



**Dynisco**  
Plastics

OPT • TROL

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## Extrusion Control System



# Extrusion Control System

## Overview

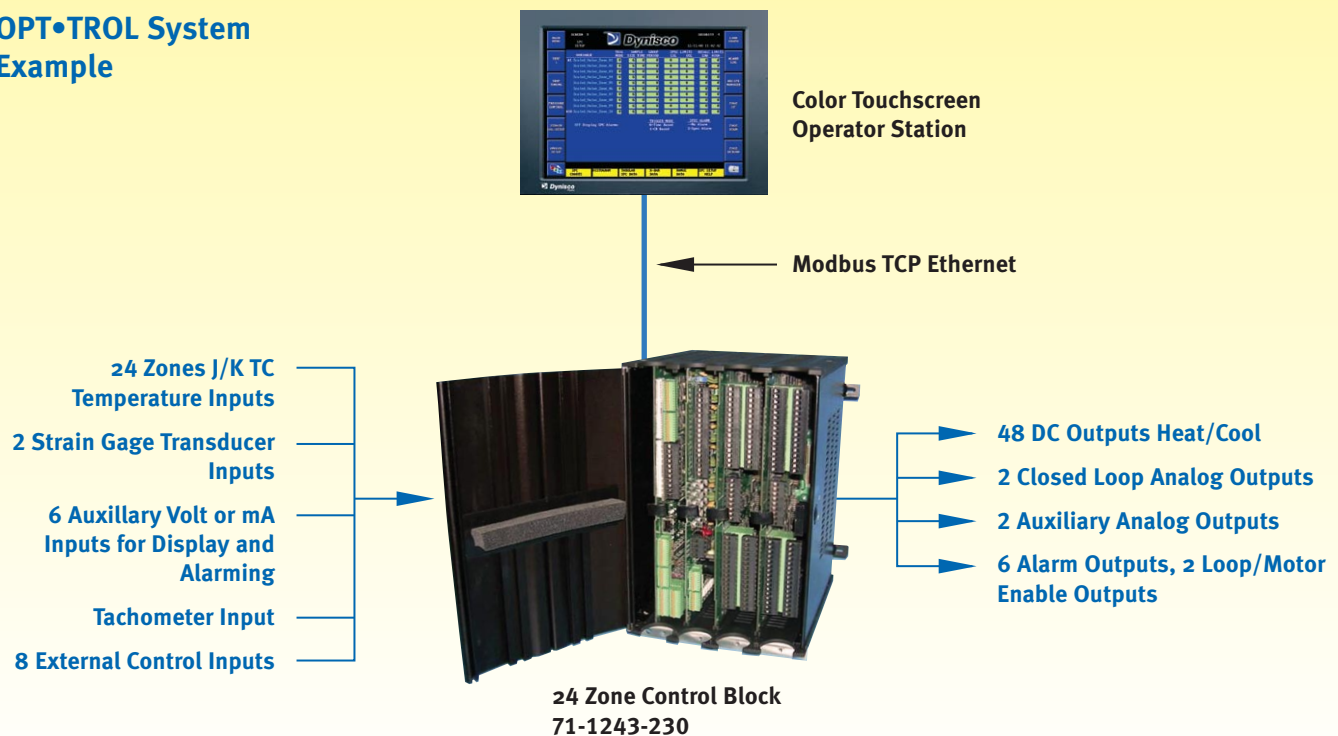
OPT•TROL™ (optimal control) is a true plug-and-play system specifically designed for small to medium extruders, but includes features found in larger extrusion control systems. Auto tuning temperature control has two low current 24Vdc outputs per zone, which will allow all zones to be heat only or heat/cool. The operator station includes a rugged LCD touch-screen with CE.NET operating system, Modbus TCP/IP Ethernet communication, and a 1GB flash back up memory stick as standard. The building block architecture of the Control Module allows a compact, lower cost-of-entry control solution for small to large extruders. Standard control system definitions save valuable engineering time and expense.

The system is preprogrammed to meet the user's requirements. The program is loaded, tested and a memory stick back up is supplied for true out-of-the-box performance. The temperature control card(s) is (are) designed specifically for single-screw, twin-screw, co-extrusion or blown film applications. Fully automatic adaptive temperature tuning (as well as conventional tuning) is provided. Predefined screens and sequence logic greatly simplify installation and setup. Recipes, screen captures and logging functions can be stored on various memory devices. Applications that match the

predefined screens and logic will not require additional programming. Includes real time clock and battery backup.

- Labor and material savings by wiring directly to I/O terminal blocks
- Robust hardware ensures fewer failures
- Higher productivity from advanced control architecture
- Scalable – one control solution for large and small machines
- Reduced installation costs
- Global – multi-lingual
- Internationally accepted IEC standards
- Small profile to reduce panel space
- Pre-configured screens and sequence for rapid start-up – saves time and expenses
- Adaptive auto-tuning for precision pressure and temperature control
- Differential Pressure display and alarming
- Alarm logging, data logging and trending for sophisticated data capture and analysis
- Ethernet communications simplify installations
- Recipe management for quick set-up and true plug-and-play operation
- Security passcode protection

## OPT•TROL System Example



# OPT•TROL® Operator Station

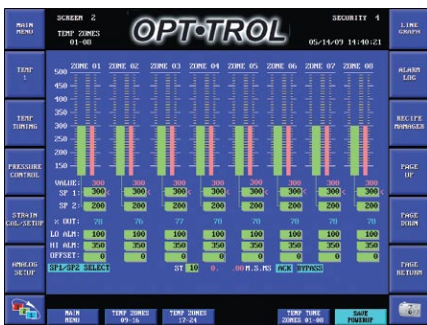
## Feature Overview

- High Speed Display Updates
- Ethernet Communications (Modbus TCP)
- Recipe Storage to USB Memory Stick or Compact Flash
- Online and Web Browsable RLD Diagnostics
- Closed Loop Control Updated Less than 1msec for Fast Response to Pressure Changes
- Large Color Touch Screen
- Statistical Process Control
- Multiple Language Capability

The OPT•TROL Compact operator interface is a sleek new flexible design that provides a cost-effective Human Machine Interface for the OPT•TROL control system. It is available with a 12.1-inch TFT display with 800 x 600

viewing resolution, as well as a touchscreen interface. The display is provided with a Strong ARM 200MHz processor equipped with up to 64M of Nand flash memory and runs on a Microsoft® CE.NET embedded operating system.

It is equipped with a real-time clock and battery backup. Ethernet communications are standard, with provisions for USB serial communications if required. There are two USB ports, one of which is on the front side of the display, as well as an optional compact flash for recipe and file storage. Screens are factory programmed by means of an enhanced OPTiGrafix screen editor. Line graphs can be created, displayed and stored to the compact flash. The display also has statistical process control capability with enhanced trending.



Temperature zones screen



Pressure control screen



Setpoint change log screen



Alarm log screen



Line graph screen



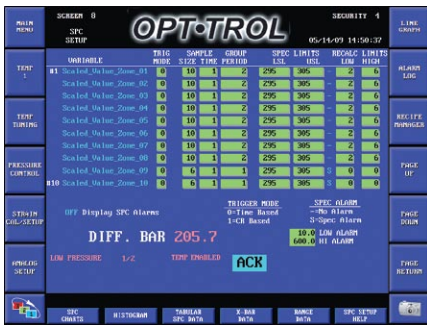
Recipe manager screen

# OPT•TROL Operator Station (cont'd)

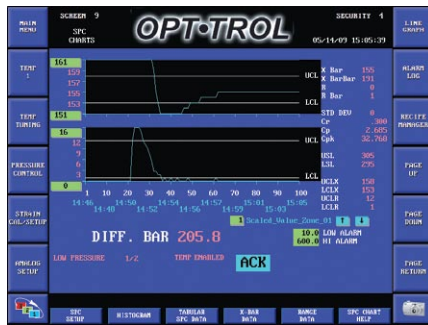
**Statistical Process Control (SPC)** is a software feature of the OPT•TROL control system. SPC provides for the simultaneous calculation of 10 different user selected parameters. Any process value from the system can be selected as an SPC parameter. Each of the 10 parameters allows selection of sample size, time or event triggering, time between readings, time between sample groups, upper and lower specification limits. The software will calculate and display each sample group's X-Bar, R, Cr, Cpk and Cp. The last 100 calculated values for each parameter will remain in the SPC buffer memory. SPC X-Bar and R charts, along with the last 100

samples, can be displayed on demand, event based, or automatically after 100 points have been gathered.

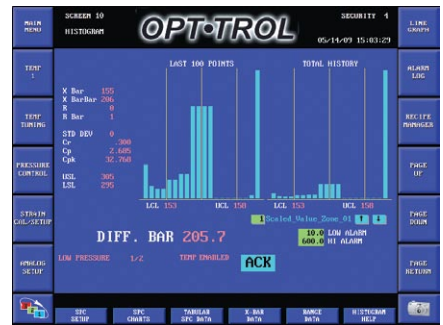
Titles for the parameters as well as the menus for the parameter choices are entered when screen programming is performed. Any value or setpoint from any controller can be used and 10 can then be selected for SPC data collection. Screens are also made available for X-Bar and R chart display and distribution curves.



SPC Setup Screen



SPC Charts Screen



SPC Histogram Screen



SPC Range Data



SPC X-Bar Data Screen



SPC Tabular Data

# Thermocouple/Analog Input Cards

## OPT•TROL Thermocouple Analog Card

Each T/C-Analog card is available with

- 16 Digital Outputs for Heat/Cool
- 8 Zones of Thermocouple Input
- 8 (Vdc or mAdc) Optional

The adaptive auto-tuning control lets you quickly bring temperatures to within 1°F of setpoint. Smart routines also watch for process high, low, deviation  $\pm$ , heater burnout, and thermocouple break alarms.

## T/C-Analog Card Specifications

Tuning:	Adaptive auto-tune, or user selectable manual
Setpoints:	Standby and run
Alarms:	Process hi/lo, Deviation hi/lo, TCB, HBO
Auto Comp:	On TC Break
Auto Start or Stop:	Via real-time clock
Number of Inputs:	8 per card
Isolation:	Channel to channel (220Vac, 50/60Hz)
Ref. Accuracy:	0.25% of span, $\pm 1^{\circ}\text{C}$
Range, Type J:	0 to 700°C (32 to 1292°F)
Range, Type K:	0 to 950°C (32 to 1742°F)
Range, Voltage:	(Analog versions only) 0 to 10Vdc
Range, Current:	(Analog versions only) 0 to 20mAdc
Alarms:	Process hi/lo, 2nd process hi/lo, Deviation $\pm$ , HBO, TCBreak
Control Mode:	Auto tuned PID. Manual tune available
Com Mode Rej:	135db @ 230Vac, 60Hz
Series Mode Rej:	60db @ 150mV, 60Hz

## OPT•TROL Control Block Only

System Power Input:	(Primary Power) Requires Class 2 Power Supply; 24Vdc, $\pm 5\%$ , 3A minimum supply
DC Outputs:	16; fused by groups of 4 (0.25A); 50mA max each output; Requires Class 2 Power Supply; 2A minimum supply

# Plug-In Cards

## OPT•TROL Strain Gage/Analog Input

Another significant feature of the OPT•TROL is the new plug-in card option. Dynisco has plug-in cards for encoder (pulse), pressure (strain gauge) and transmitter ( $\pm 10\text{Vdc}$ , 4 to 20mA) sensors.

### Analog Input Plug-In Card Specifications

Resolution: 16 bit  
 Accuracy: 0.1%  
 Sampling Rate: 100 samples per second per channel  
 Input Types: 0 to 40mV (with cold junction compensation)  
 0 to 10Vdc ( $\pm 15\text{Vdc}$  absolute maximum)  
 4 to 20mA (28mA absolute maximum)  
 2mV/Volt to 4mV/Volt (pressure transducer)  
 Output: Relay contacts, 10 milli-Ohm max (for pressure transducer calibration) (RCAL)

Excitation: Two isolated 10Vdc (350 Ohm bridge, 30mA max. load per excitation)  
 Open Sensor/Excitation detection  
 Input Impedance: Pressure/mV = 2 milli-Ohm; 0 to 10Vdc = 100k Ohm; 4 to 20mA = 137 Ohm  
 Isolation: 500Vdc channel-to-channel and channel-to-system  
 Connectors: Two 11 pin, plug-in receptacles with spring terminal connections (2.5mm spacing)  
 Signals (per Channel): (2) Excitation ( $\pm$ )  
 (4) Relay contacts and provision for external pressure transducer calibration resistor  
 (2) Pressure transducer/mV input ( $\pm$ )  
 (3) 0 to 10Vdc (+); 0 to 10Vdc/4 to 20mA (-);  
 4 to 20mA (+)

# Logic I/O Cards

## OPT•TROL

■ The OPT•TROL offers DC input and output cards to meet your specific machine requirements. The DC (24Vdc) input cards convert the machine signals into a form suitable for processing by the controller. DC (24Vdc) output cards convert controller output signals into a form suitable for machine interface.

Card Type	8 DC Inputs 8 DC Outputs
Operating Voltage	12 to 32Vdc, external
On Voltage	10Vdc
Off Voltage	5Vdc
Nominal Current	5mA
Indicators	Outputs have terminal status available as a status flag
Output Grouping	Terminal available for voltage sourcing output circuits
Isolation	Optically isolated as a card
Minimum Load	0mA
Maximum Load	2Amp
Maximum Leakage	1mA
Fuse	Each output thermally and over-current protected
Maximum Output per Card	10Amps

# Agency Approvals

## OPT•TROL 4 and 6 Slot Control Block

Device	UL	CUL	CE
Compact Operator Station	Yes	Yes	Yes
4, 6 Slot Compact Controller	Yes	Yes	Yes

CE Immunity Standards (includes all except Terminal I/O)	
Test Specification per EN 61326	Test Description
EN 61000-4-2	Electrostatic Discharge Class B response ±4kV Contact Discharge to any user accessible metallic location ±8kV Air Discharge to any user accessible non-metallic location
EN 61000-4-3	Radiated Susceptibility Class A response 10 v/m from 80 to 1000 MHz, sine wave modulated at 1 kHz to 80%
ENV 50204	Radiated Susceptibility Pulsed Carrier Class A response 10 v/m at 900 MHz ±5 MHz, square wave modulated at 200 Hz to 50%
EN 61000-4-4	Fast Transient Burst Class B response ±1 kv at 5 kHz rep rate using capacitive clamp for signal lines longer than 3 meters ±2.5 kv at 2.5 kHz rep rate using capacitive clamp for dc lines longer than 3 meters ±2 kv at 5 kHz rep rate using direct injection for ac lines
EN 61000-4-5	Surge Class B response ±2 kv each line to ground for ac lines ±1 kv line to line for ac lines ±1 kv line to ground for long distance signal lines
ENV 50141	Conducted Susceptibility Class A response 3 v rms from 0.15 to 80 MHz, sine wave modulated at 1 kHz to 80% for signal lines longer than 3 meters 3 v rms from 0.15 to 80 MHz, sine wave modulated at 1 kHz to 80% for dc lines longer than 3 meters 3 v rms from 0.15 to 80 MHz, sine wave modulated at 1 kHz to 80% for ac lines
IEC 61000-4-11	Voltage Fluctuations Class B response 100% voltage dip for 1 power cycle on ac power input only

CE Emissions			
Port	Frequency Range	Limits	Reference Standard
Enclosure	30 MHz to 230 MHz	40 dB (mV/m) quasi-peak measured at 10 meters	CISPR 16 CISPR 16-1
	230 MHz to 1 GHz	47 dB (mV/m) quasi-peak measured at 10 meters	
AC Mains	0.15 MHz to 0.5 MHz	79 dB (mV/m) quasi-peak 66 dB (mV/m) average	CISPR 16 CISPR 16-1
	0.5 MHz to 5 MHz	73 dB (mV/m) quasi-peak 60 dB (mV/m) average	
	5 MHz to 30 MHz	73 dB (mV/m) quasi-peak 60 dB (mV/m) average	

<b>Terminal I/O Block Equipment Definition</b>	Open Equipment (IEC 1131-2)
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