

Microprocessor-Based... User Programmable

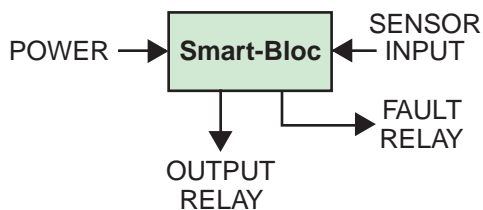
Smart-Bloc® I & Smart-Bloc® II LIQUID LEVEL CONTROLLERS

Power Supply, Signal Amplifier & Output Relay... All in One Compact Package!

FEATURES

- MICROPROCESSOR-BASED DESIGN
- COMPACT SIZE
- D.I.N. RAIL MOUNTING
- A.C. or D.C. POWERED
- USER PROGRAMABLE OPTIONS
- SINGLE OR DUAL SENSOR MODES
- USE LESS THAN 0.5 W. OF POWER
- 10.0 A. OUTPUT RELAY CONTACTS
- 0.5 A. FAULT RELAY CONTACTS
- L.E.D. INDICATION OF RELAY STATUS
- THRESHOLD ADJUSTMENT POT
- BUILT-IN HYSTERESIS

SCHEMATIC DIAGRAM



WHY MICROPROCESSOR CONTROL?

Microprocessor-based circuit design brings numerous advantages to a control product. Among these are simplicity, enhanced product features, smaller package size and lower power consumption. Because much of the control work is done within the micro itself, component counts are significantly reduced.

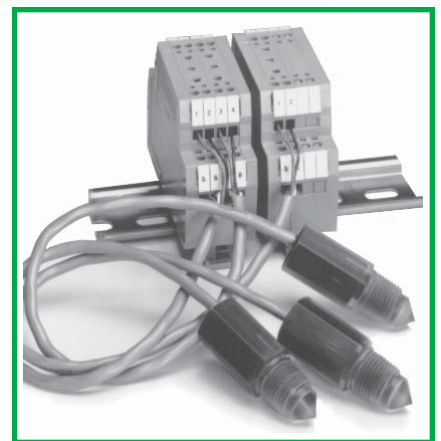


INTRODUCTION

SMART-BLOC® I & SMART-BLOC® II, microprocessor-based liquid level controllers are designed to operate with Kinematics' "basic-output", optoelectronic liquid level sensors. They provide a rugged industrial interface between the low-power sensors and the power-hungry, "real-world" devices, such as pumps and valves, which they control. Housed within a compact, D.I.N. rail mounting package is a transformer-isolated power supply, a pulse-modulated light source driver circuit, a signal amplifier and a heavy duty relay output, rated for 10 Amps @ 250 VAC. or 30 VDC.

The use of surface mount components further contributes to small size, *and* reliability because boards are automatically assembled. This means one thing...a Superior Product!

One with more features! One with greater reliability! One that is smaller in size! And, one that operates on just a trickle of power!



KINEMATICS & CONTROLS CORPORATION

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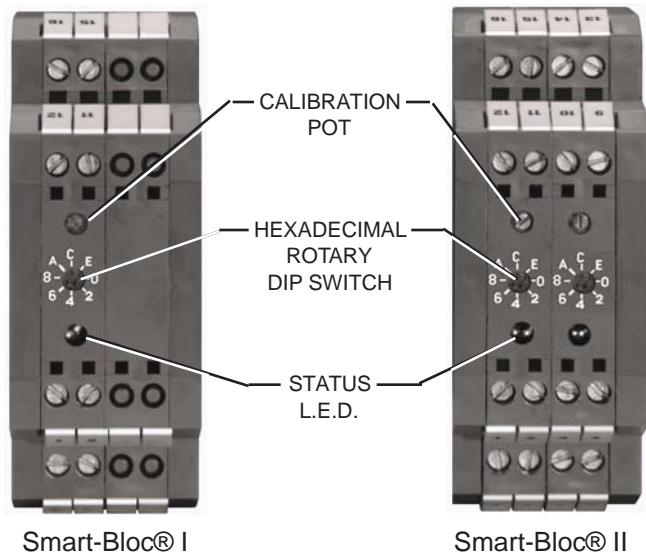
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USER PROGRAMMABLE OPTIONS

The “ON” or “OFF” state of a Smart-Bloc’s® output relay(s) is a function of the sensor’s WET/DRY state, *and* the mode of operation chosen by the user. All Smart-Bloc® controllers are user programmable by simply selecting a given position on the controller’s Hexadecimal rotary DIP switch. Eight (8) *Independent* modes of operation are selectable on *all* Smart-Bloc® models. Furthermore, Smart-Bloc® II controllers support two additional modes of operation, “Pump-Up” mode and “Pump-Down” mode.

Eight Independent Modes

Smart-Bloc® I liquid level controllers work with a single optoelectronic sensor in any one of eight *Independent* modes as listed below. Smart-Bloc® II controllers work with either *one* or with *two* sensors in any one of the same eight *Independent* modes. See table below.



HEX	MODE
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- | | |
|---|-----------------------------------------------------------------------|
| 0 | Norm. WET (energize DRY) Zero Delay MAKE, Zero Delay BREAK |
| 1 | Norm. WET (energize DRY) Zero Delay MAKE, 5 Sec. Delay BREAK |
| 2 | Norm. WET (energize DRY) 5 Sec. Delay MAKE, Zero Delay BREAK |
| 3 | Norm. WET (energize DRY) 5 Sec. Delay MAKE, 5 Sec. Delay BREAK |
| 4 | Norm. DRY (energize WET) Zero Delay MAKE, Zero Delay BREAK |
| 5 | Norm. DRY (energize WET) Zero Delay MAKE, 5 Sec. Delay BREAK |
| 6 | Norm. DRY (energize WET) 5 Sec. Delay MAKE, Zero Delay BREAK |
| 7 | Norm. DRY (energize WET) 5 Sec. Delay MAKE, 5 Sec. Delay BREAK |
| F | SENSOR DISABLE |

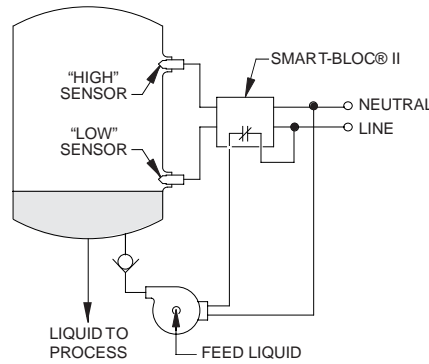
Dual Modes (Pump-Up & Pump-Down)

Smart-Bloc® II controllers are designed to operate with two, single-point optoelectronic sensors, or with one, dual-point sensor. Smart-Bloc® II will also support a single sensor working alone on either of the Smart-Bloc®’s two channels.

When two points are being monitored by a Smart-Bloc® II, the user may select one of the “Independent” modes of operation described above, or one of two “Dual” modes of operation, “Pump-Up”, or “Pump-Down” described next.

Pump-Up Mode

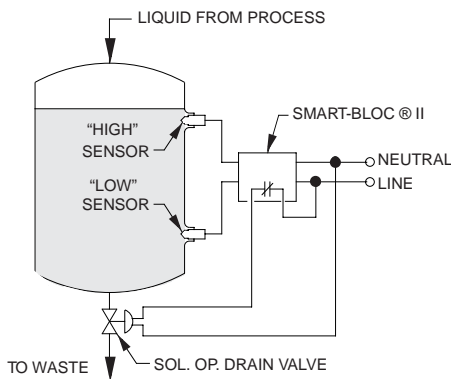
The “Pump-Up” mode is chosen when the level in a tank must be maintained between two points, *and* the process is normally depleting liquid from the tank. In this mode, the Smart-Bloc’s® output relay



contacts close *only* when both sensors are “DRY”, and open *only* when both sensors are “WET”. Refer to the diagram above. On start-up, the tank is empty and both sensors are “DRY”. Therefore, the Smart-Bloc’s® output relay contacts close to start the pump or to open a fill valve. Liquid enters the tank and continues to flow until its level reaches the upper sensor. Now, with both sensors “WET”, the relay contacts open to stop the flow. When the depletion process causes the liquid level to fall below the lower sensor, both sensors are again “DRY” and the filling action starts to restore the level to the higher point.

Pump-Down Mode

The “Pump-Down” mode is chosen when the level in a tank must be maintained between two points, *and* the process is normally adding liquid to the tank. In this mode, the Smart-Bloc’s® output relay contacts close *only* when both sensors are “WET” and open *only* when both sensors are “DRY”. Refer to the adjacent schematic. On start-up, the tank is empty and both sensors are “DRY”.



No action occurs because the relay contacts are open. As the process fills the tank, the liquid level eventually rises to a point

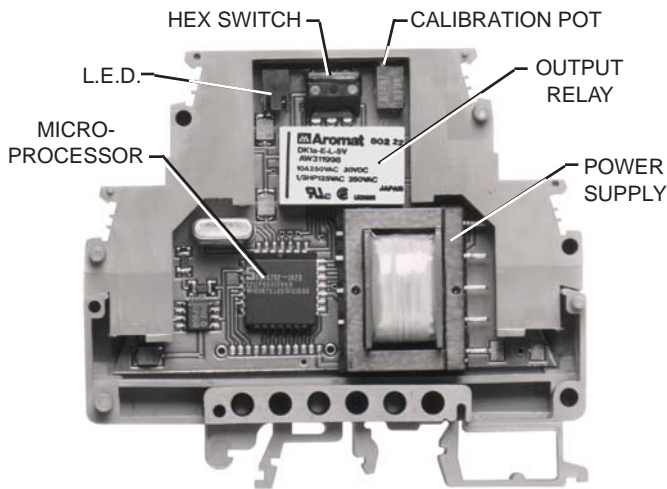
where both sensors are “WET”, and the contacts close to start a waste pump, or to hold open a drain valve until the level drops below the lower sensor. With both sensors now “DRY”, the relay opens to stop the draining process. The draining process resumes again when the process causes the level to rise above the upper sensor.

RELAY OUTPUTS

Smart-Bloc® I controllers have a single, 10 A., 1 Form A output relay. Smart-Bloc® II controllers have two of the same relays. When Smart-Bloc® II is operating with two sensors in any of the Independent modes, each of the two relays acts independently. When Smart-Bloc® II operates in either the “Pump-Up” or “Pump-Down” mode, both relays act together, resulting in a 2 Form A output.

STATUS L.E.D.'s

The "ON/OFF" status of the internal relays can be monitored by viewing the L.E.D.'s at the lower face of the Smart-Bloc®. If an L.E.D. is illuminated, the relay contacts for that channel are closed. A blinking L.E.D. indicates a faulty sensor.



CALIBRATION ADJUSTMENT

The switching threshold of each of the sensor channels is user adjustable by a 12-turn potentiometer. The pot's adjustment screw is accessible through a small screw-driver hole in the upper face of the Smart-Bloc.

LOW POWER CONSUMPTION

When we designed these controllers, low power consumption was one of our major objectives. Compare the 0.35 Watt requirement of Smart-Bloc® I, or the 0.50 Watt requirement of Smart-Bloc® II to the 5-6 Watts of power required to operate our closest competitor's controller and level sensors. The difference is a factor of ten! Low power consumption means a smaller-sized package, substantially less heat dissipation, fewer heat related failures and lower overall operating costs.

AMBIENT LIGHT IMMUNITY

Sensors that work along with either Smart-Bloc® I or Smart-Bloc® II controllers are virtually immune to false triggering by incident ambient light. The extremely high degree of ambient light immunity is attributable to several schemes. Pulse modulating the sensor's light source and filtering its return signal, along with our use of a microprocessor and some clever software are two of the way we almost totally factor-out the effects of spurious light.

FAULT OUTPUT RELAY

In addition to their two output relays, Smart-Bloc® II controllers have a 1.0 Amp. rated fault relay. Smart-Bloc® II controllers continuously monitor the functionality of each connected sensor and report their common condition as a relay output. Normally functioning sensors are characterized by *open* fault relay contacts. Failed sensors are reported as faults by *closed* relay contacts.

BUILT-IN HYSTERESIS

The microprocessor's software applies a slight amount of hysteresis to the sensor's output signal, assuring that the relay's switching is always crisp and free of chatter.

COMPACT SIZE

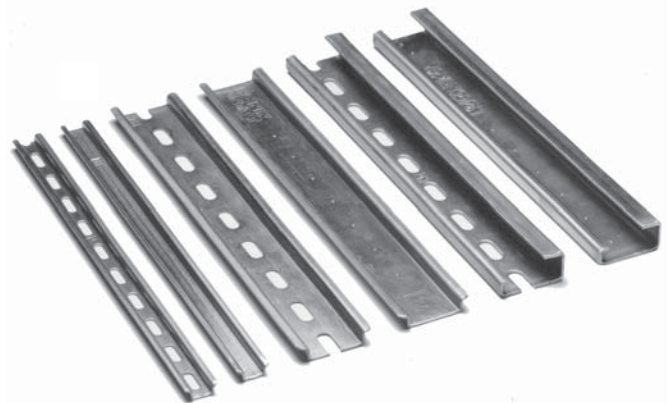
Kinematics' Smart-Blocs® have a neat, 1.16" Wide X 3.12" Long, footprint. This is especially important in densely packed control panels, where bulky components can waste critical space. Four sensors can be controlled



with two Kinematics Smart-Blocs® banked side by side in an area only 2.32" Wide X 3.12" Long. Our closest competitor can't provide control for even a single sensor in that space! His controller's footprint measures a whopping 4.56" Wide X 4.24" Long.

D.I.N. RAIL MOUNTING

Installing Kinematics Smart-Blocs® is a simple matter. They are universally D.I.N. rail mountable. However, to facilitate their mounting in control panels where a D.I.N. rail is not available, each Smart-Bloc® is shipped with it's own short segment of perforated D.I.N. rail. This enables the controller to be mounted directly to any flat surface with just two screws. Integral terminal blocks accept up to 12 AWG. wire.

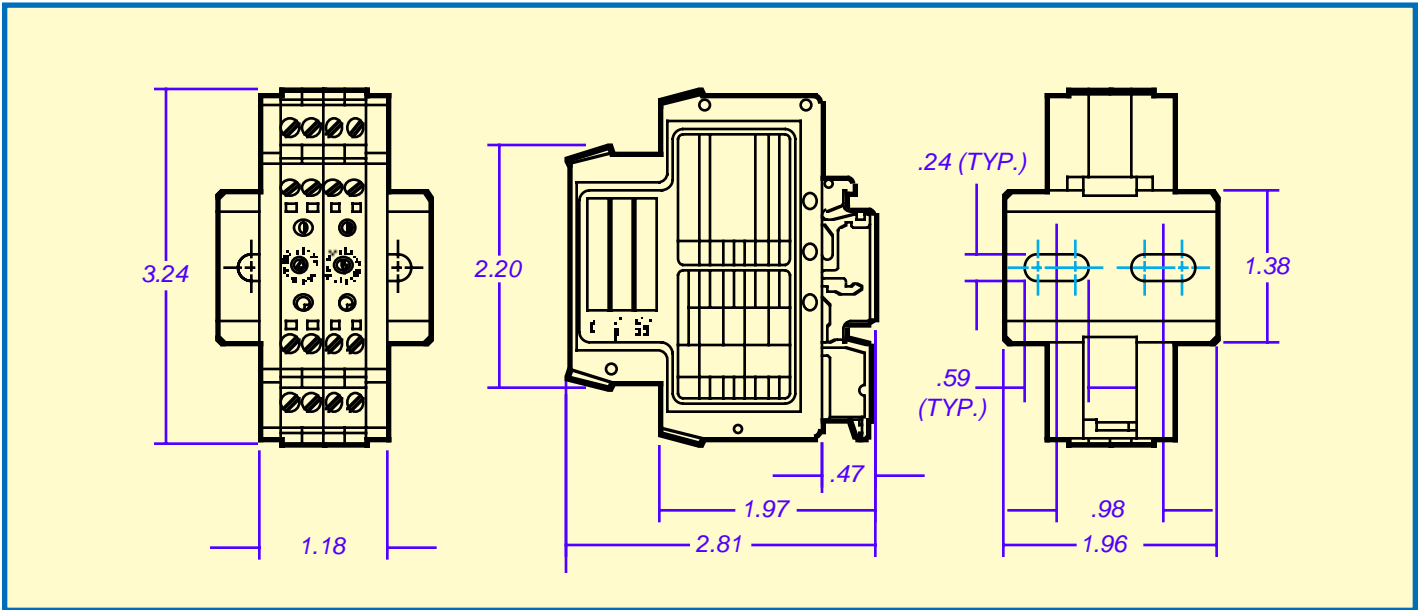


Kinematics offers full lengths of three standard D.I.N. rail cross-sections, in both perforated and non-perforated styles. Kinematics' Smart-Blocs® will mount directly to any of the three styles. Rail material is zinc-plated steel with a yellow chromate finish. Standard rail length is 2 meters (6'-6").

INTRINSIC SAFETY

Often it is necessary to monitor liquid levels in Class 1, Div. 1 & 2 environments. Kinematics' *Remote*-style liquid level sensors are considered *simple devices*, requiring no special approvals or wiring in these applications, so

long as long as they are used with proper current and voltage limiting. For such applications, Kinematics offers their I-S series of Smart-Blocs® which are modified for use with our recommended Zener® barriers.



ORDERING INFORMATION

Product Descriptions

	Order Part No.
• Standard "Smart-Bloc's"®	
"SMART-BLOC"® I, 115 VAC.	5131-0001
"SMART-BLOC"® I, 230 VAC.	5131-0005
"SMART-BLOC"® I, 8-28 VDC.	5131-0023
"SMART-BLOC"® II, 115 VAC.	5131-0003
"SMART-BLOC"® II, 230 VAC.	5131-0007
"SMART-BLOC"® II, 8-28 VDC.	5131-0025
• "Smart-Bloc's"® For Intrinsically Safe Applications	
I.S. "SMART-BLOC"® I-S, 115 VAC.	5131-0071
I.S. "SMART-BLOC"® I-S, 230 VAC.	5131-0072
I.S. "SMART-BLOC"® I-S, 8-28 VDC.	5131-0073
I.S. "SMART-BLOC"® II-S, 115 VAC.	5131-0074
I.S. "SMART-BLOC"® II-S, 230 VAC.	5131-0075
I.S. "SMART-BLOC"® II-S, 8-28 VDC.	5131-0076
• "Smart-Bloc"® Compatible Safety Barriers	
Dual Channel Zener Barrier	1027-0006

WARRANTY

All equipment described herein is warranted to the original purchaser for ONE YEAR from the date of purchase to be free from defects in materials and workmanship, but not against damages caused by misuse, negligence, accident or faulty installation.

When the equipment is installed and operated in accordance with factory recommendations and instructions, Kinematics & Controls Corporation will repair or replace, free of charge, any part of the equipment found to be defective, upon prepaid return of the part to the factory during the warranty period. In no event shall any liability or obligation of Kinematics arising from this warranty exceed the purchase price of the equipment.

All other warranties, whether expressed, implied or statutory such as warranties of merchantability or fitness for a particular purpose, are hereby excluded and disclaimed to the extent that they exceed the warranties expressly granted in this clause. In no event shall Kinematics & Controls Corporation be liable for consequential or incidental damage.

Seller's and manufacturer's only obligation shall be to replace such quality of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct or consequential arising out of the use or the inability to use the product. Before using, user shall determine the suitability of the product for his intended use, and user assumes all risk and liability whatsoever in connection therewith.

No statement of recommendation shall have any force or effect unless in an agreement signed by officers of seller and manufacturer.

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