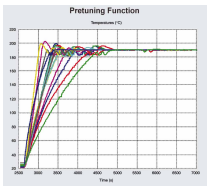
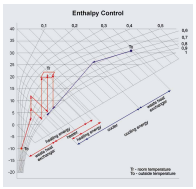
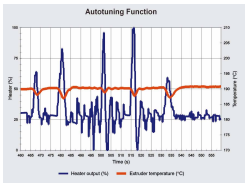
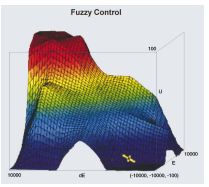
Programmable
Logic
Controllers









IDR BLOK
Process
Control
Tools

For Each Application
the Right Solution

Microsoft®
Windows® 3.11
Windows® 95
Windows® 98
Windows NT®

IDR-BLOK - Graphical Programming for Closed-loop Control Systems

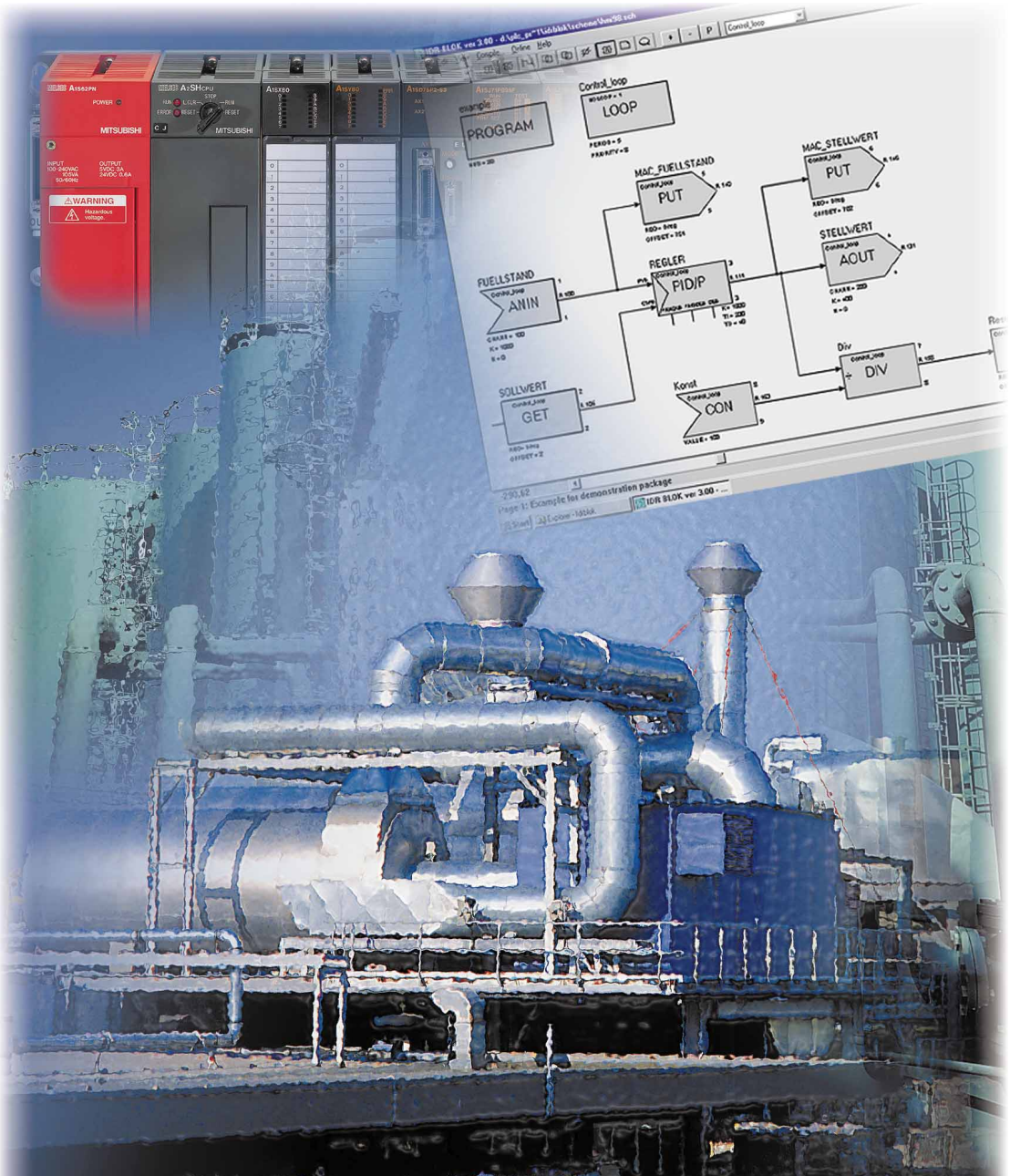
IDR-BLOK is a user-friendly development tool for programming closed-loop applications using PLC technology. Configuring a controlled system couldn't be simpler – you just assemble it graphically by placing function blocks on the screen and the integrated compiler than generates the code for the PLC. The open design means that the user can intervene and change the control parameters at any time with the IDR BLOK online mode. Function blocks for auto-tuning and fuzzy logic are also implemented.

IDR-BLOK turns a sequential logic controller into a multi-loop controller. It is the closed-loop programming software package for all MELSEC A/Q* controllers.

*AnSH, AnN, AnAS, QnAS, AnU, AnA, QnA

IDR-BLOK turns an ordinary sequential controller into a multi-loop controller. This is the multi-loop control software for all A/Q* controllers.

The software runs under Windows 3.11 and Windows 95/98/NT.



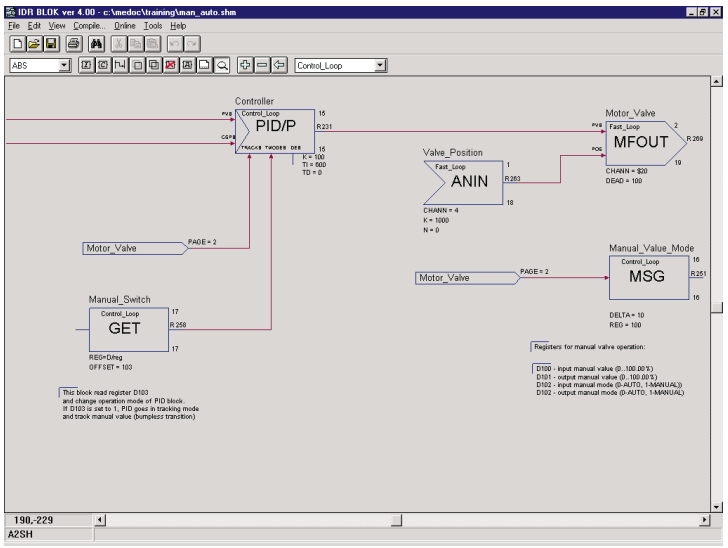
Processes and Control

Processes or systems can be classified into two large groups: discrete (sequential or batch) and continuous. In nature, processes range from predominantly discrete to predominantly continuous with a variety of intermediate forms such as semi-batch predominantly sequential; semi-batch predominantly continuous, etc.

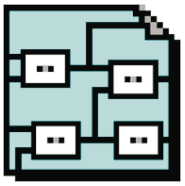
For various types of processes various types of control are suitable.

The basic building block of industrial automation systems, the PLC, has focused mostly on logic and sequential control, for which ladder diagram programming has proved very effective. This form of control is suitable for systems, which are predominantly discrete or can be structured in logical states. Control here means essentially defining the logical states and specifying conditions for the process to move from one logical state to the other thereby establishing the process sequence. Logical states can be defined for discrete variables, which are measured by digital signals, but also for continuous variables that are measured by analog signals.

For predominantly continuous processes, sequential control is not suitable, and closed-loop control i.e. feedback control must be used. While logical control is effectuated essentially in logical states of a process, feedback control acts continuously on the process and ensures that



Programming with IDR BLOK brings you in better position.



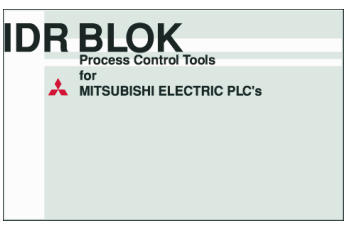
it operates at a required operational state through maintaining technological parameters at required values. State-of-the-art feedback control technology has available a number of advanced control algorithms which can be used to ensure stable and optimised operation of very complex processes.

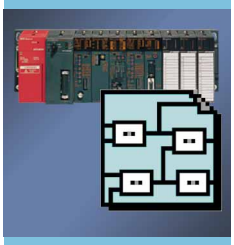
PLC's are equipped to handle only simple cases of feedback control; for more complex situations a different building block is used – a multiloop controller.

In practice, most of the industrial processes are partly discrete and partly continuous. Here, a combination of logic and feedback control is called for. Such processes are controlled by a combination of PLC's and multiloop controllers. The disadvantage of such systems is in complex data interchange, duplication of certain functions, and high price.

How to combine the advantages of PLC's with the higher functionality of multiloop controllers? The application of feedback control requires higher theoretical and technological knowledge, which by itself limits the use of multiloop controllers to professional process control engineers. It is therefore clear that this aspect, i.e. the ease of use is of greatest importance when combining a PLC and feedback control.

The answer for MITSUBISHI ELECTRIC PLC's is the IDR BLOK Process Control Tools software.





Reduces costs for your equipment with multi-loop controller in the PLC.

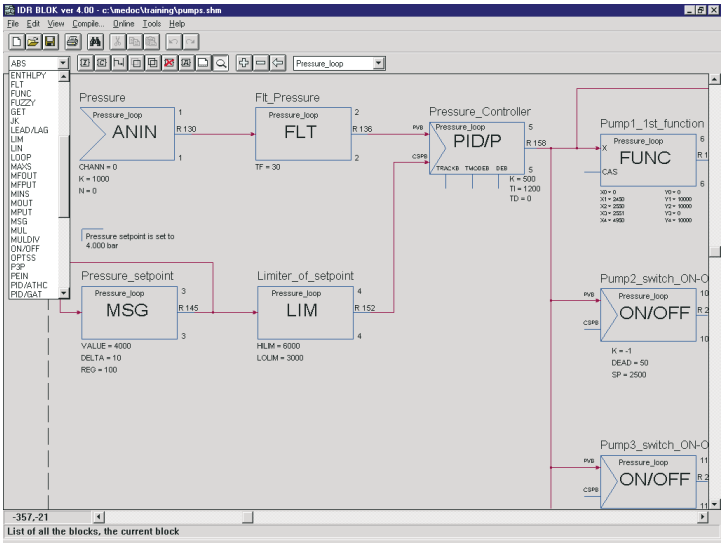
MITSUBISHI PLC and IDR BLOK – The perfect combination for multi-loop control in the PLC

The program package IDR BLOK enables the PLC to perform direct digital control (DDC) operations i.e. act as a multiloop controller.

To use IDR BLOK no specialised knowledge is necessary. The application program is written graphically by ranging and interconnecting various blocks, each with a unique function. The block structure and the mode of writing the programs is designed to model the way of thinking of the control engineer when designing control schemes:

- measure
- condition
- control
- actuate.

Thus it enables intuitive learning with a steep learning curve and extremely high programming efficiency and small expenditure of engineer's hours.



Writing and testing programs

The application program is written by ranging and interconnecting various blocks from the block library.

The above screenshot shows a detail in writing an IDR BLOK program: inserting a block from the block library.

Blocks are logically grouped in block groups, which are called loops. Each logical loop is assigned the period of its execution, i.e. the time interval between two consecutive executions of the loop, and the priority of the loop. The rate of execution of a block therefore depends on the loop it belongs to. Within one logical loop, several independent control loops, e.g. PID's can be implemented.

Each block has one or several inputs and one output value, which can be connected to the inputs of other blocks.

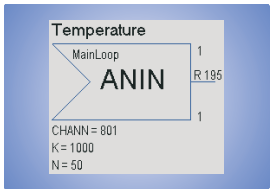
The schemes are structured into pages for direct printing and equipped with the document header data since the schemes represent control design documentation. The document header is pre-set to reduce the configuration time (but can be changed) and only commentaries have to be entered.

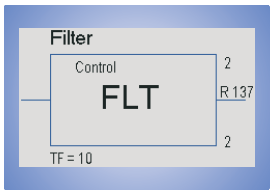
Testing of the written program is supported by the powerful on-line monitoring capability of the package. This means that all variables including the feedback control responses can be shown as real-time trends or numerical data tables and that all control parameters can be changed on-line during field testing procedure. This easy way of using the trial-and-error method in optimising the parameters further reduces the necessary theoretical knowledge.

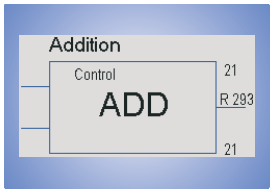
Types of blocks

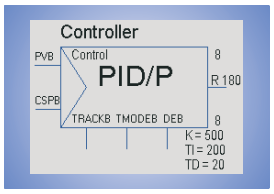
The types of blocks reflect the philosophy: measure, condition, control, actuate, as already stated. Ranged by function, there are six groups of blocks:

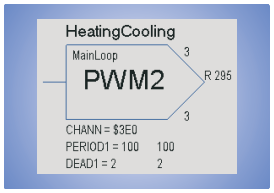
- Input blocks are intended for data acquisition of analog, digital and pulse signals from the process and conversion to engineering units.
- Function blocks perform various decision functions e.g. select input signals, search maximum or minimum value, makes average calculations, digital filtering of noise process signals, generates signals with help of look-up tables, etc.
- Arithmetical and logical blocks perform arithmetic and logic operations,
- Control blocks execute control algorithms such as PID with position and velocity algorithms, on-off controller, three-state controller, enthalpy controller, etc.
- Output blocks send commands to the actuators, make pulse width modulation outputs, etc.
- Auxiliary blocks perform miscellaneous auxiliary operations like limiting the block output value, ramp functions with limiting of block value change rate, data interchange with ladder program, make alarms with hysteresis on high and low process limits, etc.

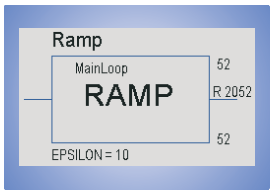






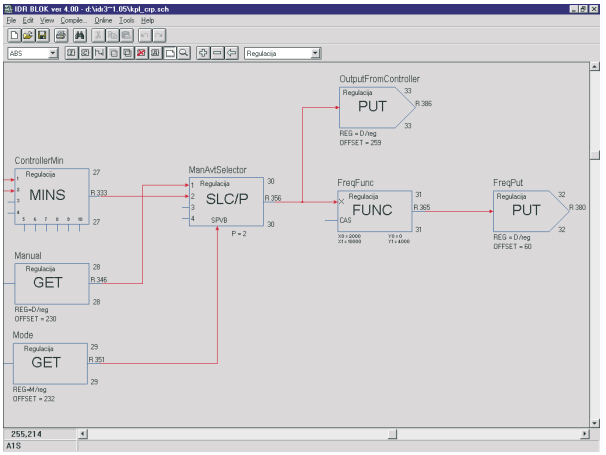


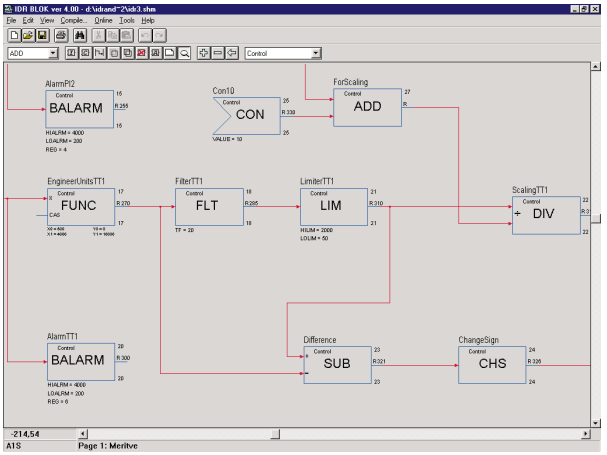




The advantages of systems implemented with IDR BLOK

The advantages of the systems implemented with the use of IDR BLOK are several: a better and simpler interconnection of logic and feedback control parts, no need for multiloop controllers (only PLC's), smaller price and higher reliability. Additionally, besides the classical PID feedback control other advanced forms of control can be implemented, e.g. feed forward control, cascade control, ratio control, Fuzzy control or auto-tuning control.





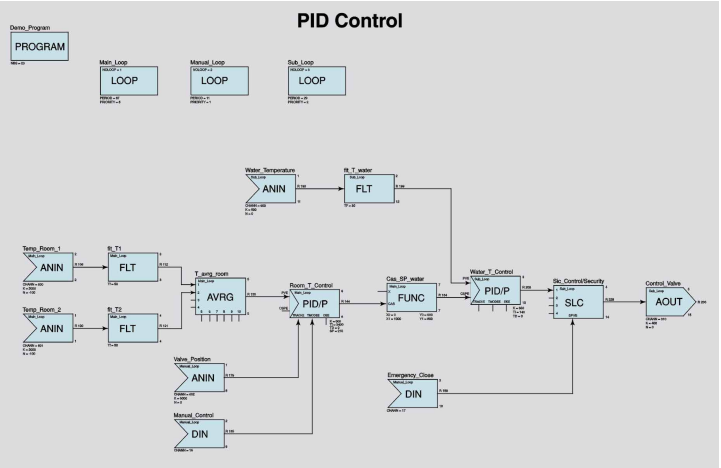
Advanced Control Algorithms in IDR Blok

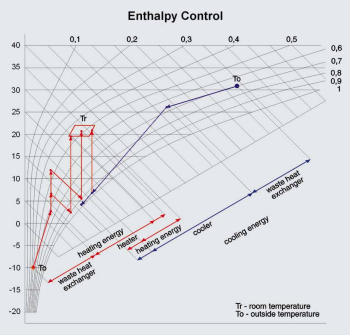
Easy draw and configuration of the control loops makes controlling of complex processes simple.

PID controller

The IDR BLOK program package is equipped with PID controller with position and velocity algorithms. The implemented PID algorithm has many features:

- Bumpless transition from manual to automatic mode,
- Output tracking,
- Anti-windup algorithm,
- Free selectable input for derivative part.





Enthalpy controller

The enthalpy controller is used to control HVAC devices. It calculates the optimum position of the mixing vanes for fresh and return air based on the energy contents of the air and the required energy flow rate for cooling or heating of the room. When the energy requirements are conflicting, i.e. when there is:

- simultaneous heating and drying or
- simultaneous cooling and humidifying,

the enthalpy controller takes into account the costs of the energy required for air preparation to optimise the vane position.

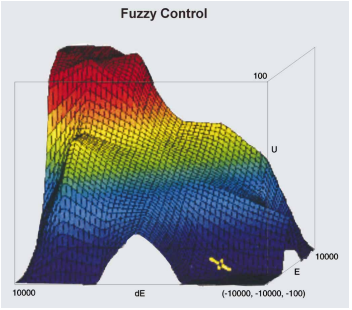
Fuzzy controller

Fuzzy logic controllers (FLC) are often used in control applications where conventional control techniques do not give satisfactory results. Fuzzy logic controllers enable the user to use his non-linear knowledge about the problem and transfer it to appropriate control action in a way that is close to human thinking.

The IDR BLOK Fuzzy logic controller editor enables the simulation during design phase and the changing of the parameters in IDR BLOK ONLINE mode.

The main characteristics of the implemented Fuzzy logic controller are:

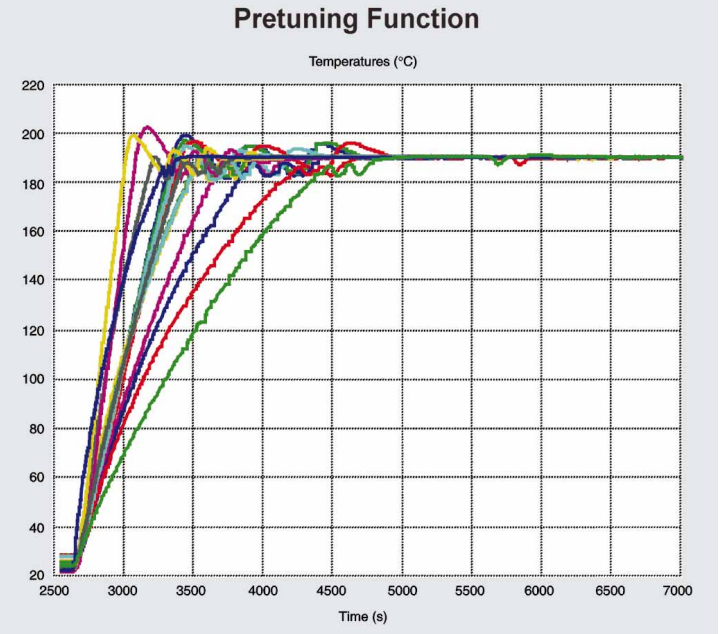
- FLC type: Sugeno 0 order,
- Number of inputs: 1 or 2,
- Number of outputs: 1,
- Number of segment for each input: 3 to 7,
- Shape of segments: triangular,
- Maximum input range: -10000 to +10000,
- Output range: -10000 to +10000.



Pre-tune algorithm

The pre-tune algorithm is a function that determines the most appropriate starting PID parameters during cold start?up of the machine. It is intended mainly to tune the control system automatically at the first start-up of the machine, after every significant service on the elements of the control system or after regular periodic maintenance of the machine. The main advantages of the implemented pre-tune algorithm are:

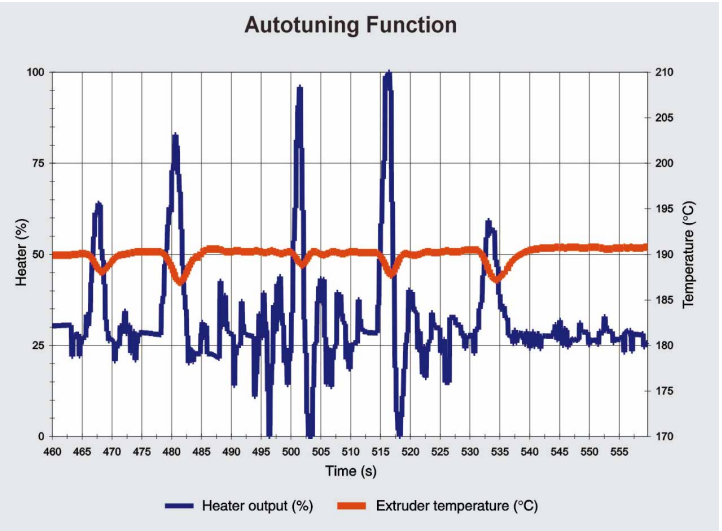
- When it is in the pre-tune mode, the controller is still working in closed loop,
- After the pre-tune is finished, user can see the calculated parameters of controller,
- Pre-tune algorithm is not sensitive to noise of input signal,
- Before pre-tune is started, the algorithm auto checks necessary conditions for start of the pre-tune algorithm.



Auto-tuning algorithm

The auto-tuning algorithm supervises the response of the control loop during normal operation. In case the response of the loop becomes worse than the predefined performance criteria, the algorithm starts to adjust appropriate control parameters to fulfil the requirements. The main features of implemented auto-tuning algorithm are:

- The system does not need artificial disturbances to start auto-tuning algorithm,
- The controller does not disturb the process,
- At all times user can see calculated parameters,



- Parameters of controller can be limited,
- Algorithm has 4 detectors:
  - noise measurement,
  - overshoot detector,
  - oscillation/decay detector,
  - long-tail detector.

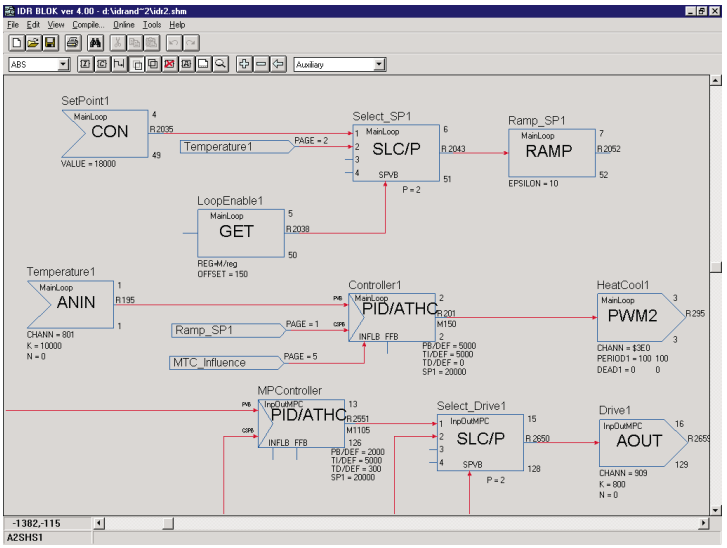
Numerous advanced control functions for user-friendly designing of process automation and control.

Development Products

IDR BLOK represents a user-friendly environment for designing control schemes for use in the fields of process automation and control. It is a system software package for MITSUBISHI programmable logic controllers (Plc's) series:

AnS/AnN PLC's, for running directly on the CPU as a microcomputer program, and all A and Q PLC's, for running on the IDR Co-processor module A1SD51S-IDR.

The program package IDR BLOK enables the PLC to perform direct digital control (DDC) operations. The PLC thus becomes suitable for various applications, e.g. acquisition of a greater number of process data and realisation of several complex control loops with up to 16 time bases.



The IDR application program is written by ranging and interconnecting various blocks. The block function is defined by the block type. The type of IDR BLOK package limits the total number of blocks that can be used in a program.

Three different software packages enable an easy entry into programming of all IDR BLOK functions.

Specifications		IDR BLOK 4.10 FULL	IDR BLOK 4.10 COMPACT	IDR BLOK 4.10 DEMO
IDR BLOK RT application runs on	CPU	AnSH, AnN*	AnSH, AnN*	AnSH, AnN*
	IDR co-processor A1SD51S-IDR	AnAS, QnAS, AnU, AnA, QnA*	AnAS, QnAS, AnU, AnA, QnA*	AnAS, QnAS, AnU, AnA, QnA*
Max. used blocks per application		1024	64	16
Program language		English	English	English
Special control blocks		Fuzzy, GAT, ATHC	Fuzzy, GAT, ATHC	Fuzzy, GAT, ATHC
Disk type		CD-ROM	CD-ROM	CD-ROM
Runs under		Windows 95/98/NT	Windows 95/98/NT	Windows 95/98/NT
Supported IDR modules		IDR10F-STD, IDR10F-ADV	IDR10F-STD, IDR10F-ADV	IDR10F-STD, IDR10F-ADV
Order information	Art. no.	129666	129665	on request
Accessories		See note		

* For the AnN, AnU, AnA and QnA series the following accessories are required: connection cable A1SC05NB (art.no. 24983) and extension base unit A1S52B-S1 (art.no. 39667). For more details refer to the technical catalogue of the AnU/QnA series.

FUZZY 4.10

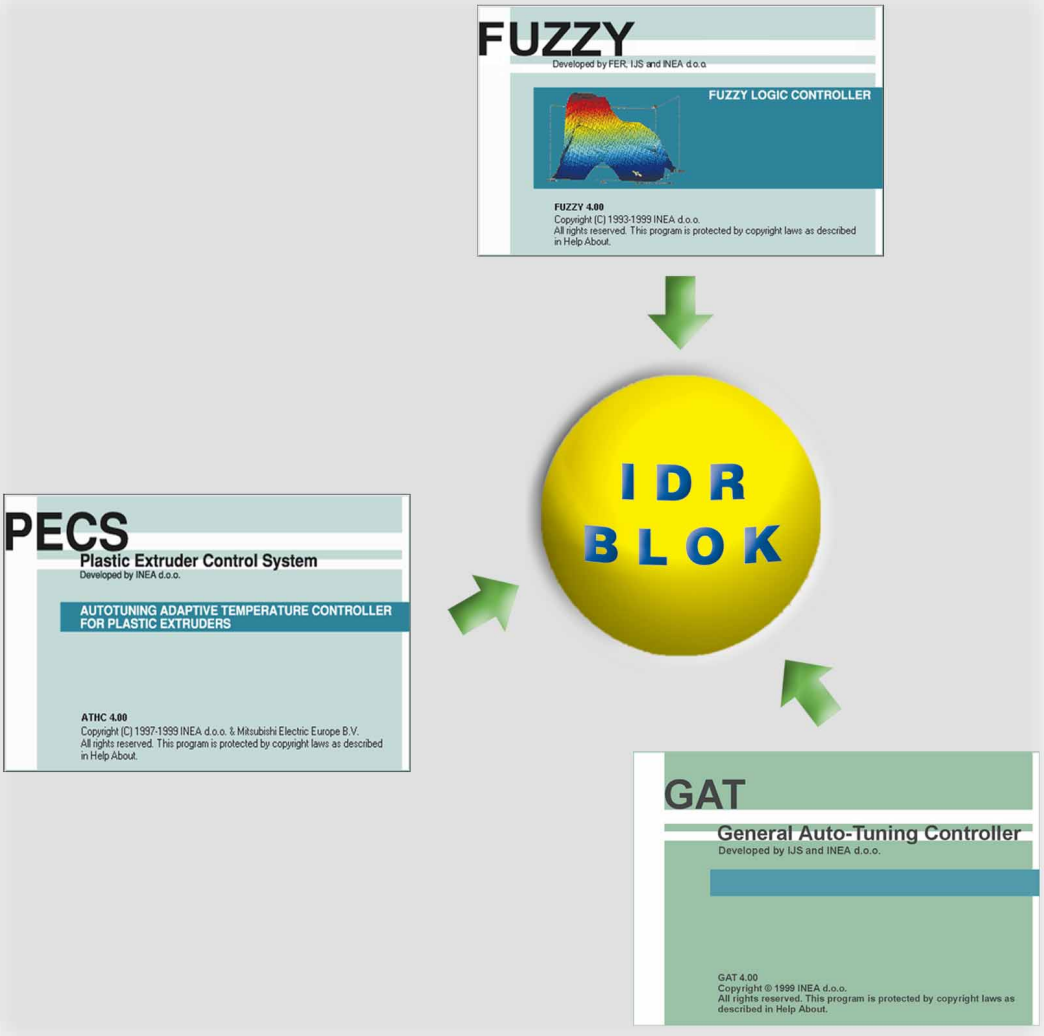
The Fuzzy Logic Controller (FLC) is often used in control applications where conventional control techniques do not give satisfactory results. The FLC editor enables the design and testing of FLC implementation by Fuzzy blocks in an IDR BLOK program. Parameters can be changed interactively in on-line mode.

ATHC 4.10

Autotuning Heating-Cooling (ATHC) controller is part of Plastic Extruder Control System (PECS) and is designed specifically for temperature control of plastic extruders. Each ATHC block is able to run dual mode control (heating and cooling) of any extruder zone. The ATHC controller has two functional features: pretuning and autotuning, both are used to optimise control parameters without any operator intervention.

GAT 4.10

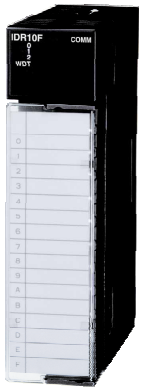
The General Auto-Tuning controller (GAT) is used in different process applications to reduce necessary engineering work with tuning of PID controllers. The GAT controller has two functional features: pretuning and autotuning; both are used to optimise control parameters without any operator intervention.



Advanced and powerfull forms of control increase your technology capability to your customers.

Run-Time Products

The function modules IDR10F enable the program to run after downloading the development software .



IDR Function modules IDR10F

The IDR function module IDR10F is an integrated necessary part of the run-time package.

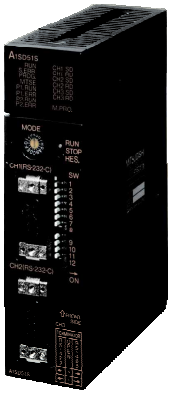
The IDR10F module has two sets of functions:

- To provide supervisory functions for the customer with digital output watch dog alarm signals.
- To protect IDR BLOK RT process control software technology.

Each IDR10F has a configuration code which defines if IDR BLOK special control blocks can be used or not.

Specifications			IDR10F-STD	IDR10F-ADV
IDR BLOK RT application runs on	CPU		AnSH, AnN*	AnSH, AnN*
	IDR co-processor A1SD51S-IDR		AnAS, QnAS, AnU, AnA, QnA*	AnAS, QnAS, AnU, AnA, QnA*
Program features	Max. used blocks per application		1024	1024
	Special control blocks		—	Fuzzy logic, GAT, ATHC
No. of occupied I/O points			16	16
Ext. power supply			12/24 V DC (20 mA)	12/24 V DC (20 mA)
Internal power consumption (5 V DC)		mA	120	120
Weight		kg	0.2	0.2
Dimensions (WxHxD)		mm	34.5 x 130 x 93.6	34.5 x 130 x 93.6
Order information		Art. no.	125359	129658
Accessories			See note	

The A1SD51S-IDR is the right platform in the PLC to run IDR BLOK application.



IDR Co-processor Bundle 1

is a run-time product consisting of:

- Co-processor module A1SD51S-IDR. This is a standard Melsec high-speed communication module A1SD51S with preloaded IDR BLOK interpreter.
- IDR Function module IDR10F-STD for up to 1024 blocks support.

IDR Co-processor Bundle 2

- is a run-time product consisting of:
- Co-processor module A1SD51S-IDR. This is a standard Melsec high-speed communication module A1SD51S with preloaded IDR BLOK interpreter.
- IDR Function module IDR10F-ADV for up to 1024 blocks support.

Specifications			IDR Co-Processor Bundle 1	IDR Co-Processor Bundle 2
Shipping contents			IDR BLOK Software, 1 x Run-time module IDR10F-STD, 1 x co-processor module A1SD51S-IDR module	IDR BLOK Software, 1 x Run-time module IDR10F-ADV, 1 x co-processor module A1SD51S-IDR module
IDR BLOK RT application runs on	CPU		AnSH, AnN*	AnSH, AnN*
	IDR co-processor A1SD51S-IDR		AnAS, QnAS, AnU, AnA, QnA*	AnAS, QnAS, AnU, AnA, QnA*
Program features	Max. used blocks per application		1024	1024
	Special control blocks		—	Fuzzy logic
	Software language		English	Language
Order information		Art. no.	87511	on request
Accessories			See note	

* For the AnN, AnU, AnA and QnA series the following accessories are required: connection cable A1SC05NB (art.no. 24983) and extension base unit A1S52B-S1 (art.no. 39667). For more details refer to the technical catalogue of the AnU/QnA series.

Main features of IDR BLOK Release 4

IDR BLOK Release 4 has undergone further changes and upgradings to expand its functionality with many new features.

Added new platform: Co-processor A1SD51S-IDR

With this new platform no microcomputer program area is necessary in the PLC to run IDR BLOK application. This means that IDR BLOK is running on AnAS and QnAS and also on AnA and QnA systems. Furthermore, on the CPU there remains more memory and more computer time for execution of the main sequence program, e.g. ladder program.

Application limits expanded

Application programs can use up to 1024 blocks. The limit is set by the amount of available file registers: 8 K file registers when the IDR BLOK application runs on the CPU (where PLC series allows it) and 4 K with the Co-processor platform.

Code is optimised automatically

Running code is optimised automatically when starting the compiling function, without any additional external programs (such as e.g. C compiler). Optimised code contains no memory overhead from unnecessary block libraries. It means more memory space for the main sequence application.

Additional Communication facilities

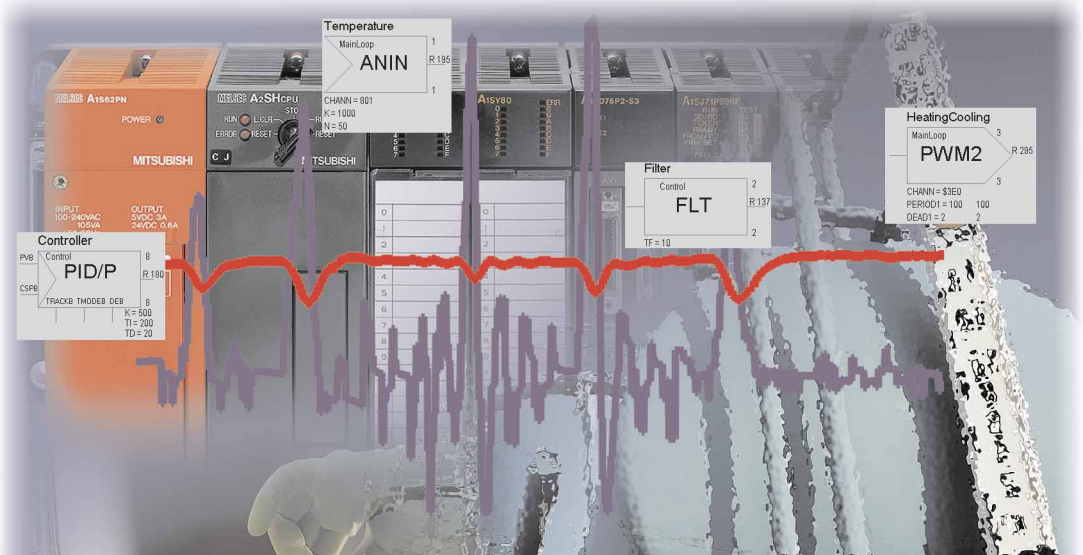
Communication is supported now also via MAC terminal using transparent mode. It means no switching of PLC programming cables and MAC cables when IDR BLOK requests monitoring and program downloading.

Ethernet communication is fully supported for download and on-line monitoring of the program. This facility provides completely new possibilities for remote download of the IDR BLOK application or on-line monitoring via local company Intranet or global Internet networks.

Other important features

The main additional features for the users are:

- Mapping the IDR BLOK program into microcomputer program area in memory EEPROM or EPROM cassette,
- Abolishment of the hardware personal computer dongle.



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