INTEGRAL MS1000 In-house management system



System description INTEGRAL MS1000



In-house management system INTEGRAL MS1000

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INTEGRAL MS1000

INTEGRAL MS1000 is the Landis & Staefa in-house management system designed for the operation of heating, ventilation and air conditioning systems (HVAC) and related building services.

Essentially, the INTEGRAL MS1000 consists of the RC1500C management station, the NITEL communications module, a control and interlock system for process control and the process peripheral devices.

The INTEGRAL MS1000 system can also be used as a higher-level system for central operation of sophisticated individual room controls.

User-friendly

With operation in graphics mode, even non-specialists can monitor the system and intervene if necessary. With freely definable graphics, the user-interface can be matched to client requirements to optimum effect.

Economical

The ability of several geographically separate systems to be operated centrally by a single user reduces personnel costs.

Partial commissioning can be carried out at any stage, ensuring that the building services plant can be used at the earliest stage possible.

Operational procedures can be ideally matched to any specification, to ensure:

- Efficient use of energy to maintain a high standard of indoor comfort
- A more rational use of manpower

The modular structure of the MS1000 system allows for expansion as and when required.

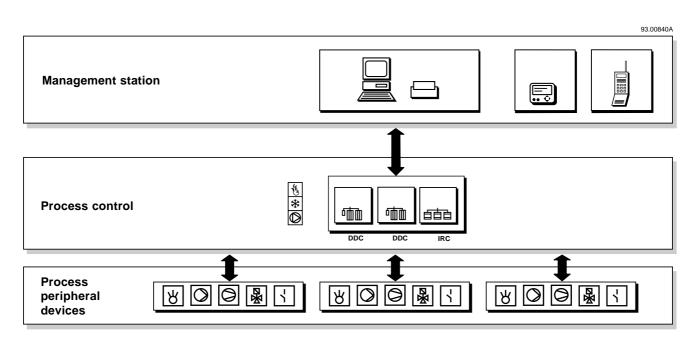
Reliable

Simple alarm handling combined with the transfer of alarms to the on-call service group ensures that faults can be identified quickly and dealt with efficiently.

The operational integrity of the plant is assured even in the event of a management station failure. All essential plant data is sampled and stored in the communication modules, independently of the management station. The control and interlock modules at the processing level are autonomous, but are monitored and operated centrally from the management station.

Flexible

Communicating software, scope for configuring and programming the devices at the process control level, and the use of terminal modules for connection of the peripheral devices all offer considerable flexibility. This makes the system highly versatile; it can be adapted to buildings used for various purposes and patterns of occupancy, and matched to a wide range of peripheral device signals.



The system levels of INTEGRAL MS1000

System topology

The INTEGRAL MS1000 in-house management system has a clear, function-related structure:

- Building management
- Communication and process control
- Peripheral devices

Remote management and remote monitoring

The RC1500C management station software enables the user to operate and monitor HVAC systems from a central location.

System communication

Communications between the process control level and the management station are handled via the NITEL communication module.

Process control

The INTEGRAL RS control and interlock system is responsible for process control in HVAC systems, and consists primarily of control and interlock modules (the "RS controllers").

The RS bus is used for the exchange of data between the RS controllers, the pronto interfaces and the operator level.

Peripheral devices

The interfaces to the peripheral devices ensure that both Landis & Staefa equipment and a wide variety of third-party products can be connected.

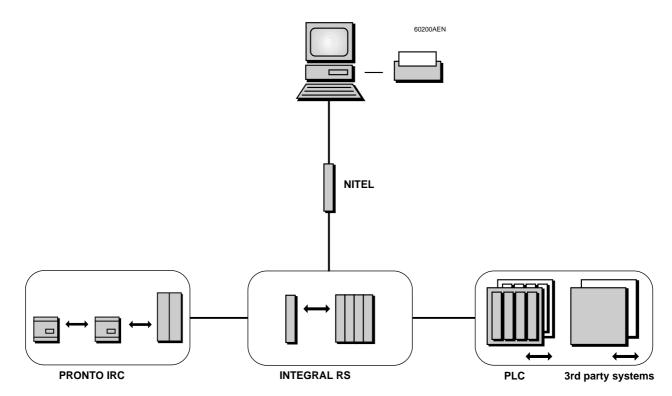
Individual room control

The Landis & Staefa PRONTO IRC system is designed for control and interlock functions in individual rooms and is capable of full communication with MS1000.

The NIPRO interface module provides the connection to MS1000. Data is exchanged between the NIPRO and the pronto controllers on the pronto trunk.

Third-party systems

In addition to process control and individual room control systems from Landis & Staefa third-party systems can also be integrated.



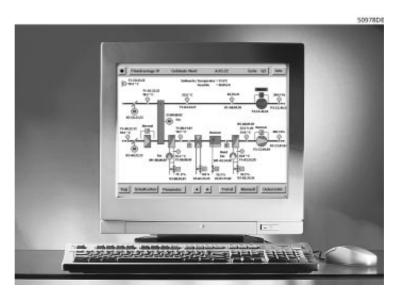
INTEGRAL MS1000 system topology

Building management

Management station

This is the point where the various elements of the system are brought together. The user is kept constantly informed of any current alarms and plant faults, and can, if necessary, intervene actively (by displaying the current plant status, modifying a setpoint or transferring an alarm, for example). The RC1500C software combined with the facility to run proprietary software ensures that the management station can be ideally matched to specific client needs.

All the integrated data points from the plant can be displayed on and operated from the management station screen.

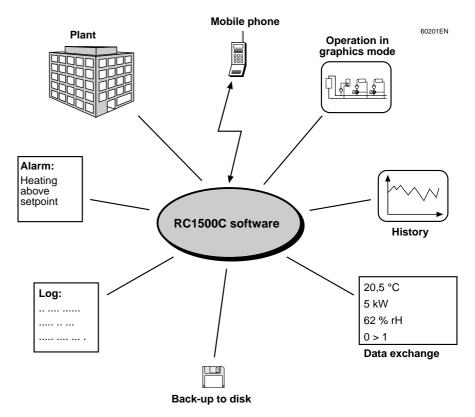


Management station

Features of the RC1500 software

- · Operation and parameter setting
- Receive, display and print alarm
- messages
- Automatically record all activities in a log (up to 2000 entries)
- Print plant data and back up on floppy disk
- Automatically receive, archive and back up energy-related and historical data
- Easy-to-use menu-driven operation, text-based and with help function
- Protected data transfer
- Dynamic graphic display for up to 10 data channels
- Export the received energy-related and historical data in various file formats for further processing in proprietary programs (e.g. INTE-GRAL OPTI, dBase, MS Excel, Lotus 1-2-3)
- Transfer alarm messages:
 - to a tone pager
 - to a mobile phone
 - to a message file
 - according to priority

- Transfer an alarm message to up to six service engineers consecutively
- Enter alarm messages manually
- Use programmable script files for "service receivers" (message pagers, computer systems etc.)



Scope of the RC1500C software

Operation and parameter setting

When connection to a site has been established, the plant can be fully monitored and operated from the RC1500C. Setpoints can be modified, for example, to suit new conditions. Further, it is often possible to repair faults from the management station, thereby avoiding the need for a service call, or at least ensuring that it can be properly planned.

Text mode

In text mode, the user is guided through a menu structure in an interactive process. For additional support, a single keystroke within any menu invokes a help screen with important context-sensitive information. Critical inputs (such as those which might result in the deletion of data) are double-checked with a system prompt. Data can be received even while the RC1500C is in active use.

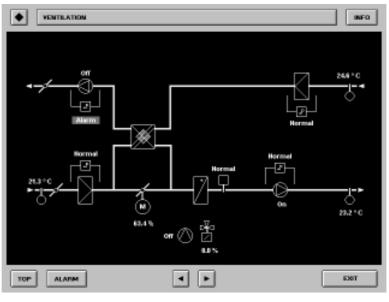
Data tables in text mode

In addition to the complete list of all the integrated data points, the user can also compile and display groups of data points with a selection of significant values. An optional comment can be added for each data point. The RS controller setpoints and outputs can be modified both in the complete data point list and in the selective data point displays.

Text mode can also be used to programme RS switch times and to define history points.

Graphics mode

In graphics mode, the colour monitor provides a clear display of the complete plant or individual sections of plant, and of the plant status. Each display includes various function fields which can be operated with the mouse (e.g. to modify a setpoint or jump to another schematic).



Plant diagram in graphics mode

Land	is	& Stae	efa		Data po:	int	t valu	ues 87120002 = NITEL V1.4 =	
No.	No. Data point SAPIM text Value Status Comment								
RS	m	odule :	1:	Demo MS1000					
32.	1	RSUAI	1	T1 OUTDOOR	16.25 C		AUT	Outdoor temperature	
33.	1	RSUAI	2	T1 FLOW	53.15 C		AUT	Flow temperature	
34.	1	RSUAI	3	B6 SA TEMP	18.72 C		AUT	Supply air temp.	
35.	1	RSUDO	3	M03 PUMP	0	*	AUT	Circulating pump	
36.	1	RSUDO	4	M5 BURNER	1	*	AUT	Burner switch signal	
37.	1	RSUDO	5	M08 DAMPER	1	*	AUT	Damper	
38.	1	RSUDO	6	FAN	1	*	AUT	Fan switch signal	
39.	1	RSUDO	7	LAMP	0	*	AUT		
40.	1	RSUAO	1	Y04 VENTIL	0.00 %	*	AUT	Valve position	
41.	1	RSUAO	2	Y07 VALVE	21.6 %	*	AUT	Valve position	
42.	1	RSUAO	8	VALVE SIM	0.00 %	*	AUT	-	
43.	1	RSUS	1	T1 OUTDOOR	20.50 C	*	AUT		
44.	1	RSUS	2	W HTG SPT	22.30 C	*	AUT	Room temp. setpoint	
45.	1	RSUS	3	VENTILATION	20.00 C	*	AUT	Extr.air temp setpoint	
\Data point values Go back = `Esc'									
								point <182> :	
								Page Up/Down = `< >'	
							= `F		

Data point values (text mode)

Log

All activities, whether actions performed by the user or messages from the plant, are recorded in the log. In the case of an alarm message, for example, the log entry consists of the date, time and an error message.

Messages from the plant are stored in the communication module. For each type of message, the user can select when the message is to be transmitted to the management station. Alarms, for example, might be transmitted immediately, and maintenance messages at a given time.

The availability of a chronological record of events enables the user to analyse the system in detail, so that even complex problems can be solved when necessary.

The log data (up to 2000 entries) can be displayed, printed or deleted according to various search criteria:

- Plant-specific messages
- Alarm messages
- System messages
- All messages.

Separating the information into various categories makes it possible to focus more quickly on a problem area and deal with it more quickly.

Time programmes

Correctly programmed time schedules help save energy. They ensure that the lighting is switched off at the end of the working day, that the air conditioning is disabled in offices during holidays, that the temperature is reduced at night, and that the plant never runs longer than actually necessary. Whether for the entire energy supply system or for individual rooms, all the necessary time schedules will be found in INTEGRAL MS1000. In addition to the time schedules repeated on a weekly basis, exception programmes can be used to schedule one-off or regular events such as public holidays, works closures, special opening times or exceptional business hours.

The time schedules are stored locally in the communication modules of the system, so that they operate independently of the management station. This ensures reliable operation even when the management station is switched off or not communicating.

Log entries

ROOM NUMBER	R 1919											
						_			_			
MOSEAT	OFF	ON	ON	OM	ON	OFF	ON	ON	ON	ON	ON	OFF
TUESDAY	орт	OM	ON	ON	ON	099	ON	ON	ON	ON	ON	orr
WEDNESDAY	orr	он	ON	OM	ON	055	OM	OM	ON	ON	ON	OFF
THURSDAY	orr	он	ON	ON	ON	off	ON	OM	ON	ON	ON	OFF
FRIDAY	OFF	он	ON	ON	ON	077	ON	ON	ON	OM	ON	OFF
SATURDAY	orr	OFF	orr	orr	097	0FF	orr	OFF	orr	orr	orr	orr
SUNDAY	INDAY OFF		OFF			OFF OFF			OFF			OFF
	88:81	88:88	88	11	88	13 88		15 88	88	17 80	88	: 66

Weekly schedule

_____ MS1000 Display all messages | 165 _____ 31.03.96 21:36:43 A 8712-1000 Service message transmitted (ST) 31.03.96 21:36:13 A 8712-1000 Alarm: Error MO3 Pump 1 RSUDO 3 31.03.96 20:00:58 A 8712-1000 History received: 1 Heating I 31.03.96 18:35:24 A 8712-1000 Read NITEL configuration 31.03.96 17:00:35 A 8712-1000 History received: 1 Ventilation II 31.03.96 16:32:23 A 8712-8000 Service message transmitted (ST) 31.03.96 16:31:55 A 8712-8000 Alarm: Temp < 4 C T1 OUTDOOR 1 RSUAI 1 31.03.96 15:35:29 A 8712-1000 History received: 1 Ventilation I Message 355 of 362 ------| Please select No V1.4 Help:F1 | Press F5 to print messages | connection Group A | Del, PgUp, PgDn, ↑, ↓ Home, End, F5 End:Esc

Historical data logging

The history feature is used to log data from various data channels over a given period of time. Up to ten data channels can be logged for each history block.

Up to ten history blocks can be defined. The historical data can be configured in a variety of ways and is transmitted automatically to the management station, where it is converted into standard ASCII files, suitable for display in an analysis program.

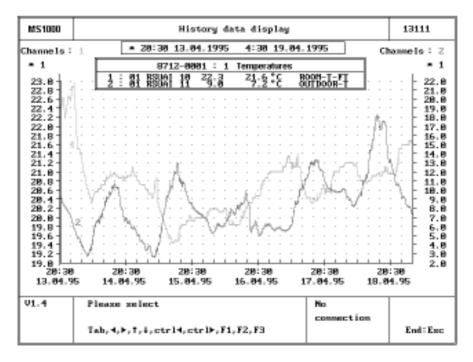
Areas of particular interest can be enlarged with the zoom function, for closer examination. Two cursors (vertical hair lines) can be used to select and vary the area displayed. Various methods of sampling can be selected for the logging of historical data:

- Once only, either immediately or with a defined start-time
- Continuous logging

A special feature is the option of analysing the historical data with the additional software package INTE-GRAL OPTI, to monitor and optimise energy consumption. However, it is equally possible to convert the logged data into various other ASCII formats for analysis with other suitable software (e.g. dBase, Excel, Lotus 1-2-3).

Energy analysis

The program INTEGRAL OPTI from Landis & Staefa provides transparent energy consumption information. To this end, sensors are used to register actual energy consumption values (oil, gas, electricity, etc.) and influencing factors. It compares these values with the budgeted values and presents the current energy balance sheet in various reports. Key numerical factors are then used to determine which energy consumers represent weak points in the system, and whether optimisation measures are called for.



Historical data logging

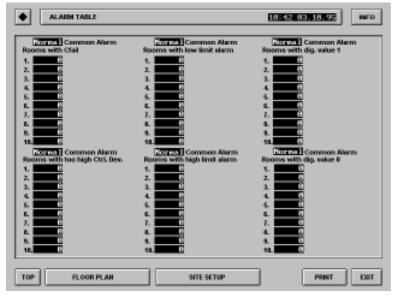
Safety considerations

Various safety considerations need to be taken into account in a building management system. One aspect of this is the alarm handling system, which monitors the integrity of the plant and transfers incoming alarms to the relevant locations.

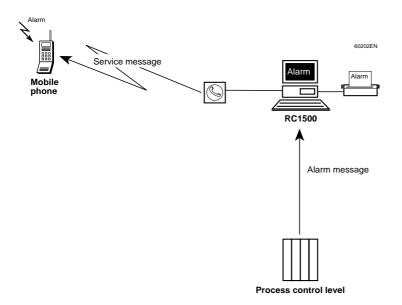
Another is operational security (access protection). This is important, since unauthorised adjustments, whether intentional or accidental, can seriously impair the operation of the plant.

Alarm handling

The alarm handling system incorporates a wide range of versatile alarm functions. These ensure continuous monitoring of the operational integrity of the plant and automatic transfer of alarms to the management station.



Alarm table in graphics mode



Up to 100 different alarm blocks can be defined for each building. The following parameters can be entered for each block:

- Alarm text (30 characters)
- Alarm inputs (ten digital data points or ten analogue data points for limit monitoring)
- Priority (1 to 9)
- Interval between message repeats (15 minutes to 24 hours)
- Method by which alarm block is to be activated (manually or via digital input)

When a plant fault occurs, an alarm messages is transmitted immediately to the management station, where it is displayed, printed and stored. If a service schedule is operative, the messsage can be transferred to a service receiver (e.g. pager) in accordance with its priority.

Alarms can be reported locally at the NITEL level, by connecting an additional printer.

Types of receiving equipment

Alarm messages can be transferred in the form of service messages to the following "service receivers":

- Mobile phone
- Tone pager
- Alphanumeric message pager *
- Text file to own or network PC (alarm reporting for each system) *
- Third-party computer system via modem or COM port*
- Serial printer via modem or COM port*
- * With these options, the transfer of the alarm message can be adapted to the type of receiving equipment.

Transfer of an alarm message to a mobile phone

Operational security (Access protection)

To define the operation of the plant to suit individual user groups (e.g. resident engineer, night porter etc.), or to prevent local access to the PC by unauthorised personnel, access to plant data can be defined at three password-protected operating levels, at each of which only certain activities can be performed.

Unauthorised access to data at the management level is impeded by a shared protocol for connection and communication.

The three password-protected operating levels prevent unauthorised access not only to the plant data but also to the NITEL communication module, and hence, to the process control level.

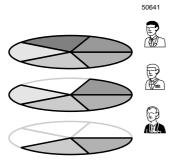
Engineering and commissioning

The design engineering, instrumentation, structuring and parameter setting for the INTEGRAL MS1000 in-house management system involves various activities which may be defined collectively as 'engineering'.

Engineering at the communication and management level is facilitated by the use of PC engineering tools.

Engineering as a customer service

It is for the system contractor to decide whether to carry out the engineering tasks independently, or whether to leave them partially or wholly to the system supplier. The decision will depend primarily on the availability of appropriately trained staff and the necessary engineering tools.



Operating levels 1 to 3

Functions at the three operating levels:

Operating level 3: All activities (Configuration)

Operating level 2: Access for operation and setpoint adjustment (Parameter setting)

Operating level 1: Access for operation only (Read-only values)

Communication and process control

Communication module

The communication between the process control and building management levels takes place via the microprocessor-controlled NITEL communication module.

The NITEL acts as the interface between the RC1500C management station and the process control level, the control and interlock system INTEGRAL RS and the PRONTO IRC individual room control system. The NITEL communicates with individual RS controllers and the NIPRO pronto interface via a bus connection, the RS bus.

The communication module samples and stores all the important plant data and prepares it for further processing by the management station.

Integration of third-party systems

In addition to INTEGRAL RS and PRONTO IRC a wide variety of thirdparty systems can be integrated at the management level.

Examples include:

- Programmable logic controllers (PLC)
- Access control systems
- Door controls
- Hotel booking systems
- etc.

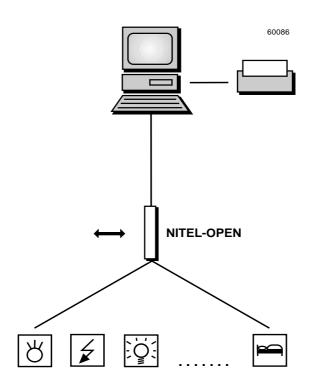


NITEL communication module

Summary of NITEL functions

- Group significant data points into ten menus
- Display up to 900 data points
- Adjust setpoints and modifiable outputs, and modify time switches, 7-day and exception programmes
- Integrate RS data points into management station graphics
- Define up to 100 alarm blocks each with its own priority level and transmission instructions
- Define up to ten history sampling blocks, each with ten inputs
- Three-level access hierarchy with password-protected operation
- Transfer of alarm and historical data to up to four management stations

All NITEL functions can be menuoperated.



NITEL-OPEN for integration of third-party systems

Process control with INTEGRAL RS

The local processing of data in the INTEGRAL MS1000 in-house management system is normally handled by the INTEGRAL RS control and interlock system. This system controls the process in HVAC systems.

At the heart of the system are the microprocessor-based DDC control and interlock modules (the "RS controllers").

In accordance with the principle of distributed intelligence, the RS controllers operate autonomously, so ensuring that the operation of the building services plant will not be impaired by a fault elsewhere in the system. The RS controllers can be programmed with customer-specific structures and parameters, so that the system can be adapted to suit all types of HVAC systems.

There are three categories of RS controllers:

INTEGRAL RSM-Type
 Freely programmable RS card
 modules with an external (terminal
 module carrier) interface for
 connection of the process periph eral devices.

- INTEGRAL RSC-Type
 Freely programmable RS compact controllers, with a built-in interface for connection of the process peripheral devices. The compact controllers are particularly suitable for standard frequently recurring applications (e.g. packaged full air conditioning units for computer rooms and laboratories, roof-top AHUs, chillers etc.)
- INTEGRAL RSA-Type RS application controllers with plug-in software application modules (preprogrammed for a specific application or programmable), and a built-in interface to the peripheral devices. Particularly suitable for small-scale heating, ventilation and air conditioning systems.

Controllers with built-in NITEL

Cost-effective compact controllers (NRUT) and application controllers (NRK14–TEL and NRK16-TEL) with built-in NITEL communication modules are available for remote operation of simpler systems.

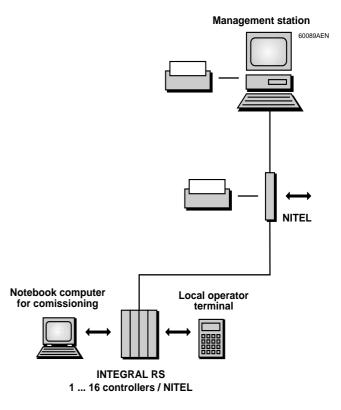
RS bus

The RS controllers communicate with each other and with the locally connected operator terminals on the RS bus.

The RS bus can accommodate up to 16 RS controllers and a maximum of 16 operator terminals.

When RS card modules are interconnected, an electrical connection is formed through their interlocking bases; this is the *internal RS bus*. This bus is also connected to the service socket, and can be connected from this socket via a bus adapter over a distance of up to 2,400 m. In this way, remote RS card modules and RS compact controllers can also be interconnected.

Detailed information about the INTEGRAL RS system will be found in the Landis & Staefa description, document K11.





INTEGRAL RS

Individual room control with PRONTO IRC

PRONTO IRC (Integrated Room Control) is a stand-alone microprocessor-based individual room control system. It is capable of full communication with MS1000.

System features

- Wide scope for configuring and programming individual room controllers
- Individual, zone (trunk) and group (cross-trunk) communication between the individual room controllers, the process interface and the user interfaces.
- Integration into higher-level systems if required

Integration into the MS1000 system

A key feature of the PRONTO IRC system is its outstanding ability to communicate, which enables it to be integrated into higher-level systems. This, in turn, permits:

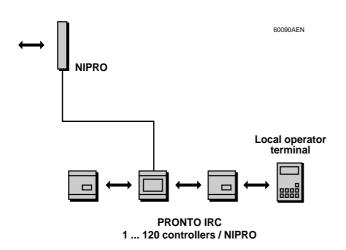
- Demand-based supply of energy
- The ability to influence individual room controllers from a central location
- Control via 7-day and exception programmes
- Interrogation of controllers for diagnostic purposes

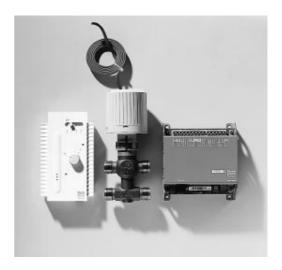
The individual room control system is integrated into the MS1000 system via the NIPRO interface. This is identical in construction to the RS card modules, and should ideally be mounted directly adjacent to one of these. The NITEL is then automatically connected to all modules on the same bus. It is, however, also possible to connect the NIPRO remotely to the RS bus.

Data processing in the PRONTO-Interface

To make it possible to exchange data between th RS bus and the individual room control system, the PRONTO data points are mapped in the NIPRO as RS data points. This permits full operation of the PRONTO data points, and allows the creation of individual time schedules in graphics mode. Up to 120 PRONTO IRC controllers may be connected to each NIPRO.

Details of the PRONTO IRC individual room control system will be found in the Landis & Staefa description, document P20-01.





PRONTO IRC

Application examples

School building

Motivated learning improves in classrooms where thermal comfort, good air quality and good lighting conditions prevail. At the same time, the cost of energy and upkeep of the building needs to be kept as low as possible. INTEGRAL MS1000 can meet these two objectives - with a high degree of comfort and low operating costs.

The demands on the building management system are determined by the special requirements of school buildings, and include:

- Minimum energy consumption while the building is not in use
- Heating and ventilation to match classroom usage (based on the school timetable)
- Arrangements to allow the use of various spaces outside normal school hours (e.g. assembly hall, sports halls etc.)
- Monitoring and control of individual room temperatures
- Reliable lighting control for optimum lighting conditions

Management station

- Status indication, fault and maintenance messages, with appropriate instructions for the caretaker
- Easily programmed time and holiday schedules
- Easy-to-operate energy-enable signal outside normal school hours

Control, interlock and monitoring system

(INTEGRAL RS)

- Precise, energy-optimised control
- Monitoring of faults and maintenance messages

Individual room control systems (PRONTO IRC)

- Accurate temperature control in each occupied room
- Change-over to Energy hold-off or Stand-by mode at night or in unoccupied areas
- Lighting and blind control





Thermal comfort in the class rooms

Centralised monitoring of building services by the INTEGRAL MS1000 building management system puts the user in full control of both the system and the building.

Exception programmes are available to take account of usage outside normal hours. In the event of a fault, a fault message appears automatically on the management station screen. These messages can also be transferred to a pager. This ensures that the resident engineer, whether in the building or elsewhere, will receive a plain text message describing the fault.

Maintenance messages inform the resident engineer of any maintenance tasks required. An overview displayed at the management station details all faults current at any given time, including, for example, an unacceptable control deviation, or a value outside the high or low limit. It is also possible to check from the management station whether all windows are closed and all lights out.

Office building

The building services plant in a medium-sized office block is to be monitored and operated centrally. The resident engineer has various other responsibilities and cannot devote full-time support to the building management system. There is a requirement that the system should be firstly, cost-effective, and secondly, easy to operate. Further, a separate energy consumption bill for each tenant is required annually.

For these requirements INTEGRAL MS1000 is the optimal solution.

Control and interlock of the HVAC and related building services plant is achieved with INTEGRAL RS. The water, electricity and heating consumption of each tenant is recorded by the RS modules. These are integrated into the MS1000 system via the NITEL ommunications module. Graphics-based plant schematics displayed on the management station indicate the plant status. Any faults occurring in the system are transmitted to the management station, displayed, printed and then transferred to the resident engineer's pager.

In order to calculate individual energy consumption costs, all meter readings are transmitted to the management station at regular intervals. Here the data can be analysed in a spreadsheet and individual accounts can be prepared.

The system incorporates a powerful and easy-to-operate 7-day programme to match the supply of energy in an office building to the actual working hours. The programme is easily modified to take account of any variations in working hours. Lastminute changes in the use of specific rooms, or other unusual events, such as a meeting in the evening, can be accommodated by exception programmes. Simply enter the startand end-dates and times to programme an exception to the normal weekly schedule for the period concerned.





Technical data

System capacity

Number of connected RS controllers and PRONTO interfaces*	1 16
Number of PRONTO controllers per PRONTO interface	Max. 120
Number of integrated RS data points*	Max. 900
Alarm inputs*	Max. 1000
History inputs*	Max. 100
History memory (kB)*	100
Local printer*	1
* per NITEL	

Management station

IBM or compatible personal computer
Intel 80386 or higher
2 MB
1.44 MB 3 1/2"
80 MB
VGA
Parallel printer port (LPT1, 2 or 3) Serial RS232 port
Mouse port for graphics operation

Communication modules

Communication module	NITEL
PRONTO interface	NIPRO
The communication modules meet the requirements for \mathbf{CE} – marking	

Order number: N11 / en / 96-10





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