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microcon Distributed Control Systems

Process Automation to Business Information

Energy Conservation | Environment | Process Efficiency

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Distributed Control Systems

The Forbes Marshall microcon control system is tailor made and designed keeping in mind the requirements of today's control system user. These multifunction features make the system ideal for applications in a variety of industries such as chemical, pharmaceutical, food and beverage, power, petrochemical, metallurgical, cement, glass, paper and pulp, water supply and treatment, sugar, distillery and many more.

Features

Modular and expandable system

Ideally suited for both continuous and batch applications

Choice of various redundancy configurations

Choice of rack mounted or DIN rail mounted IO modules

Open system architecture

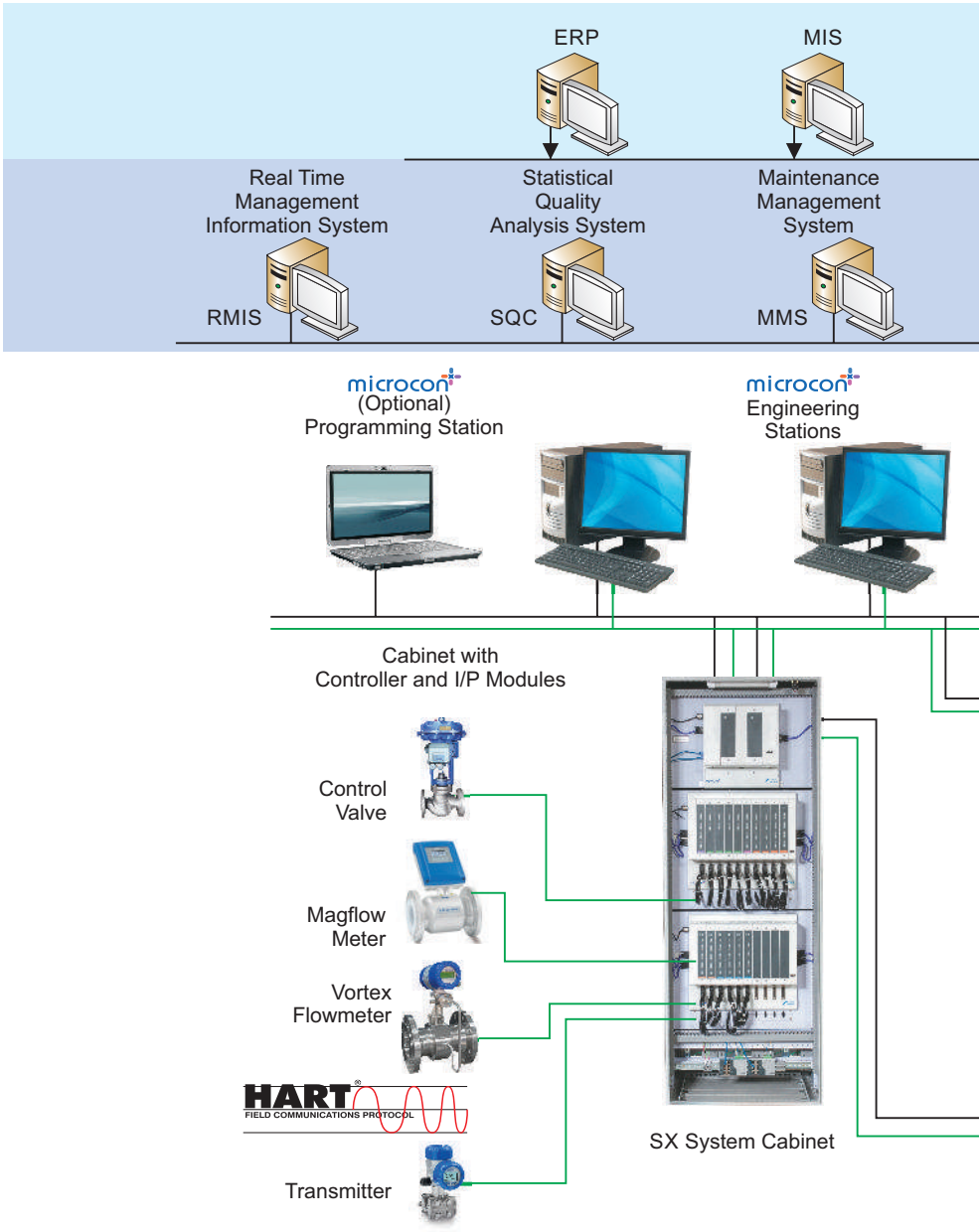
Ease of configuration

Hardware and software reliability

Convenient installation

Seamless integration to MIS/ERP systems

Ease of connectivity to the internet



System Architecture

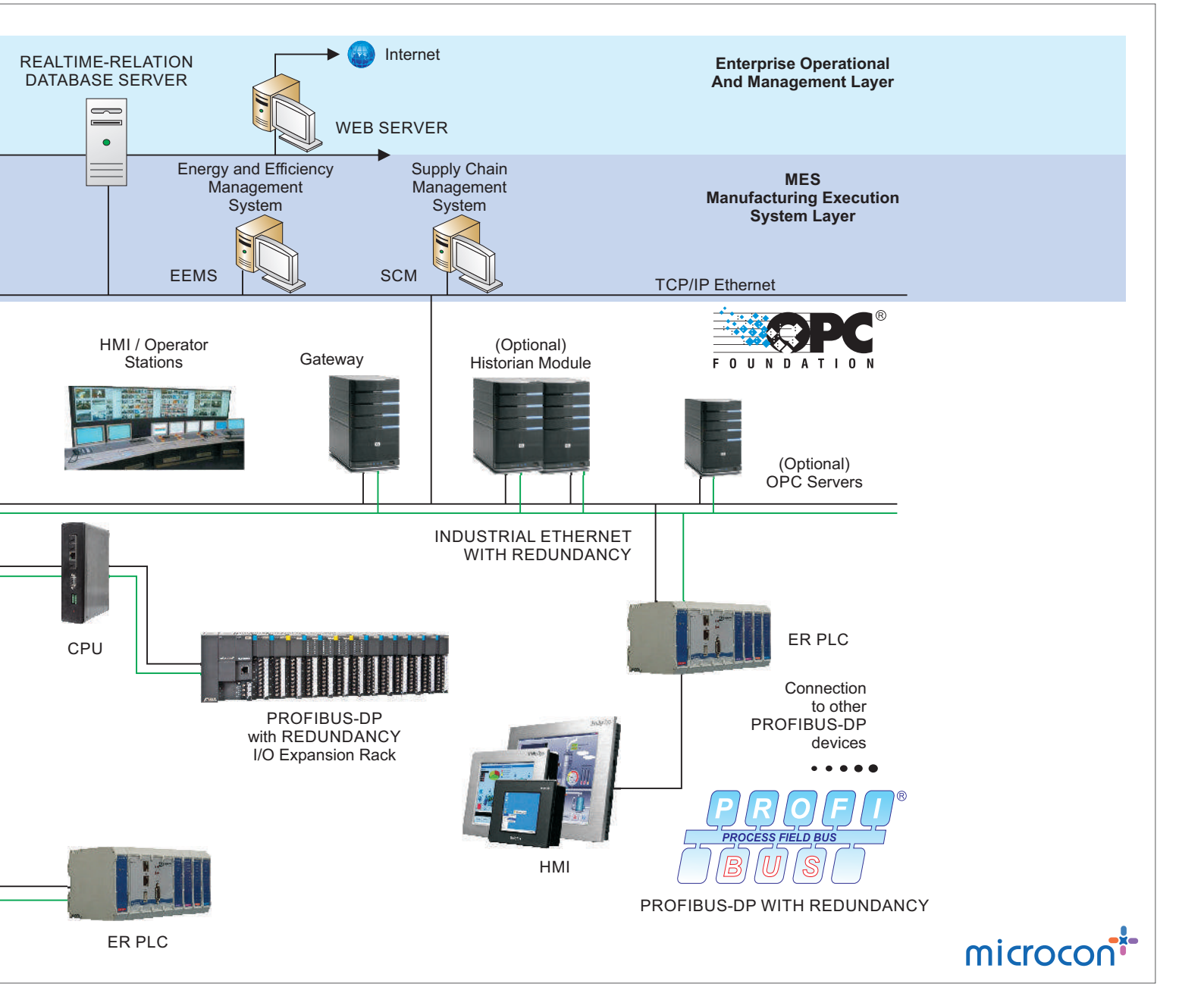
The system has been designed to have a completely modular and expandable architecture and also to handle both continuous and batch applications simultaneously. In order to cater to area wise system requirements, the system has the remote IO configuration as a standard feature and is also capable of supporting various field bus standards so as to satisfy future demands for expansion. The IO modules of the system communicate to the main controller on Profibus DP and the controller module has direct Ethernet connectivity. This DCS system has been designed with advanced technology to provide a high level of reliability and also can provide various levels of redundancy as per user demand.

The engineering and operator stations of the system work on Microsoft Windows based packages and the engineering software is designed as per IEC 61131-3 Standard to provide advanced function blocks, ladder logics, sequential function charts, structured texts as well as computing formulae as the programming tools for configuration requirements.

Communication Networks

Operational Level – This data communication is known as System Network (S-Net). It is a redundant real time industrial Ethernet with star, loop or bus topology structure. It follows IEEE 802.3 and IEEE 802.3u standards with adaptable communication speeds of 10 to 100 Mbps. For long distance communication, optical fibre options are also available.

Control Level – This data communication is known as Control Network (C-Net). It is a profibus DP industrial fieldbus allowing the controller modules to communicate with the IO modules and field devices. It is completely based on IEC61158 International Standards and works on master-slave topology with communication speeds of 12 Mbps. A profibus DP link can be connected to a maximum 126 nodes (0-125) with a variety of communication media like twisted pair, optical fibre or a combination of both. This communication can be carried through a distance of 1.2 km to 10 km by selection of proper medium.



Hardware

Engineering Station

The microcon engineering station consists of a high performance computer with controller programming software which is as per IEC61131-3 Standard. The engineering station facilitates the configuration of the DCS and also downloads the operational parameters on to the field control station and uploads to the operation station.

Operator Station

The microcon operator station consists of a high performance computer with TFT monitors of various sizes for HMI display. The HMI software is loaded onto the operator station and provides dynamic graphics, process mimics, real time and historical trends, group displays, faceplate displays, alarm management and reports. The operator station is used to monitor and control the entire production process and also check the running status of the system networks, controllers and IO modules. The operator stations can be either individual workstation based or client server architecture depending on the requirements of the system configuration.

Controller & IO Modules

The hardware consists of multi-loop controller modules and a variety of IO modules for handling analog and digital signals from the field. All the modules are rack mounted with separate racks for controller and IO. These are housed in the microcon system and marshalling cabinets with power supply modules and marshalling termination assemblies.

Features of microcon System

Modular and Expandable Architecture

The microcon system is designed to handle very small to very large application requirements. The system can be expanded from a very small system of say 10 loops to a very large system of a few thousand IOs. The complete architecture of microcon is based on various types of modules such as communication modules, controller modules and IO modules. The analog modules are designed to handle 16 channels per module whereas digital modules handle 32 channels per module. The system can be expanded to form a large integrated system by addition of hardware modules.

Open System Structure

In order to ensure the openness of the system, standard open network communications are adopted in the system. The enterprise administration layer is provided with redundant 1000 Mbps Ethernet (TCP/IP Protocol), which can be connected with superior systems via special network or AirLAN wireless microwave.

The system management layer is provided with the redundant 100 Mbps Ethernet, which can be linked to the control layer through servers, to a management information system through a gateway, to the enterprise administration layer through SIS. The control layer is provided with the redundant 100 Mbps Ethernet or 10 Mbps ArcNet, which can be linked to main control units through a concentrator and to other DCS systems through the gateway.

The field signal processing layer is provided with 12 Mbps Profibus-DP bus or 1Mbps CAN bus, as well as other standard buses, which can connect the main control units of high performance with the locally dispersible signal processing modules, loop control modules and other intelligent units. In addition, the system is also provided with the standard RS485, RS232 and Modbus communication protocols so as to connect with other intelligent units such as PLC and intelligent instruments etc.

The microcon communication modules also include the Foundation Fieldbus, HART and Wireless Communication protocol.

Open Operation System

The system can use either standard IBM/ HP/ DELL compatible computers or dedicated workstations as operator or engineering stations. The system operation layer adopts the Microsoft Windows based operating system, and is provided with ODBC and OPC interfaces, thus ensuring the openness of system software and satisfying the requirements for high performance man-machine interface.

The system control station can adopt the mature multi-task operation to ensure real-time quality, security and reliability of the control system. The software for the control station is solidified in semi-conductor disks, while the real-time data is saved in SRAM with power-off protection function, thus satisfying the requirements for real time quality, security and reliability.

SX Series Modules

The microcon SX Series hardware consists of a rack mounted controller and IO modules. The controller module fits into a controller rack whereas the IO modules can be fitted into the IO rack. The controller rack can accommodate redundant controller modules. The IO racks are used for expansion where they can accommodate 10 IO modules. The communication between the controller module SX-201 and the IO modules is on IO-BUS, two channel, redundant, Profibus DP communication. The controller module communicates with other controller modules as well as the operator and engineering station on SNET two channel, redundant, Ethernet communication.

The controller module has standard hot swapping facility, double Profibus DP communication, and NAND flash memory as standard features. The analog and digital IO modules are available as 32/16 channel configuration whereas the temperature IO modules are available in 16 channel IO densities. All the IO modules are intelligent, configurable and have hot swapping facilities. The user can choose various redundancy options such as hot standby controller level or even hot stand by IO level redundancy. The communication and power supply redundancy is standard 1:1 hot redundant.

SR Series Modules

The microcon SR Series hardware consists of a non-redundant controller and IO modules. The IO, modules can be fitted into the IO rack. The IO racks are used for expansion where they can accommodate 10 IO modules. The communication between the controller module and the IO modules is on IO-BUS, two channel, redundant, Profibus DP communication. The controller module communicates with other controller modulesas well as the operator and engineering station on SNET redundant, Ethernet communication.

The controller module has standard hot swapping facility, Profibus DP communication, and NAND flash memory as standard features. The analog and digital IO modules are available as 32/16/4 channel configuration whereas the temperature IO modules are available in 8 channel IO densities.

All the IO modules are intelligent, configurable and have hot swapping facilities. The communication and power supply redundancy is standard 1:1 hot redundant.

CPU and Racks At a Glance

Model		Name	Technical Specifications
Rack	SX 120	Controller rack	2 power, 2 controller
	SX 121	IO rack	2 power, 10 I/O
	SR-R16	IO rack	2 power, 2 communication, 12 I/O
	SX 122	IO rack for SOE cards	1 power, 1 cpu, 6 I/O
Controller	SX 201	Controller module	Redundancy
	SR 201	Controller module	Non-Redundancy

SX Series IO Modules at a glance

Model	Description	Specifications
SX-481	32-channel AI module	4-20mA
SX-510	32-channel AO module	4-20mA
SX-481-A	16-channel AI module	4-20mA
SX-510-A	16-channel AO module	4-20mA
SX-610	32-channel DI module	12 to 30 VDC (On stage), < 5V (Off stage)
SX-611	16-channel DI SOE module	
SX-710	32-channel DO module	12V to 30V
SX-472	16-channel RTD AI module	Cu50, Pt100 constant current

SR Series IO Modules at a glance

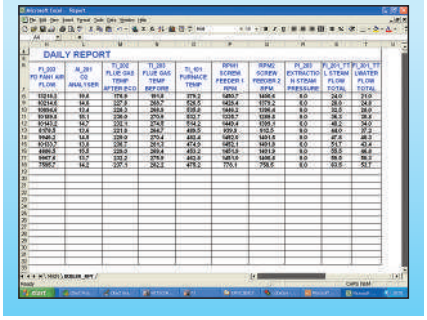
Model	Description	Specifications
SR48	16-channel AI module	4-20mA
SR49	8-channel AI module	4-20mA
SR51	4-channel AO module	4-20mA
SR61	16-channel DI module	12 to 30 VDC (On stage), < 5V (Off stage)
SR71	16-channel DO module	12V to 30V
SR62	32-channel DI module	12 to 30 VDC (On stage), < 5V (Off stage)
SR72	32-channel DO module	12V to 30V
SR43	8-channel RTD AI module	Cu50, Pt100 constant current
SR47	8-channel Thermocouple AI module	J, K, T, N, E, R, S, B or ±80 mV signal

The operator station of the system consist of highly reliable PC work stations with monitoring software operating in a Windows environment. The software performs operator control functions, plant monitoring and display functions, logging functions, SOE recording, performance calculation sand optimization functions, historical data storage and retrieval functions. The software provides over view displays, group displays, dynamic graphics and mimic displays, individual tag point data displays, bar graph displays, trend displays, X-Y plots, alarm management and event displays and reports. The system can print logs / reports automatically at prescribed time intervals or on demand or by the occurrence of predefined events. In addition to the standard logs, the operator can create new logs, modify existing logs and reassign them among the printers online.

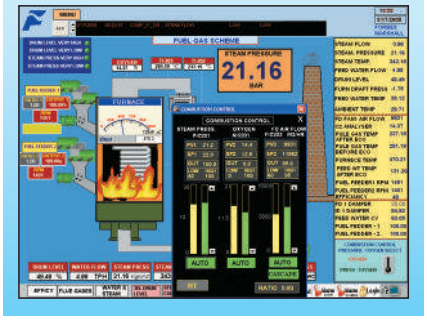
The Sequence of Event Recording (SOE) function refers to the system recording the sequence of event at a high timing resolution. An SOE record usually consists of an event source that leads to the event sequence record and a number of binary value status changing events, while an event source can be a number of external interrupted binary values. The system is also capable of performing online realtime performance calculations such as analyse boiler and turbine working conditions and identify actions required to optimize operations. The performance calculations include calculations of flows, enthalpies, efficiencies, heatrates, saturation temperatures etc. The prime objective of plant performance calculations is to provide the plant operator, with controllable losses in a tabular form, including deviations in heat rate and efficiencies, on a continuous basis, to determine the optimized operating conditions.

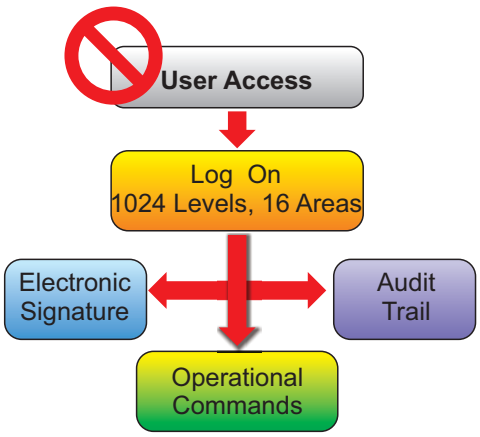
Alarms

Reports

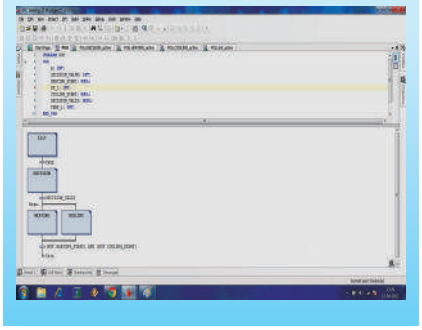


Engineering Flow Charts

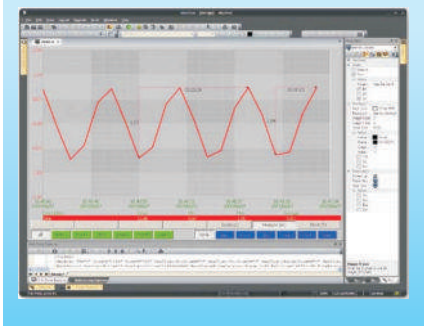




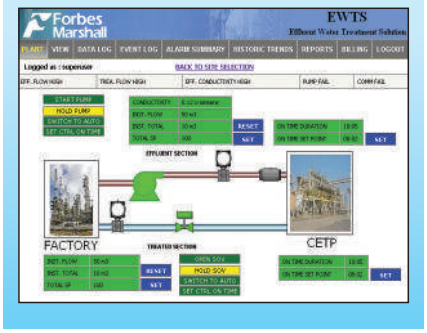
Sequential Function Charts



Trend Displays



Remote Monitoring



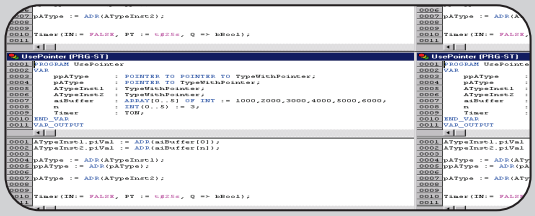
ProConf – Programming to International Standards

The ProConf programming software is based on CodeSys (IEC 61131-3)

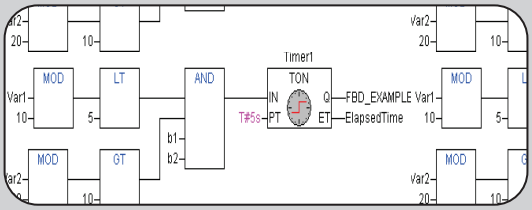
Fully developed technical features, easy handling and the widespread use of this software in the automation components of different manufacturers guarantee successful programming with this software.

Programming languages

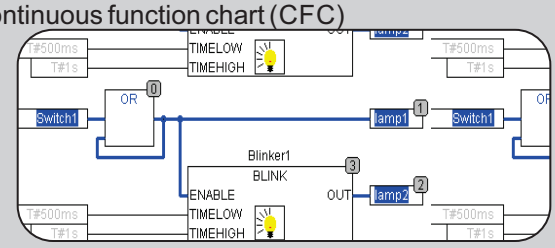
- Instruction list (IL) and structured text (ST)



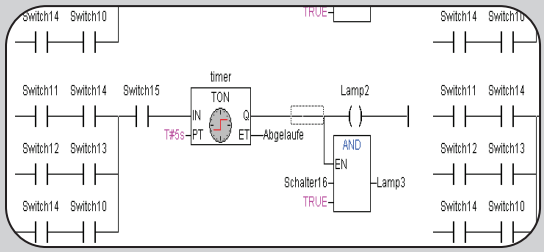
- Function block diagram (FBD)



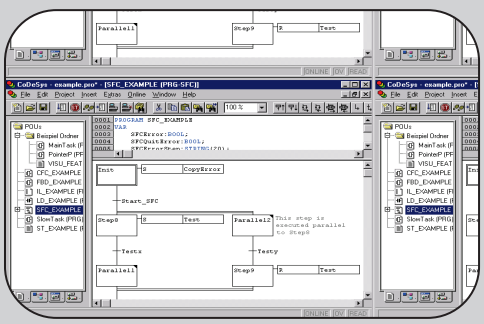
- Freely definable graphical function block chart/ continuous function chart (CFC)



- Ladder diagram (LD)



- Sequential function chart (SFC).



Testing and commissioning

ProConf offers you a number of important functions for debugging your application quickly and efficiently, for testing and commissioning. All these features are available, as soon as you have logged onto the online mode.

Simulation

You can test your application program even without the controller being connected, as the ProConf provides integrated online simulation. You use this on the same operating surface and with the same handling procedure as if you were online with the controller connected.

Multitasking

The fact that the application is structured in several separate run-time programmes (multitasking) optimises the resources of your control system and facilitates the implementation of time-critical tasks. You can give priority to high-speed processes, and for slower processes allocate only as much computer time as is necessary.

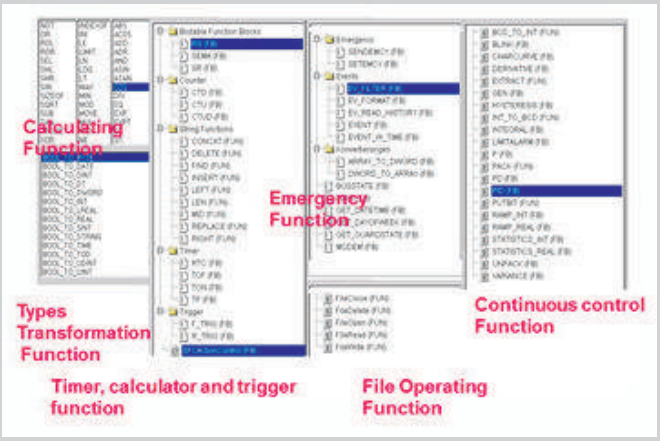
Fieldbus configurator included

The ProConf hardware configurator shows all the local I/O and the distributed peripherals (PROFIBUS) on a single level. This allows you to configure inputs and outputs directly, allocating their parameters and their symbolic names. This prevents assignment errors between peripherals and the IEC based program. In addition, you can also test the variables in online operation.

Abundant Control Algorithms Library

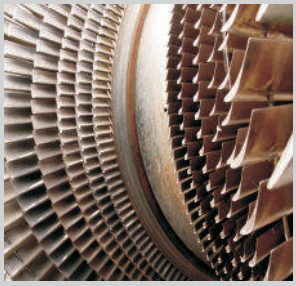
Can write your own library of control algorithms easily just as one writes a programme.

Once written it can be used in the next programme.



Major Areas of Expertise

Boilers and Turbines



Various references exist for different types of fuel fired boilers right from sugar to chemical industries including power boilers and turbine controls for both captive and thermal power stations. Boiler efficiency package, boiler load sharing packages, blow down control, feed water management system etc. are also provided. Special techniques are available for combustion control even in case of solid fuels like bagasse. Sequence of event recording @ 1 ms time stamping is possible for specific application requirements.

Steel

Large number of Forbes Marshall systems are in operation both for integrated steel plants as well as mini steel mills. Forbes Marshall has systems for water injection, steam injection, coal tar injection, heavy oil substitution (partial) for coke in blast furnace. Gas mixing stations for steel converters, VD / VAD / VOD in steel refining, pickling line automation, jet wiper system for galvanising line, continuous casting mMachine automation and industrial gas flow-metering systems.

Pharmaceuticals

Forbes Marshall has vast experience in providing specialized control systems for Pharmaceutical Industry with specific application areas of fermentation biotechnology, bulk drug batch reactors, solvent recovery distillation columns and formulations. Special control algorithms are developed for pH and batch reactor temperature control, apart from batch and recipe management schemes.

Paper

Forbes Marshall provides specialized solutions for the paper and pulp industry. Some of the applications include digester automation, stock preparation, chemical addition, head box controls and paper machine controls. Solutions include a highly beneficial Thermocompressor system for steam and condensate management. Forbes Marshall systems have been successfully integrated with QCS systems to generate the setpoints for consistency / basis weight control.

Oils and Fats

Specialized packages have been supplied for edible oil refining, fatty acid and soap manufacturing systems both in India and abroad. The system includes packages for FAT splitting, fatty acid distillation, glycerin distillation, sweet water evaporation, crystallizer controls, perfume dosing system for soap making.

Food and Beverages

Specialized large jobs done on active dry yeast manufacturing, fish paste preparation, tobacco dryers, soft drinks, egg powder, dairies and there are also several references for alcohol distilleries and breweries including specialized packages for biogas effluent treatment plants.

Sugar

Plant-wide package solutions and specific package for automatic cane feeding control / mill automation, imbibition water, juice flow stabilization, lime sulphitation pH control, evaporator controls and automation for both batch and continuous pans.

Chemicals

Specialized control systems have been developed for both batch and continuous chemical applications. Various types of distillation column control techniques and specific batch and recipe management techniques provide the ideal solutions for the chemical industry. Special range of analysers to monitor various online parameters are also available.

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