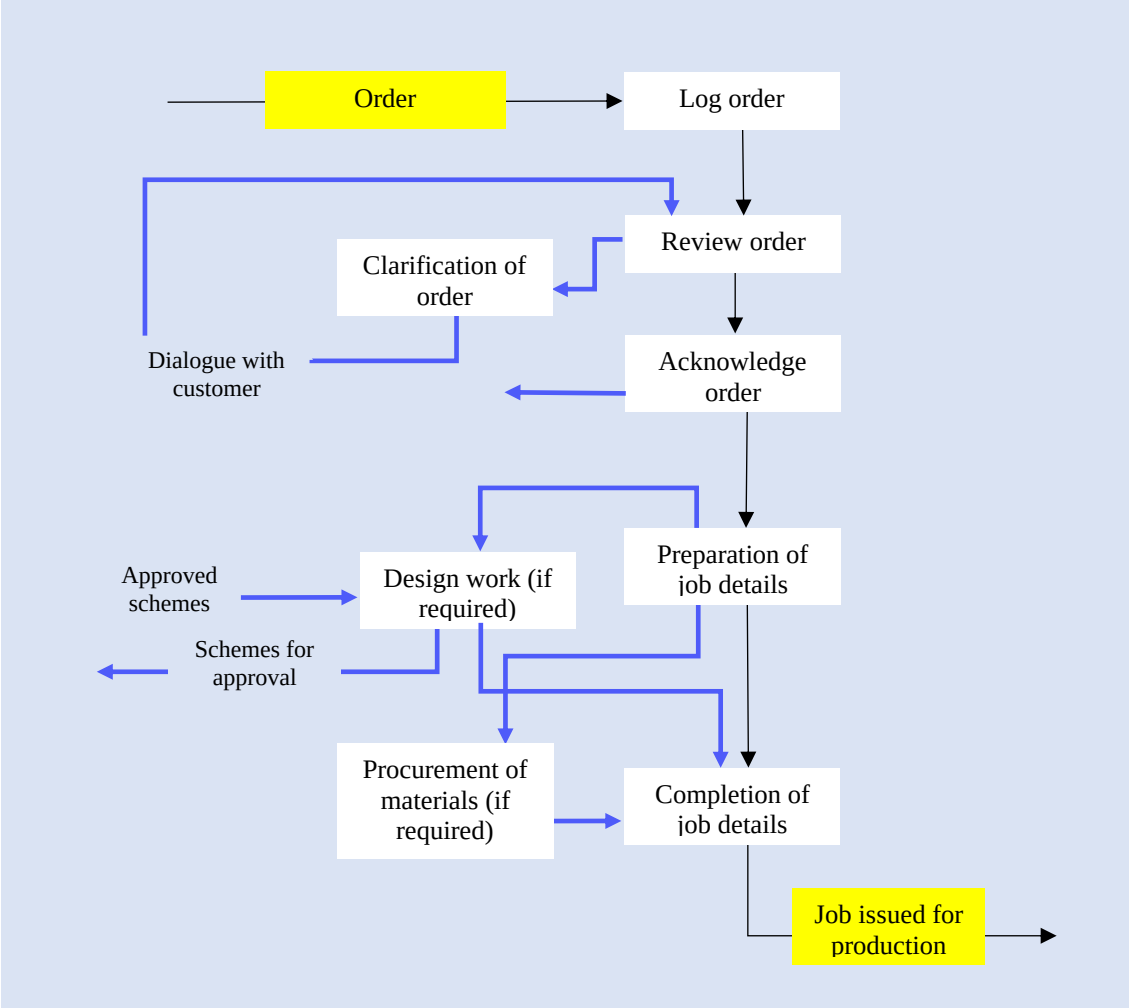


Figure 7: Thomas Keating's order entry process

6.1.4. Design process

The scientific instrumentation and mould tooling that the Company builds is bespoke to the customer. As a result, a key aspect of the Company's design process is that the customer should

verify and validate the scheme design before the Company proceeds to detailed drawings and subsequent manufacture. This may take several iterations.

The responsibilities and actions required for controlling the design, distribution and correction of drawings for the manufacture of scientific instrumentation and tooling products are clearly defined and documented in Design Control Procedure TK-QP-002 and, once manufacture has begun, Control of Production Procedure TK-QP-004. These responsibilities and actions ensure that:

(a) the Company is able to plan and control its design and development stages, including for pre-order inquiries, orders and internally generated projects

(b) design schemes are reviewed, verified and validated by the customer

(c) customer approvals are gained before the Company proceeds with detailed drawings

(d) the responsibilities and authorities for design are established, including where design services are commissioned externally, and

(e) any changes to the customer's design requirements at any stage are appropriately managed.

The design process is illustrated in diagrammatic form in Figure 8 below.

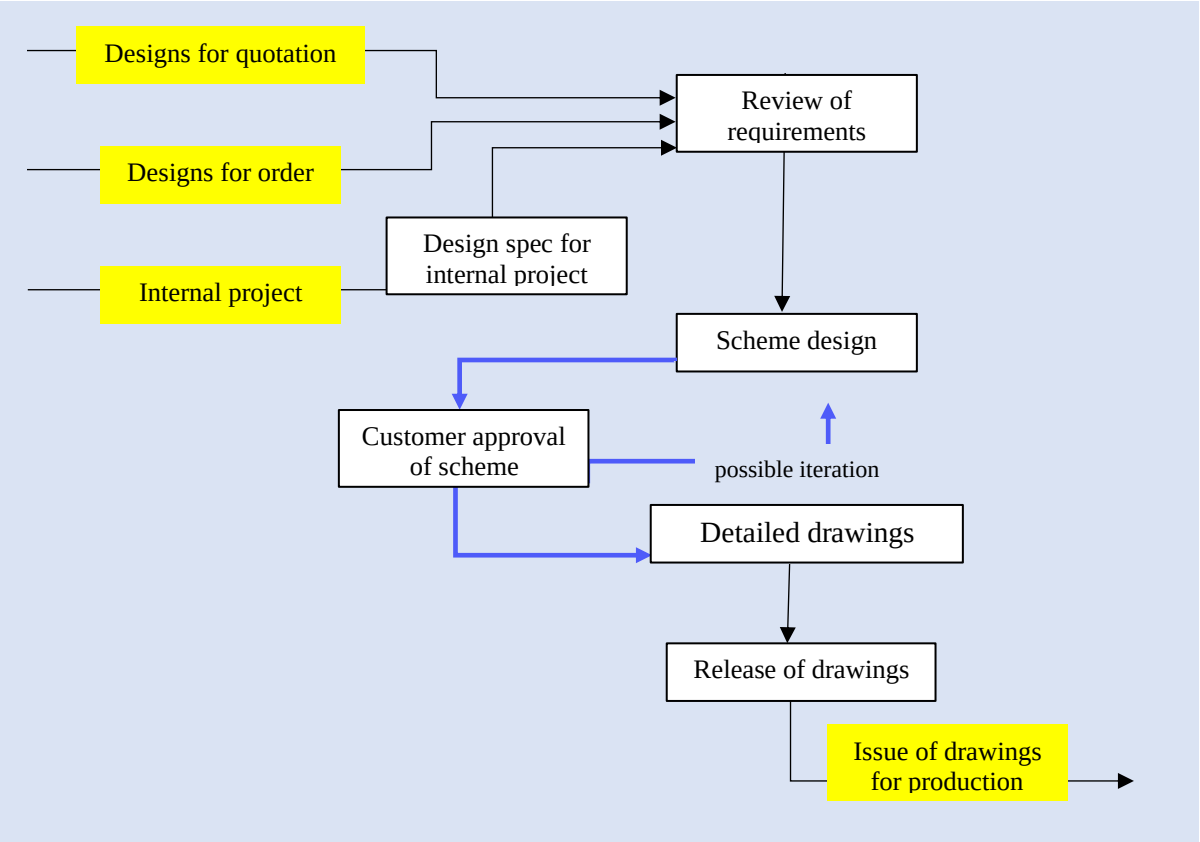


Figure 8: Thomas Keating's design process

6.1.5. Purchasing process

Thomas Keating uses external providers to source raw materials, consumables, maintenance services for its key plant and specialist scientific services, such as antenna design and microwave measurement.

The Company has established a controlled method for these purchases of materials and services and for the inspection of incoming items received from suppliers and customers. This includes assigning responsibility for actions connected with these activities, so as to ensure suppliers are clearly informed of the Company's requirements and suppliers and customers are notified of any nonconformity or other issue with goods or services received. The relevant procedures are defined in Control of Externally Provided Goods and Services and Goods Inward Procedure TK-QP-003 and supplemented in relation to externally commissioned design services by Design Control Procedure TK-QF-002.

The Company takes steps to ensure that its ability to meet customer requirements is not adversely affected by outsourcings. Amongst other things, external suppliers are required to provide documentary deliverables, such as inspection and testing reports, materials certificates and/or certificates of conformity where relevant. Incoming inspection also includes measurement by the Company where applicable in accordance with Monitoring, Measurement and Testing of Product Procedure TK-QP-005.

In addition to the requirements for individual procurements, the procedure sets out the basis for the evaluation, selection and continual monitoring of external providers. Suppliers are selected and subsequently reviewed based on their ability to supply product/services that fulfil the following requirements:

(a) conformity to specified purchase requirements

(b) on-time delivery

(c) price, and

(d) general factors affecting the ease to do business with them.

Relevant information concerning the external supplier's ability to satisfy these requirements is maintained and analysed by the Works Director and any nonconformities addressed with the supplier as required. The information, including the outcome of any nonconformities, is also reported to the Quality Review Committee.

The purchasing process is illustrated in diagrammatic form in Figure 9 below.

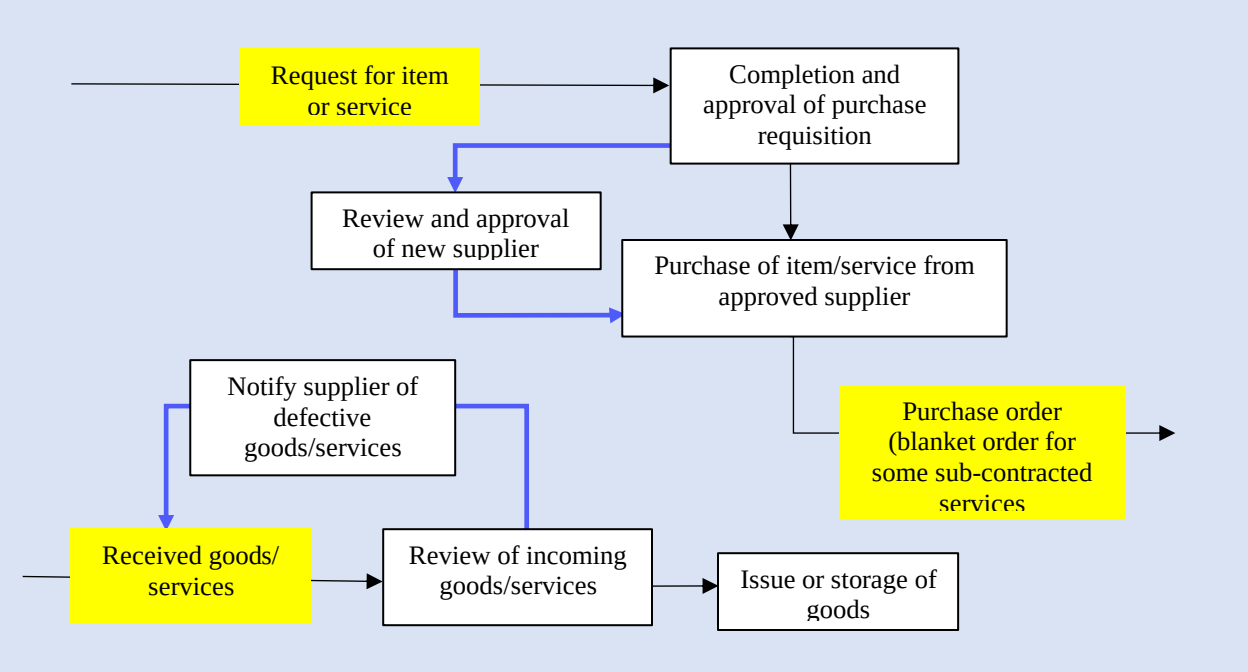


Figure 9: Thomas Keating's purchasing process

6.1.6. Production process

The Company's product realisation process has been developed in order to satisfy the Company's quality objectives and thereby increase customer satisfaction. The Works Director together with other members of senior management is responsible for reviewing product realisation plans in light of changing business conditions such that future requirements for new processes, additional or replacement equipment and staff can be estimated.

The purpose of the process is to ensure that:

(a) production is planned and scheduled in line with customer requirements

(b) raw materials and products are traceable, and supplies of goods and services supported by materials certificates and certificates of conformity, when appropriate

(c) drawings are appropriately controlled after issue to the shop floor

(d) production travellers are prepared and completed when appropriate

(e) product (including customer property) is appropriately preserved during the course of production, and

(f) product is checked during the course of production, tested as required and subject to final inspection and approval before release to the customer.

Production control is principally established through the procedures documented in Control of Production Procedure TK-QP-004, Monitoring and Measurement of Product Procedure TK-QP-005, Non-Conforming Goods and Services, Customer Complaints and Corrective Action Procedure TK-QP-006 and Handling, Storage, Packing and Dispatch Procedure TK-QP-007. These procedures are further supplemented by Control of Externally Provided Goods and Services and Goods Inward Procedure TK-QP-003 and Design Procedure TK-QP-002. Under these procedures, production is controlled at all levels in the organization, including in the event of any changes in the customer's requirements.

The Works Director is responsible for short and medium-term production planning based on information provided by sales personnel and availability of staff, including resolving changing and/or competing priorities. The Works Director is also responsible for issuing adequately documented drawings and manufacturing instructions (including production travellers referencing production procedures where required) to the shop floor and for overseeing procurement and storage of relevant raw materials (supported by materials certificates where traceability is required) and consumables in conjunction with the Toolmaking Manager and other Heads of Department.

Prior to the commencement of production, individual jobs are allocated by the Works Director to a "lead operator", who is then responsible for ensuring the job passes through the production process in an efficient manner. This includes maintaining control over the relevant job folder and drawings, requisitioning special techniques and services (such as heat treatment and surface treatments) when needed, ensuring that individual piece parts are traceable through drawing/batch numbering etc when required, advising when items are ready for electroforming or testing (as applicable), conducting a final inspection before jobs are authorised for release to the customer and thereafter packing the relevant item for delivery to the customer. In practice, the Scientific Instrumentation Director acts as the lead operator on all major scientific instrumentation jobs.

In order to meet customer requirements, production staff at all levels are required to check their work on an ongoing basis during the production process, to record key measurements as required, to handle and store product correctly and to use only authorised measuring equipment that has an in-date calibration label when carrying out mechanical measurements of products and piece parts. As a further control to prevent the release of non-conforming product, all product and any related deliverables are also subject to final approval by the Works Director, the Scientific Instrumentation Director or the Toolmaking Manager before release to the customer.

Documentary deliverables may include certificates confirming conformity with the quality management system. Certificates of conformity are signed by or on behalf of the Quality Assurance Manager.

The production process is illustrated in diagrammatic form in Figure 10 below.

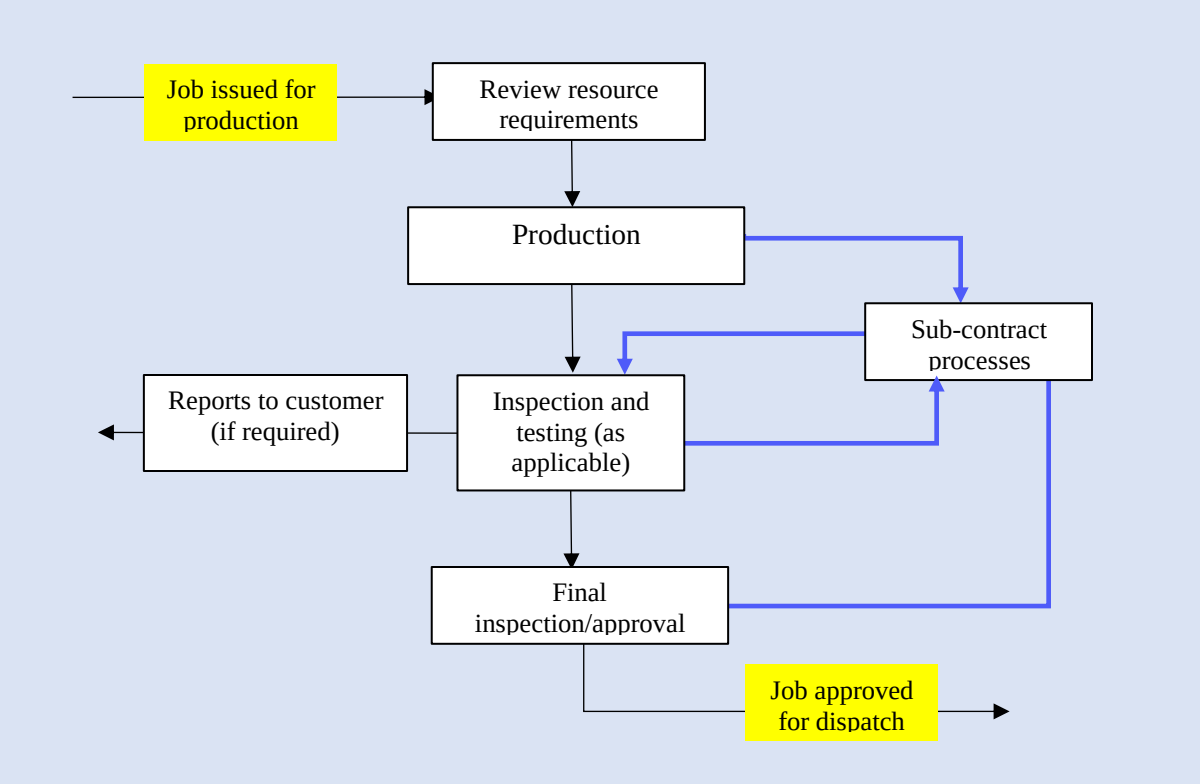


Figure 10: Thomas Keating's production process

6.1.7. Non-conforming product process

The Company aims to prevent the unauthorised use or dispatch of non-conforming product and materials at all stages of production.

The mechanisms for identification of non-conformities and consequential actions to be taken are set out in Control of Externally Provided Goods and Services and Goods Inward Procedure TK-QP-003, Control of Production Procedure TK-QP-004, Monitoring, Measurement and Testing of Product Procedure TK-QP-005, Non-Conforming Goods and Services, Customer Complaints and Corrective Action Procedure TK-QP-006 and Handling, Storage, Packing and Dispatch Procedure TK-QP-007.

The Company employs a system of inspection and measurement to provide adequate evidence of conformity to suit both manufacturing and customer needs. As described in section 6.1.6 above, responsibility for authorising the release of product is clearly identified so that release will not occur until all appropriate production stages have been satisfactorily completed, unless otherwise approved, including, where applicable, by the customer.

The Company's procedures establish methods whereby any non-conforming item, detail, assembly or component is recognised and suitably identified, appropriately recorded and the appropriate action taken to either scrap, return to the external provider, re-work or obtain a concession. Any non-conforming product that is corrected is subject to re-verification to demonstrate conformity to requirements. The procedures also deal with any damage that occurs during transit, whether to the customer or a sub-contractor.

A further objective where the non-conformity originates within the Company is to determine the cause of the non-conformity and to ensure that appropriate action is taken to prevent a similar re-occurrence.

6.1.8. Contract completion process

The contract completion process ensures that completed product is dispatched to customers in a way that preserves its condition after final inspection. It also ensures that all jobs are subject to review after delivery for the purposes of ensuring the job folder is complete before filing and capturing any lessons learned, including as a result of feedback from customers. The relevant procedures are set out in Handling, Storage, Packing and Dispatch Procedure TK-QP-007 and Customer Enquiry, Order and Contract Completion Review Procedure TK-QP-001.

Particular packing procedures are specified in relation to space-related products, including primary, secondary and tertiary packaging, appropriate labelling and the use of humidity absorbers and the use of shock detectors.

The contract completion process is illustrated in diagrammatic form in Figure 11 below.

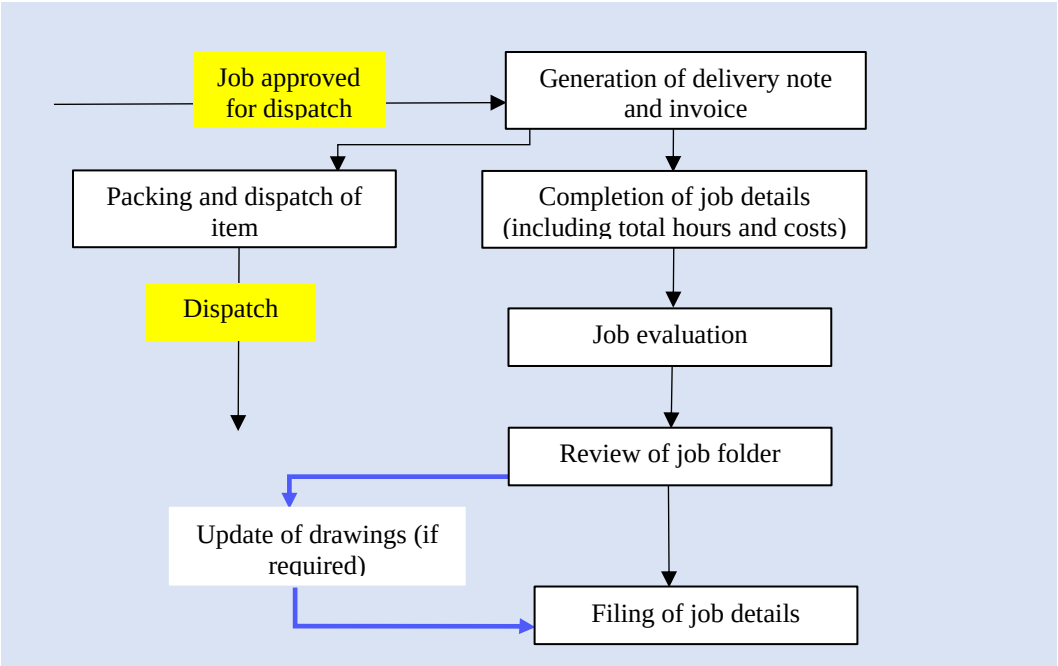


Figure 11: Thomas Keating's contract completion process

6.2. Support processes

6.2.1. Overview

In addition to processes that directly affect product realisation, the Company has established and maintains processes that support product realisation indirectly.

Key features of Thomas Keating's business are the ability of its staff to push the frontiers of technology through skills built on training and long experience and the tight tolerances to which they are required and able to work. As a result, the Company has established processes to ensure the maintenance and enhancement of its skills base on an ongoing basis, to ensure that plant and machinery, including critical infrastructure, is appropriately maintained and to ensure that only properly calibrated measuring equipment is used in monitoring and inspecting production.

In addition, the Company has established and maintains a process to ensure that documented information, including documented information evidencing conformity to requirements, is created and controlled in line with the requirements of ISO 9001:2015.

These processes are supported by the following documented procedures:

Number	**Title**
TK-QP-008	Control and Maintenance of Plant and Equipment Procedure
TK-QP-009	Staff Training and Competence Procedure
TK-QP-010	Control of Records and QMS Documents Procedure

6.2.2. Maintenance of plant, machinery and equipment process

The Works Director is responsible for overall control of the production environment and maintenance of the Company's plant, machinery and equipment supported by the Toolmaking Manager and the Head of Electroforming. Key items of the Company's infrastructure, such as compressors and chillers, are supported through service contracts and other plant is subject to ongoing regular maintenance in accordance with the requirements of Control and Maintenance of Plant and Equipment Procedure TK-QP-008.

Unless a customer requires the Company to use the customer's own measuring equipment, all measuring equipment used for inspection, both during the production process and on final inspection ahead of release of product to the customer, is required to be properly calibrated. This procedure applies equally to equipment owned by the Company and equipment which belongs to Company staff.

Calibration checks are done on all relevant measuring equipment against master slips that hold a calibration certificate and are traceable to National Standards. The Quality Assurance Manager is responsible for ensuring that the checks are done at frequencies specified in the procedure and that

all calibration records are kept up to date. Staff are responsible for ensuring they use only measuring equipment with a valid calibration sticker and that they take care to handle and store measuring equipment in a way that protects it from damage. The calibration records are audited periodically to ascertain adequacy of calibration.

6.2.3. Staff recruitment and training process

The Company's recruitment and training process has been developed to ensure that the Company recruits only staff with suitable skills, experience and/or aptitude as appropriate and that these staff are developed appropriately through a combination of on-the-job experience and internal and external training courses. The relevant procedures are set out in Staff Training and Competence Procedure TK-QP-009.

Particular attention is paid to the recruitment and training of apprentices through a combination of attendance at training college and ongoing supervision by a senior toolmaker and, if they are involved in electroforming work, the Electroforming Manager. In this way, apprentices build up their skills in a structured way.

The Works Director maintains a skills matrix and training log covering all members of staff. This is used to ensure that the Company maintains an appropriately diversified skills base that is able to meet customer requirements in line with evolving technologies and for succession-planning purposes. It is also used to record training needs and the completion of training courses.

The Scientific Instrumentation Director, the Works Director, the Toolmaking Manager and other Heads of Department are responsible for ensuring an open culture is created and maintained on the shop floor in which production staff assist each other, technical knowhow is shared and corporate memory preserved.

6.2.4. Documented information process

The Company's documented information process applies both to the documented information required by the ISO Standard and that required by the quality management system itself. The purpose of the process is to:

(a) ensure that documents required by the quality management system (including procedures and supporting forms) are approved before issue, readily available and their integrity maintained

(b) ensure that documented information of external origin is identified and controlled

(c) prevent the unintended use of obsolete information, and

(d) ensure that records are appropriately created, stored and disposed of at the end of their prescribed retention period.

The relevant procedures are set out in Control of Records and QMS Documents Procedure TK-QP-010.

The Quality Manual and documented procedures supporting the quality management system processes are subject to review by the Quality Review Committee. Documented procedures must be drafted by an appropriate person and have a set format to aid familiarity and ensure their coherence as a whole. The Quality Assurance Manager is responsible for maintaining an up-to-date catalogue of all supporting forms and production procedures and for making changes to them as required. All documented procedures supporting the quality management system, forms and production procedures are subject to version control and protection against unauthorised change.

Documents of external origin that are used for the purposes of the quality management system processes (such as customer orders, customer drawings, customer approval of schemes produced by the Design Office and customer-provided quality assurance documentation) is identified through the use of their unique job number.

Records are established and maintained that provide evidence of the conformity to requirements and of the effective operation of the quality management system. These records are in a variety of formats including paper and electronic. Hard copy records relating to individual jobs bear their unique job number and are stored in the relevant job folder. Other than personal data, which is stored in line with the requirements of the General Data Protection Regulation, the minimum retention period for records is 15 years for hard copy documents including drawings; electronic documents are stored for life.

6.3. Control/improvement processes

6.3.1. Overview

Detailed control of the operational processes that directly and indirectly result in the realisation of the product is accomplished via the control and improvement processes. These processes also govern control, monitoring and improvement of the quality management system itself to ensure it achieves its intended results.

These processes are supported by the following documented procedures:

Number	**Title**
TK-QP-011	Planning, Review and Improvement of the Quality Management System Procedure
TK-QP-012	Internal Audit Procedure

6.3.2. Management review process

In addition to senior management's day-to-day involvement in the quality management system which is required to operate the Company's business and may result in ongoing improvements to processes and procedures, the Quality Review Committee meets quarterly (and otherwise as required) to review the continued suitability, adequacy and effectiveness of the Company's quality management system, including progress against the Company's quality objectives, opportunities

for improvement and the need for any other changes to the system having regard to the Company's purpose and strategic direction. The Quality Review Committee also reviews the scope of the quality management system, the Company's quality policy and its business and quality objectives on an annual basis. This process is supported by Planning, Review and Improvement of the Quality Management System Procedure TK-QP-011.

In conducting its reviews, the Quality Review Committee considers the impact of any changes to the Company's external and internal environments and their effect on interested parties, changing risks and opportunities (see further section 6.3.3 below) and future resource requirements. The Committee also takes account of performance data and a range of other inputs, including:

(a) results of internal and external audits

(b) customer feedback in the form of survey results, complaints and general comments

(c) reports on suppliers

(d) process performance and product conformity information

(e) information on the status of corrective actions

(f) information on the implementation of any changes to the quality management system

(g) suggestions for improvement received from staff, and

(h) progress on actions arising from previous reviews.

Results from the reviews may include actions related to improving the effectiveness of the system and its processes, product and service improvement and development to address current and future customer requirements and current and future resource requirements.

Meetings of the Quality Review Committee are minuted and all actions arising recorded as part of driving continual improvement.

The management review process is illustrated in diagrammatic form in Figure 12 below.

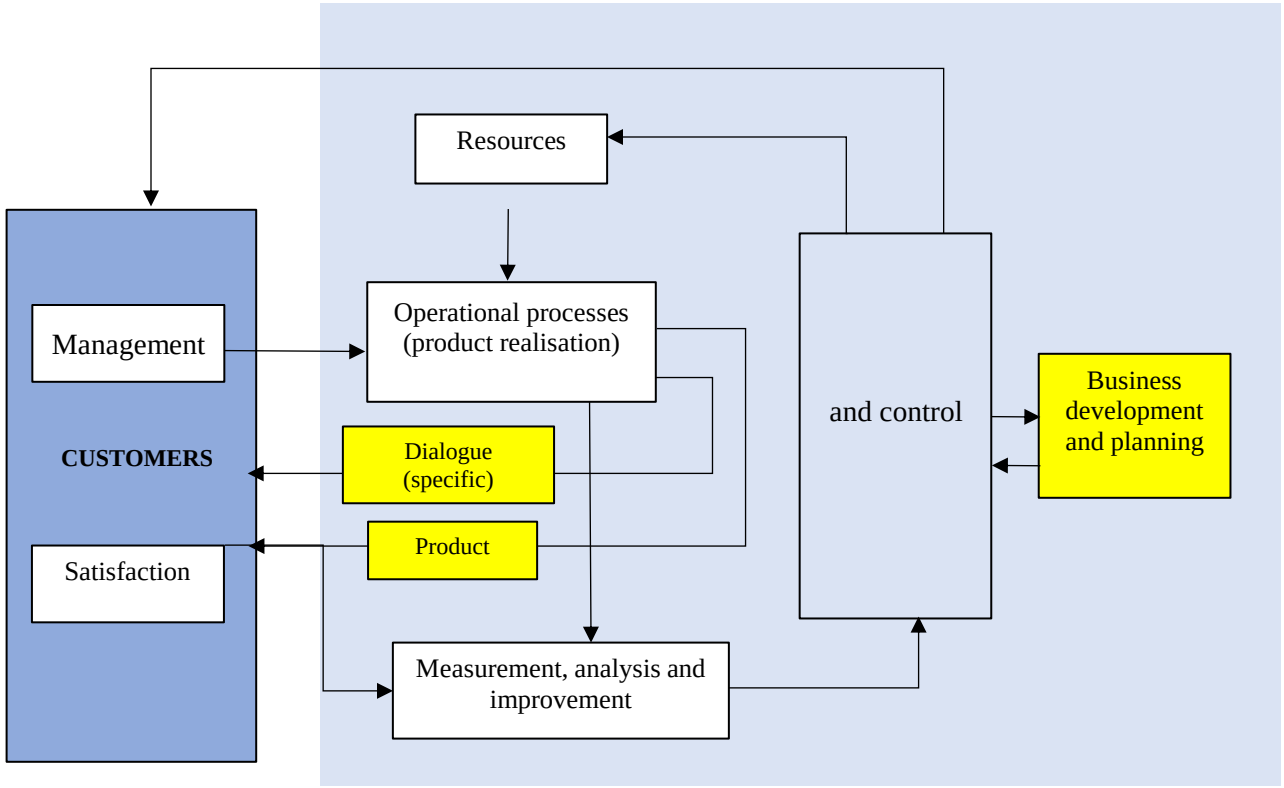


Figure 12: Thomas Keating's management review process

6.3.3. Risk/opportunity assessment process

The senior management consider risks and opportunities (strategic and operational) on an ongoing basis as well as more formally at meetings of the Quality Review Committee. The Company has a risk register and uses a RAG rating system for the purposes of identifying and evaluating risks and the effectiveness of mitigants where available, with a view to reducing the causes of potential non-conformity to a practicable level. Changes to procedures or other additional mitigants may be introduced as a result of non-conformities identified during production.

The Quality Assurance Manager is responsible for maintenance of the Company's risk register.

Risk assessment also forms part of the review of individual customer requirements at the time of quotation. This is the responsibility of individual members of senior management at the quotation stage as discussed in section 6.1.2 above.

6.3.4. Change management process

The change management process ensures that adequate planning of the quality management system is carried out during periods of change whether arising from external factors or from

changes to the quality management system itself. This process is also supported by Planning, Review and Improvement of the Quality Management System Procedure TK-QP-011.

In addressing change, the Quality Assurance Manager is responsible for consulting and planning appropriately, introducing changes only after adequate training has been given to members of senior management and piloting significant changes before their introduction if there is a reasonable likelihood that improvements will result from this. The Quality Assurance Manager is also responsible for planning the communication of changes and the generation of supporting training and other materials as required.

6.3.5. Internal audit process

The Company has an established internal audit process for the following purposes.

(a) to verify whether quality activities and related results comply with planned arrangements, the ISO Standard and the requirements of the quality management system

(b) to determine the overall effectiveness of the quality management system as implemented and maintained, and

(c) to identify opportunities for improvement.

The process is defined in Internal Audit Procedure TK-QP-012 as supplemented by Planning, Review and Improvement of the Quality Management System Procedure TK-QP-011.

Internal audits are arranged and conducted at planned intervals and may also be conducted on an ad hoc basis if the need arises. The Quality Assurance Manager produces an annual audit schedule in conjunction with the Internal Auditor which identifies when processes or elements of the quality management system will be audited. The Company's product realisation processes are audited at least twice a year through sampling a number of completed jobs, including jobs of different types selected by the Internal Auditor at their discretion. Other elements of the quality management system are audited on a risk-based approach, having regard to previous audit findings and the extent and nature of changes to the quality management system. The audit schedule will also take account of the need to follow up on corrective actions (see further below) to ensure that they have had the desired effect.

The Internal Auditor and Works Director are responsible for organising internal audits to ensure that the audit criteria, scope, methods and objectives of each audit are defined. Prior to the audit date the Internal Auditor or Deputy Internal Auditor will review relevant documentation relating to the activities to be audited (including relevant quality management system documentation and past audit findings) and make contact with Heads of Department in the area(s) being audited.

Any non-conformity identified during an audit is first discussed with relevant personnel before being recorded in writing. A brief report setting out all audit findings is then provided to the Quality Assurance Manager and subsequently presented to the senior management team.

The Quality Assurance Manager is responsible for identifying the root cause of all nonconformities identified in the audit report and for determining what corrective action is required to prevent their reoccurrence. These corrective actions must be approved by the Internal Auditor.

7. Cross-referencing table

The following table cross references sections 1 to 6 above against the requirements of BS EN ISO 9001:2015.

BS EN ISO 9001:2015 section reference and title		Quality Manual section reference
1.	**Scope**	
2.	**Normative references**	
3.	**Terms and definitions**	
4.	**Context of the organisation (title only)**	
4.1.	Understanding the organisation and its context	1/6.3.2
4.2.	Understanding the needs and expectations of interested parties	6.3.2
4.3.	Determining the scope of the quality management system	2.2/6.3.2
4.4.	Quality management system and its processes	2.3/2.4/2.5/6
5.	**Leadership (title only)**	
5.1.	Leadership and commitment (title only)	
5.1.1.	General	3.1/3.2/3.3
5.1.2.	Customer focus	3.3/3.4/3.6
5.2.	Policy (title only)	
5.2.1.	Establishing the quality policy	4.1/6.3.2
5.2.2.	Communicating the quality policy	4.1/3.3/6.3.2
5.3.	Organisational roles, responsibilities and authorities	3
6.	**Planning (title only)**	
6.1.	Actions to address risks and opportunities	3.6/6.3.2
6.2.	Quality objectives and planning to achieve them	4.2/5.2/6.3.2/6.3.5
6.3.	Planning of changes	6.3.4
7.	**Support (title only)**	
7.1.	Resources (title only)	
7.1.1.	General	5/6.1.5
7.1.2.	People	5.1
7.1.3.	Infrastructure	5.2
7.1.4.	Environment for the operation of processes	3.3/6.2.3
7.1.5.	Monitoring and measuring resources (title only)	
7.1.5.1.	General	6.2.2
7.1.5.2.	Measurement traceability	6.2.2
7.1.6.	Organisational knowledge	6.2.3
7.2.	Competence	6.2.3
7.3.	Awareness	4.1/4.2/3.3
7.4.	Communication	3.3

7.5.	Documented information (title only)	
7.5.1.	General	6.2.4
7.5.2.	Creating and updating	
7.5.3.	Control of documented information	
8.	**Operation (title only)**	
8.1.	Operational planning and control	2.3/2.4/6
8.2.	Requirements for products and services (title only)	
8.2.1.	Customer communication	3.3/6.1.2 – 6.1.7
8.2.2.	Determining the requirements for products and services	6.1.2
8.2.3.	Review of the requirements for products and services	6.1.3/6.1.4
8.2.4.	Changes to requirements for products and services	6.1.4/6.1.6
8.3.	Design and development of products and services (title only)	
8.3.1.	General	6.1.4/6.1.6
8.3.2.	Design and development planning	
8.3.3.	Design and development inputs	
8.3.4.	Design and development controls	
8.3.5.	Design and development outputs	
8.3.6.	Design and development changes	
8.4.	Control of externally provided processes, products and services (title only)	
8.4.1.	General	6.1.5
8.4.2.	Type and extent of control	6.1.5
8.4.3.	Information for external providers	6.1.4/6.1.5
8.5.	Production and service provision (title only)	
8.5.1.	Control of production and service provision	6.1.6/6.1.8
8.5.2.	Identification and traceability	
8.5.3.	Property belonging to customers or external providers	
8.5.4.	Preservation	
8.5.5.	Post-delivery activities	6.1.8
8.5.6.	Control of changes	6.1.4/6.1.6
8.6.	Release of products and services	6.1.6
8.7.	Control of nonconforming outputs	6.1.7
9.	**Performance evaluation (title only)**	
9.1.	Monitoring, measurement, analysis and evaluation (title only)	
9.1.1.	General	2.5/6.3.2
9.1.2.	Customer satisfaction	6.3.2
9.1.3.	Analysis and evaluation	6.3.2
9.2.	Internal audit	3.5/6.3.5
9.3.	Management review (title only)	
9.3.1.	General	3.4/6.3.2/6.3.3
9.3.2.	Management review inputs	