

Automation

Main Automation Contractor (MAC) solutions

Helping the process industries to reduce
risks and project delays

Power and productivity
for a better world™



Main Automation Contractor (MAC)

A Main Automation Contractor (MAC) provides project management, the supply of expertise, products, systems and services. It also provides interface management of the engineering suppliers to ensure common supply and takes responsibility for the data transfer between parties. Initial concept design and Front-End Engineering & Design (FEED) studies can be undertaken to rationalize process requirements leading to practical, optimal solutions.

MAC scope of supply

ABB has considerable experience in the MAC role for global projects and can take total responsibility for the management of the automation/instrumentation, selection, manufacture, installation, commissioning and after-sales support. A project sponsor will form a direct point of contact with ABB's Executive Management. He will work within a steering committee consisting of senior members of the clients project team. By assigning ABB as the MAC early in a project, ABB will gather engineering requirements, optimize the scope definition and therefore reduce both CAPEX and OPEX costs. This also reduces the project schedule, engineering required and change requests.

Where there are multiple contractors (EPCs) supplying the different process units, ABB will perform the interface management function to ensure a consistent, compatible solution. This eliminates the need for the client or Project Management Contractor (PMC) to co-ordinate and pass information between many different parties.

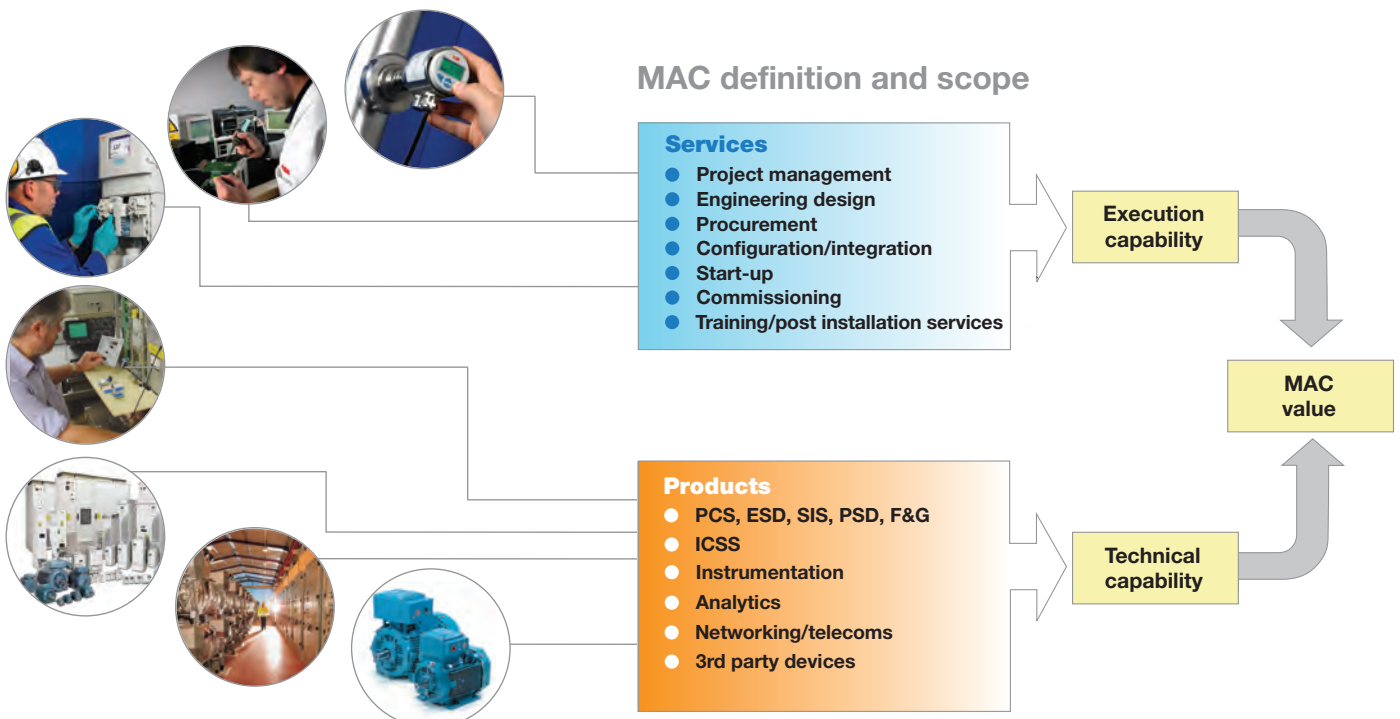


Wider scope than conventional vendors

Focus is on working proactively with clients and PMCs to deliver the complete solution.

Front-End Engineering & Design (FEED)

The MAC works closely with the client and its EPCs to develop the overall project concept and system specifications/requirements.



Co-ordination and interface between major EPCs

This ensures that the concepts and requirements developed during the FEED phase are implemented effectively and the design standardization is achieved across the facilities.

Product solution using MAC and third party suppliers

The MAC takes integration responsibility for these products with the process and packaged plant equipment provided by the EPC(s). The MAC assists or undertakes the installation of the completed system(s) under the direction of the EPC(s).

Final commissioning and start-up assistance

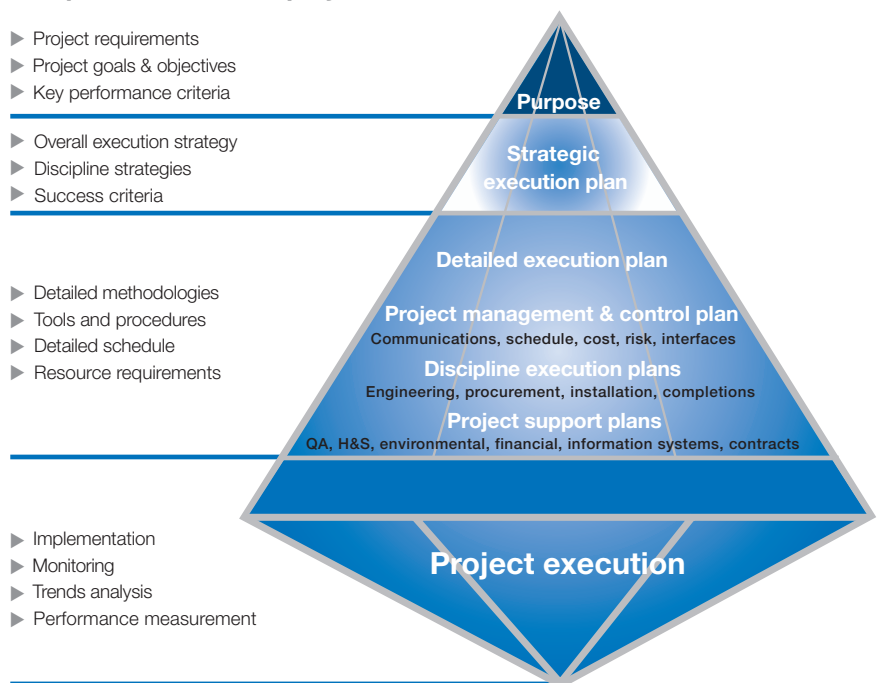
Final commissioning and start-up assistance is achieved by working under the direction of the EPC(s) at the construction site(s). Thus the integrated automation system is co-ordinated across the multiple process units.

Reduced risks

Risks are reduced by aligning the different engineering teams involved and the products supplied to minimize surprises at all stages of the project. As all of the equipment is known to work together, risk is reduced during the project implementation and on site. ABB's device integration testing reduces reliance on individual suppliers' statements on compliance to standards.



Composite solutions - project execution



Requirements for a flawless project execution

- Interface Management – the process identifies critical interfaces early in the project. This leads to an early identification of issues which have the potential to impact project costs or the schedule. Their impact can be minimized at this early stage.
- Constant monitoring highlights areas of criticality so that they can be quickly addressed and brought under control.
- Interface Management - based on the premise that timely identification, development and exchange of project data between parties is crucial to achieve flawless project execution.

Benefits of using ABB as the MAC

ABB is committed to significantly reducing the CAPEX and OPEX of projects without compromising quality and safety. The advantages and benefits of using ABB in this way include:

Feature	Advantage	Benefit
Knowledge	ABB has over 30 years expertise and experience in the development phase of projects. Early involvement of ABB in a project increases the feasibility of using existing solutions based on past project experience	By working on MAC contracts and using the same tools, this migration of knowledge significantly reduces engineering time and cost for purchaser, vendor and end user
Integrated team	ABB operates as an integral part of the client's design team. Working as one team in partnership with the client enables faster communication, rapid resolution of queries and a closer working relationship	<ul style="list-style-type: none"> - Reduced interface role for the client and PMC - Clear contractor accountabilities - Saving cost and schedule - Complete management organization structure
Single vendor	Having one vendor package instead of multiple packages reduces expenditure on pre-tender engineering, vendor selection and procurement	<ul style="list-style-type: none"> - Reduced expediting and inspection costs - only one contract needs to be managed - Fewer progress review meetings - Lower operational staff training costs covering the system instead of individual products - Reduced design options gives simpler, faster designs
Integration	One company has complete responsibility and ownership for integrating all products and systems from field instrumentation, DCS, intelligent motor control systems, safety systems and telecommunications	<ul style="list-style-type: none"> - Fewer interfaces between organizations – simplified supply chain - Improved productivity - Optimum efficiency - Maximized safety - Minimum environmental impact - Protection of the asset
Risk reduction	<p>One company takes responsibility for all risk - supplying a functional system and not just products</p> <p>Avoids the risks associated with multiple contracts which often leave gaps between different vendors through which the purchaser is exposed</p> <p>ABB can utilize SmartPlant® instrument engineering tool to allow data transfer from Smart P&I diagrams right through the instrument engineering, field design and on to the control system. These systems permit electronic sharing of information</p>	<ul style="list-style-type: none"> - Interfacing between suppliers and communication protocols is eliminated - saves time and costs. - Reduces potential delays during Factory Acceptance Test and on site pre-commissioning - Constant risk assessment and management is assured
Flexibility	Access to an extensive range of certified and compatible products and services including third party equipment	ABB takes responsibility for both its own and third party products
Information sharing	Electronic sharing of information	Saves time and cost. Reduces risk of different disciplines using different versions of engineering data
Standardization	<p>All aspects of the project are standardized including:</p> <ul style="list-style-type: none"> - Products - Work processes - Documentation - Spare parts - Service and support 	<ul style="list-style-type: none"> - Consistent technology - Improved work effectiveness and productivity, reduces life cycle costs

Feature	Advantage	Benefit
Design	<p>Definitive basis of design using FDS from FEED through implementation</p> <ul style="list-style-type: none"> – Early input by operations and maintenance – Consistent methodology – Reduced design cycle – Reduction in FAT 	<ul style="list-style-type: none"> – Reduced engineering – Secured schedule
Technology	<p>Low maintenance from 'plug & play' design</p> <ul style="list-style-type: none"> – Scalable future proof architecture – SMART technology – Predictive and advanced control – Minimize technology platforms 	<ul style="list-style-type: none"> – Reduced engineering – Reduced time to market
Single vendor	<p>ABB engages directly with own factories and quickly with its established third party suppliers. Optimized, standard engineering solutions</p>	<p>Significant reduction in time leading to secured delivery times</p>
Health and safety	<p>ABB puts a strong emphasis on safe working practices. Integrated site team, managed through a single vendor, provides simpler control of unified safety processes. This results in consistent safe working practices and the production of safety plans to OHSAS 18001</p>	<ul style="list-style-type: none"> – High level of safety training provides a safe working environment, eliminating lost time and associated costs – Keeps people safe
Technical support	<p>A high level of service and support is only available from a MAC/MEC with a total commitment and knowledge of the complete system and product portfolio. ABB offers support from their product specialists and engineering consultancy groups for specialist advice for:</p> <ul style="list-style-type: none"> – HSE issues – Functional safety – Product applications – Process optimization 	<p>Best in class solution at optimal cost. A single company is responsible for the instrumentation, automation, analyzers, telecommunications and electrical scope. This removes the issues of "not my responsibility"</p>
Maintenance/ asset optimization	<ul style="list-style-type: none"> – ABB uses various tools and asset management systems to provide life cycle support for their installations – The remote diagnostics and inherent asset management capabilities of ABB's Industrial IT concept provides predictive maintenance which can be extended to incorporate the "Industrial IT enabled" CMMS 	<p>Reduced operational and maintenance costs.</p> <p>Reduced maintenance costs by ABB taking responsibility for the total maintenance of the automation, telecoms and electrical assets</p>
Quality	<p>ABB operates a quality assurance system that is in accordance with the requirements of the International Standard ISO 9001/BS5750 Part 1, and is the holder of current certifications from BSI Quality Assurance</p>	<ul style="list-style-type: none"> – Quality goals are set to the expectations and perceptions of the customers – Ensures consistency of supply – Controlled and continuously improved processes – Rigorously enforces quality standards in all aspects of the contract

Using ABB as a MAC

The key to the successful execution of a process plant's automation/electrical scope of work is to use an established and motivated team of well qualified, technical and project support personnel backed up by proven systems, processes and tools.

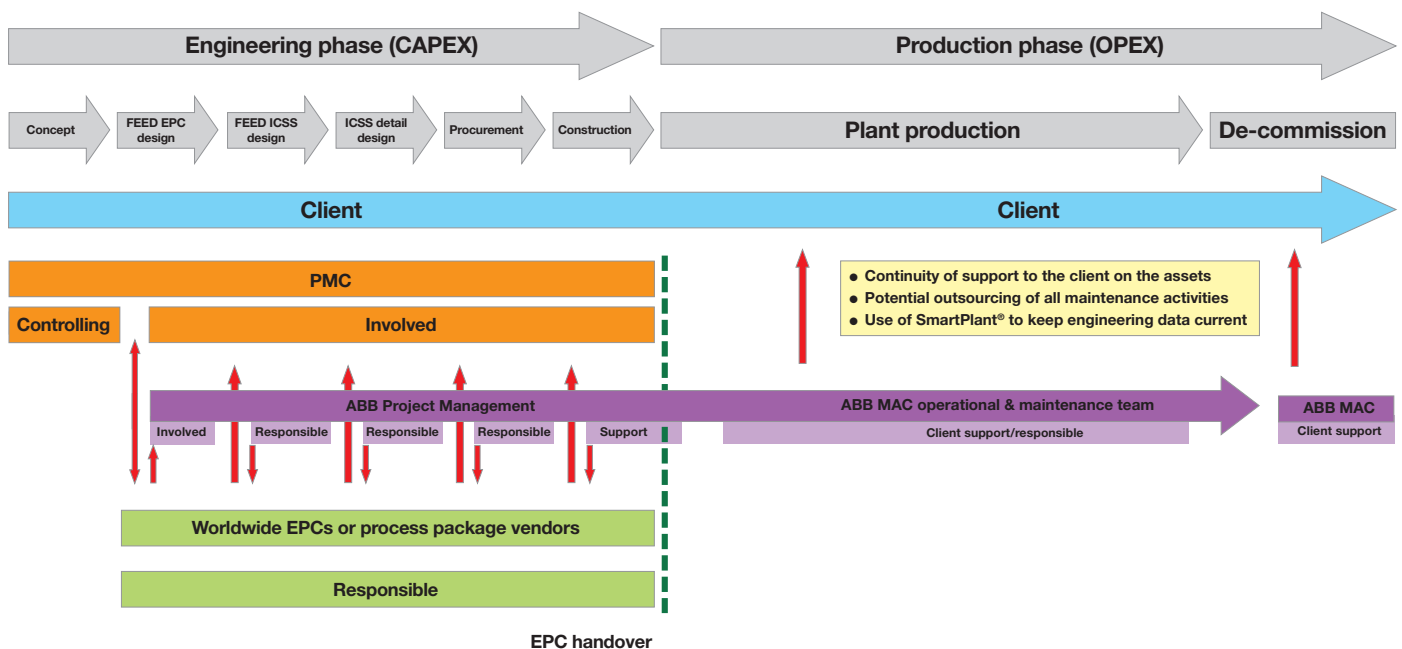
ABB is well equipped to address and respond to these key requirements through its global resources and systems capabilities. These are enhanced by local in-country resources and strategic agreements with local providers.

ABB's project execution methodology is based on modern project management techniques supported by well trained and qualified personnel, coupled with proven systems, processes and tools. The focus of ABB's approach is to ensure that the project scope is well defined at the outset. The work is planned well in advance of the execution stage, while any change requests are processed in a formal, controlled manner.

Execution responsibilities are identified, agreed between all participants and detailed project specific plans (covering all aspects of the work) are established, implemented and followed.



ABB recognizes that the client may engage a Project Management Contractor (PMC) who liaises with, and monitors the performance of, a number of different EPCs and package plant vendors during the project execution. ABB has successfully completed many projects that have had multiple EPCs and PMCs looking after the automation, instrumentation and telecoms scopes on its behalf.



Typically, these projects involve multiple EPCs and process package vendors. Therefore, in addition to the normal project issues, they require the co-ordination of the EPCs to achieve a common, compatible design for the overall system that meets the requirements of the process plant application.

In order to manage and control these multiple requirements, common functional design specifications (cFDS) for each system (distributed control system (DCS), safety instrumented system (SIS), power management system (PMS), telecoms system etc) will be developed and agreed as appropriate with the client's management team at an early stage in the project.

This cFDS defines the design requirements of the systems and details aspects of the designs that must be common for each project section. ABB will then take these cFDS and develop compliant specific system design specification for each EPC. This ensures that commonality exists across the design and that the final project integrates seamlessly. As part of the cFDS preparation, ABB will identify the use of its system libraries and standard designs/solutions for the particular industry or application, so reducing risk and cost.



What is the scope of supply?

Main Automation Contractor (MAC)

A MAC provides project management and the supply of a composite scope of expertise, products, systems and services. It also provides interface management of the engineering suppliers to ensure commonality of supply and takes responsibility for the data transmission between parties. Initial concept design and FEED studies can be undertaken to rationalize process requirements with practical, optimal solutions.

Main Instrument Vendor (MIV)

A MIV supplies the instrumentation, analyzers and associated scope along with the engineering design. The MIV takes responsibility for the instrumentation, meeting the measurement and control needs of the process as well as being compatible with, and interfacing to, the control and safety systems.

Products

- Field instruments
- Analyzers and analyzer houses
- Valves
- Fire & Gas detectors
- 3rd party instrumentation

Main Automation Vendor (MAV)

A MAV supplies the automation system (ICSS) and associated scope along with the engineering design and responsibility for ensuring compatibility and interfacing of the automation system with interconnected devices and intelligent systems.

Products

- Integrated Control & Safety System (ICSS)
 - Distributed Control System (DCS)
 - Safety Instrumented System (SIS)
 - Emergency Shut Down (ESD)
 - Fire & Gas system (F&G)
- Integration to collaborative production Management system (CPM/MES)
- Power management system (PMS)
- Field transmitters

Front End
Engineering &
Design (FEED)



Total
Management
Support



The MAC (Main Automation Contractor) scope is shown diagrammatically above. ABB has considerable experience for large MAC projects and is capable of fulfilling this role independently for clients and EPCs.

Management

- Lifecycle management
- Project management
 - Commercial management of the project
- Interface management
 - Data flow management between client and package sub-suppliers

Telecommunications

The supply and engineering of an integrated telecoms scope and the integration to the operational centers for integrated visibility within the automation system.

Products

- Networks for management and automation systems
- Internal communication systems
 - PA systems etc.
- External communication systems
 - radio/satellite, WAN
- Security - networks /IT infrastructure, CCTV
- Access control



Supporting the entire instrumentation, automation and electrical installation throughout each phase of its use

Providing the best engineering resource to oversee all phases of the main automation design, installation and commissioning

Dataflow management between client and package sub-suppliers

The life cycle stages of a MAC project

The MAC approach to project fulfilment requires a shift in thinking from the traditional view that automation systems are mere extensions of the processes required to make the facility function effectively.

Instead the focus should be on the automation and safety systems being a key component of the overall plant. It demands that all participants work together using their unique knowledge and expertise to provide the technical concept definition, project standards, cFDS criteria and generic equipment specifications, thereby ensuring a single integrated solution for the entire facility from the outset of the project.

The overall project will be executed in distinct stages:

FEED

During the FEED stage, common standards are set for the automation/instrumentation systems, including the key engineering criteria that are required throughout the whole project life cycle. This is also when the cFDS are produced. This stage would normally be conducted with the client or PMC, who would require each of the EPCs to comply with the common standards across the entire plant.

Implementation

Following FEED, the detailed plant design is carried out by area to achieve a Functional Design Specification (FDS) for each process. This activity is generally undertaken in close co-operation with the EPC and the ABB team located in the EPC office.

ABB completes both hardware and software design engineering of each of these systems at the most appropriate ABB facility. If required, ABB will integrate and test the systems at their partner's facility in-country. This has worked well on previous projects, especially for the integrated testing with, for example, telecoms equipment prior to shipment and installation.

The project team is multi-national and consists of engineers from ABB's partner facility in-country, the Main Execution Center and other appropriate ABB facilities. The project director is drawn from the Main Execution Center team and, where necessary, this person develops the integrated international team of project managers and engineers to deliver the project.

A senior manager is appointed in-country to lead the local teams and liases on a day-to-day basis with the project director. As the nature of the work changes, from design to build and installation, the role and responsibilities of the in-country manager increases.

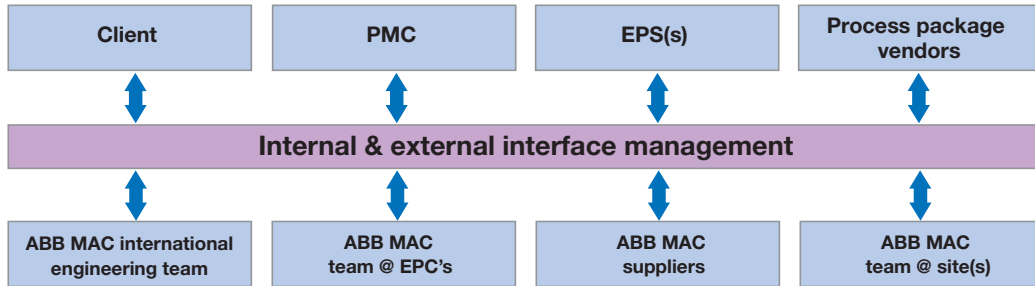
Site installation, pre-commissioning and commissioning support

For on-site activities, ABB typically utilizes personnel from the local organization who have been involved during the implementation stage. This ensures a smooth transition, along with process system and installation supervision expertise.

Post start-up services

After-care covers the complete life cycle of the commissioned automation, instrumentation, telecoms system. According to user requirements and capabilities, services can extend from ad-hoc support or consultancy through to Full Service™. Here ABB takes full responsibility for the plant and maintenance personnel of the asset.

Interfacing with clients & EPCs



To enable smooth interfaces across the entire project, the ABB management team will include:

Project director or manager: Where multiple EPCs are involved on large projects, ABB will normally appoint a project director to co-ordinate the total project management scope. A project manager will be appointed for each EPC or group of EPCs.

The project director/manager is responsible for the timely delivery of the project to the agreed schedule and ensures that the client/PMC are fully informed of any material issues that may arise. This manager will appoint a specific member of the project team to implement and manage the interface process. The project manager will support and assist the interface manager in ensuring that the interface process is implemented effectively.

Interface manager: Normally reports to the project director and has the responsibility to fully implement a well defined and documented interface management process. He will develop and issue a project interface plan for the client which will include ABB/EPC/client co-ordination procedures and document all key interface contacts. His primary role will be to ensure that all of the required data transfer between all parties is carefully managed and controlled.

Engineered data

ABB, in collaboration with Integraph, has developed a bidirectional interface to the SmartPlant™ package to transfer engineering information direct from the EPC into the control system database. This tool also allows changes made in the system database to be transferred electronically back to the EPC's database. Similarly, by the use of secure web access, other project information such as the schedule can be shared between parties.



ABB – An international business

ABB (www.abb.com) is a leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries and employs about 117,000 people.

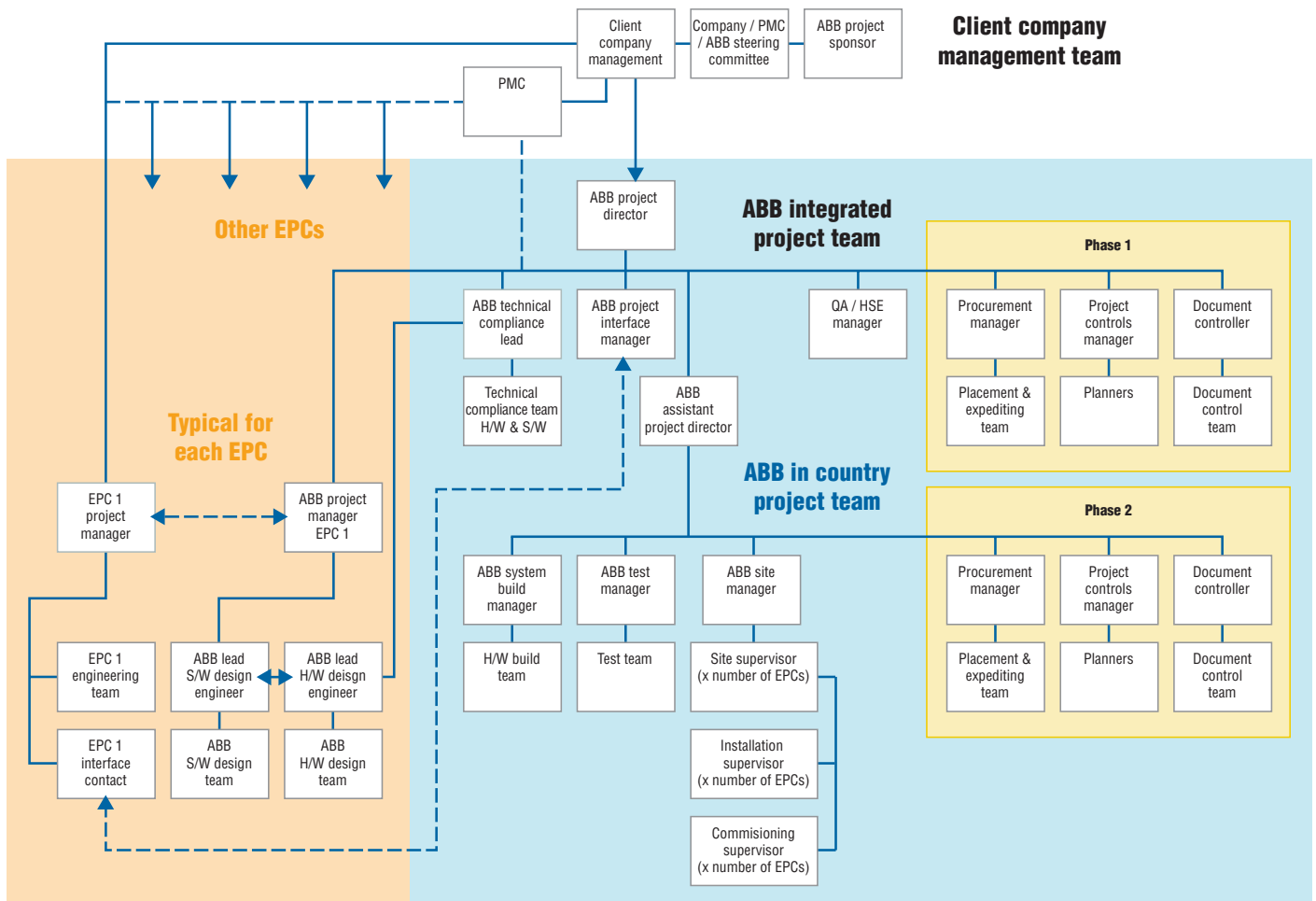
ABB recognizes the requirements for in-country project content, both for financial reasons and to ensure operational support of the process plant. ABB therefore looks to maximize the in-country work content, whilst utilizing the proven project management expertise in its Main Execution Center.

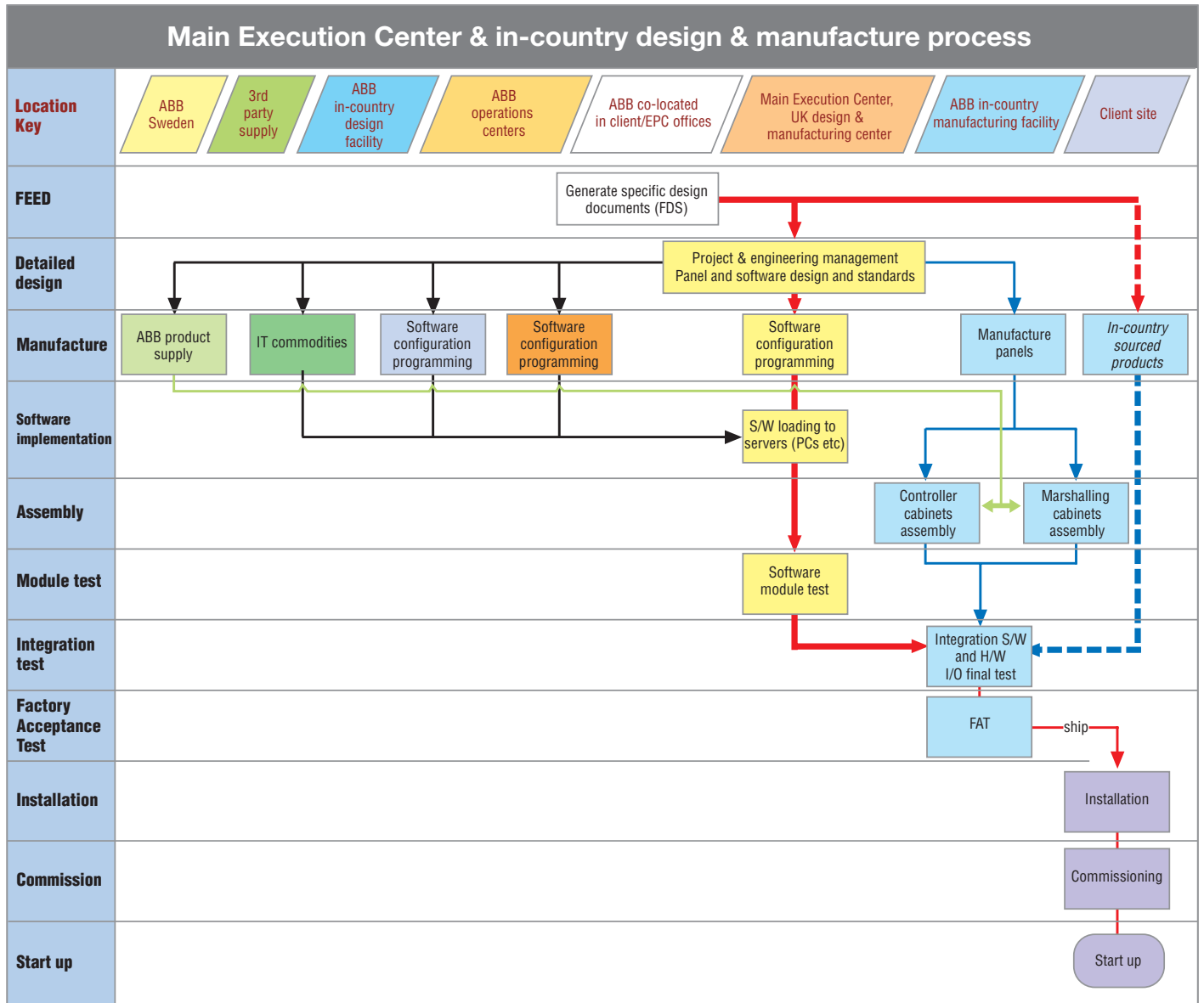
Additional support will be drawn from ABB's global presence, corporate IT network and common methods of working, as well as partner companies that ABB regularly work with.

The chart below shows an example of the processes which can be applied to manage possible composite solutions. In this example, as MAC, it illustrates how localized work can be performed in any part of the world.

Key issues with international projects are often about local content and local support, with a sustainable long term commitment and business plan providing real benefits to the local economy. The Caspian project undertaken by ABB embodies all the MAC concepts with a significant commitment to localization providing a service and support capability using local engineers and business partners as part of a sustainable business.

Typical ABB MAC processes for an international supply scenario.





Typical ABB MAC processes for an international supply scenario.

Why choose ABB as your MAC?

“The ability to provide a total solution should be a primary factor for any user choosing a manufacturing system partner.”

Source: ARC

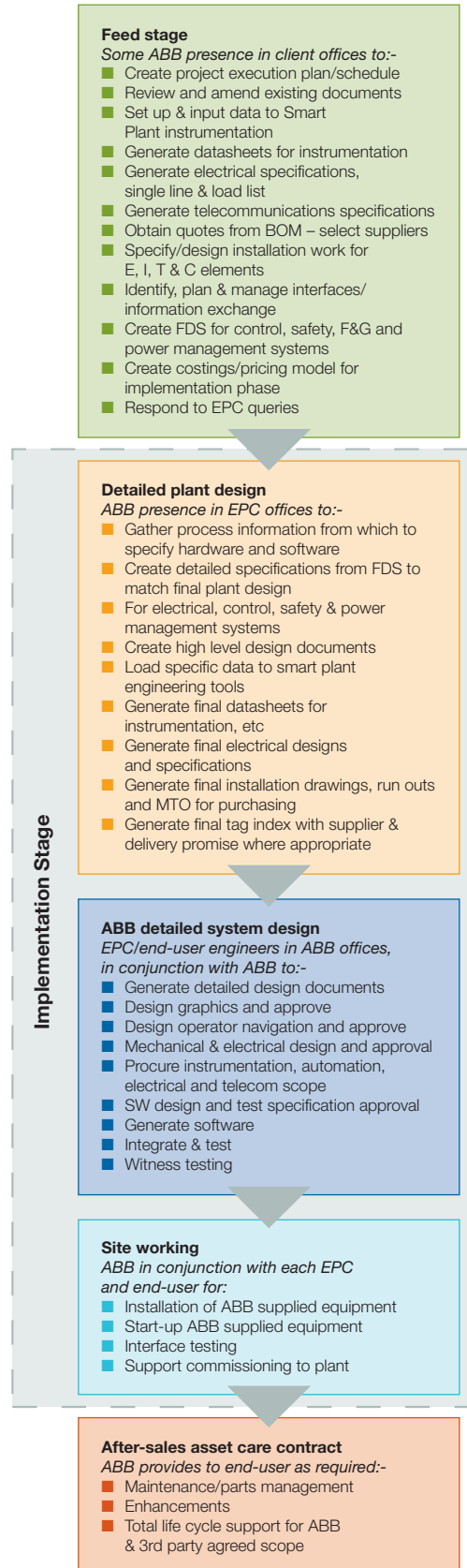
Very few companies have the wide product portfolio, the worldwide organization plus the management and interfacing experience of ABB.

ABB is able to use its own local engineering and manufacturing support in many countries, but is also prepared to enter into partnership with the client's preferred local organizations to give indigenous supply and support.

ABB's Industrial IT philosophy ensures that all of its own and many competitors products have been rigorously tested and certified IndustrialIT Enabled™. This means that the selected products are known to work together seamlessly. ABB has also made agreements with selected third party suppliers as well as client's preferred suppliers, for specialist equipment falling outside of its own portfolio.

Additionally, using ABB's experience in the use of Ethernet, Foundation Fieldbus and Profibus, the best technology can be selected in conjunction with the client.

By using ABB's interoperability certification and conformity test centers, compatibility and compliance to the standards for both its own and third party equipment can be established prior to the site installation. This can significantly reduce costs and delays to the site start-up program.



Frequently asked questions

When would you use a MAC?

When you require a complete managed approach to reduce risks in the provision of the automation solutions for your project - and throughout the complete life cycle of the plant.

What is the alternative to a MAC?

The alternative is to leave each contractor, including the automation equipment vendor, to work independently and hope that a fully integrated system is delivered on time and to cost. Alternatively, the client can take on the overall management of the automation, safety and telecoms systems and healthcare themselves.

What is the role of the EPC when working with the MAC?

Under a MAC contract, ABB works in partnership with the EPCs for the benefit of each EPC and the end-user. ABB's product knowledge can add value to the EPC's core skill base. Often the MAC role is totally integrated into the EPC's project team, taking over the risk and responsibility for work packages from the EPC.

What is the typical scope covered?

Depending on a variety of end-user needs and capabilities, the scope can be all embracing or limited to defined elements of the overall project.

How much does it cost to use a MAC?

Generally, compared with the conventional procurement and separate engineering contracts, the MAC approach should reduce risk and cost whilst securing the schedule.

What after-sales support is there?

With ABB the support can be tailored to the client's requirements. ABB can offer a range of services from call out to Full Service™ agreements.



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