CD600 Plus

DIGITAL CONTROLLER
Multi-Loop

smar

The CD600Plus is a powerful stand-alone single-station process controller. It is capable of simultaneously controlling up to 4 loops with up to 8 PIDs and sophisticated strategies consisting of more than 120 function blocks.

It has a powerful multiple I/O channel hardware platform. In a single station, this high-end controller replaces as many as eight traditional controllers, numerous signal conditioning modules, and wiring. The high reliability of the CD600 has earned a great reputation from a wide range of high-end users. Thousands of these units are spread all over the world, in all industrial segments, from the most simple to the most complex control loop.

Designed, developed and manufactured by SMAR, with years of proven field experience reflected in this powerful and reliable instrument. It is characterized by its simplicity and application versatility.

Programming the control strategy is accomplished by interconnecting up to 120 pre-programmed blocks. Also by selecting one of the many complete preprogrammed control configurations strategies available.

The controller can be programmed using the CONF600Plus software. The CONF600Plus is a software that provides user-friendly graphic interface.

The CD600Plus has technical features that make it one of the most advanced and powerful multi-loop controllers available in the world market. It can be used as a stand-alone, or as part of system.

For example, a single unit is capable of controlling a complete boiler system with a 3 element level control, cross limit combustion control and draft control. The CD600Plus replaces single loop controllers, dual/cascade loop controllers, ratio control stations, bias stations, manual stations/loaders, setpoint programmers, batch controllers, display stations, and many other panel instruments and signal conditioners.

MAIN FEATURES

✓ Up to four independent control loops with up to eight PID functions.

✓ 8 analog inputs, 8 analog outputs, 8 discrete inputs and 8 discrete outputs.

✓ 72x144mm DIN panel with analog and digital indication in an 8 digit alphanumeric display for PV, SP and MV.

✓ Built-in 24Vdc 200 mA power supply for up to 8 field devices.

✓ More than 120 function blocks are available for user programming.

✓ Detachable terminal blocks, for easy maintenance.

✓ Easy data transfer between operator workstations and control systems through OPC.

✓ Built in isolated EIA-485 serial communication port.

✓ Adjustment of control options through the front panel.

✓ Depth of 25 cm.

✓ Work with ENET-710 for CDBUS/ TCP comunication.

The CD600Plus is less than 25 cm in depth, which means, that it can be installed in a low depth panel. The front, has DIN 43700 standard measures, easily replacing the old electronic or pneumatic controllers.

This is characterized by a universal AC/DC voltage switching power supply, which makes it light, small and appropriate for use anywhere around the world. Field I/O signals and communications are wired through plug-in connectors. The EIA-485 communication is isolated. The eight discrete inputs are galvanically isolated in order to avoid failures.

It has an internal watchdog and failure output. The discrete outputs have high current thermal and thermal protection. The controller has excellent EMI/RFI protection preventing effect from noise. Current input shunts and power fuse are external, allowing them to be changed without removing or opening the controller.

The CD600 provides enough power for up to 8 transmitters. Optionally the ISD600P external discrete output box provides intermediate relays for the discrete outputs.

Communication and OPC Supervision

The CD600Plus has EIA-485 communication as a standard feature, requiring no expansion board or gateway, where up to 29 controllers can be multidropped on a network. Even if communication fails, the CD600 still works as an independent controller.
Through the OPC Server the CD600s can be integrated with just about any process visualization software. Moreover, integrating auxiliary software such as auto-tuning, link to Office applications, statistical process control, and batch is easy. The industrially hardened ICS2.0P or any other interface converter can be used to connect the CD600 network to a PC.

To connect the CD600Plus to an Ethernet network, the ENET-710 interface is available.
A modern control system needs more than just engineering and operation software. Even more than inflexible "closed" applications and inaccessible data associated with other controllers and systems. As Information Technology (IT) is playing an increasingly important role in the process industry, OPC is the platform to build upon.

The CD600 OPC Server accesses the controllers on the EIA-485 network. Multiple users can simultaneously access the local server in the same workstation or remotely over the Ethernet. This enables real time data to be shared among workstations eliminating inconsistencies. All of the information in the controllers is made available to the OPC client applications.

OPC is a widely accepted industry standard client server technology for interchanging parameter values between applications. OPC eliminates the need for specific drivers for every HMI application. It opens up a wide, and fast growing, selection of auxiliary software from a vast array of suppliers. Using the OPC as a bridge, data can be exchanged with other sub-systems. The configuration tool automatically generates the communication configuration for the OPC server.

A block created in the CONF600 becomes available to client applications without additional driver configuration. From the client application just point and click to display a parameter. There is no need to retype any tags, therefore, eliminating problems with typing errors. All block parameters are shared throughout the system, hence there is no need to map or patch variables via drivers.


OPC Server

HMI OPC Client   HMI OPC Client

Tag List
Tag   Address

RS485/ TCP/IP

OPC Server and Device
OPC Client and OPC Sever

smar
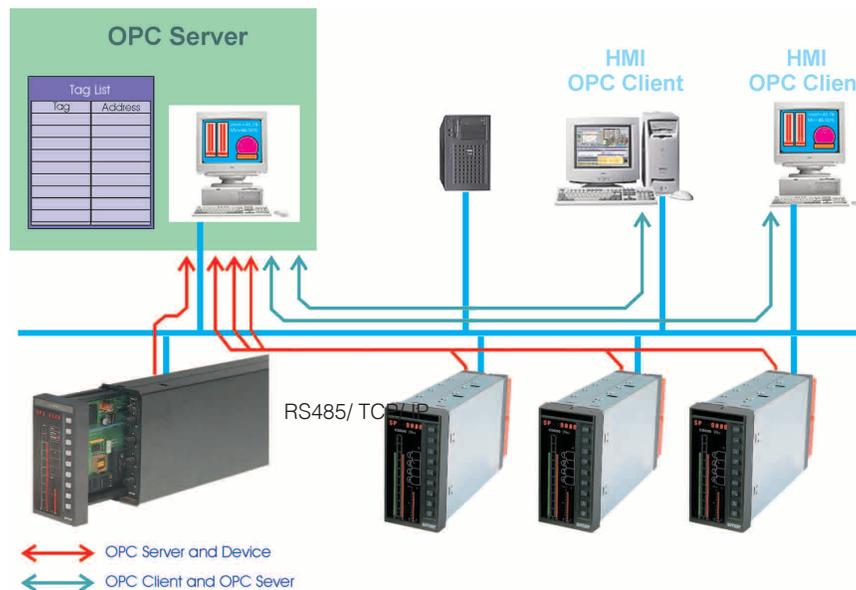
Front Panel

The front panel has two high-resolution 101-segment bar graphs side by side with different colors for easy distinction between SP and PV. The front panel functions as a virtual operator display for four loops with dedicated LEDs for mode and alarms. It is possible to switch local/remote, auto/manual mode, view and adjust setpoint, output and selected internal parameters including ratio and even alarm limits. Parameters are scaled in engineering unit and identified by a user configurable mnemonic. Loop tuning and alarm acknowledgement can also be done from the faceplate.

Tag Holder

Display Selection

8-Digit General Purpose dot-matrix Alphanumeric Display

Station Monitor

Loop Selection

Loop Monitors
- Loop number.
- Manual mode.
- Local mode.
- Alarm high and low.

Actuation for Setpoint, Ratio, Selected Parameters, etc.

Local/Remote

Alarm Acknowledgement

Auto/Manual

Bargraph:
Setpoint

Process Variable

Output

Manual Actuation
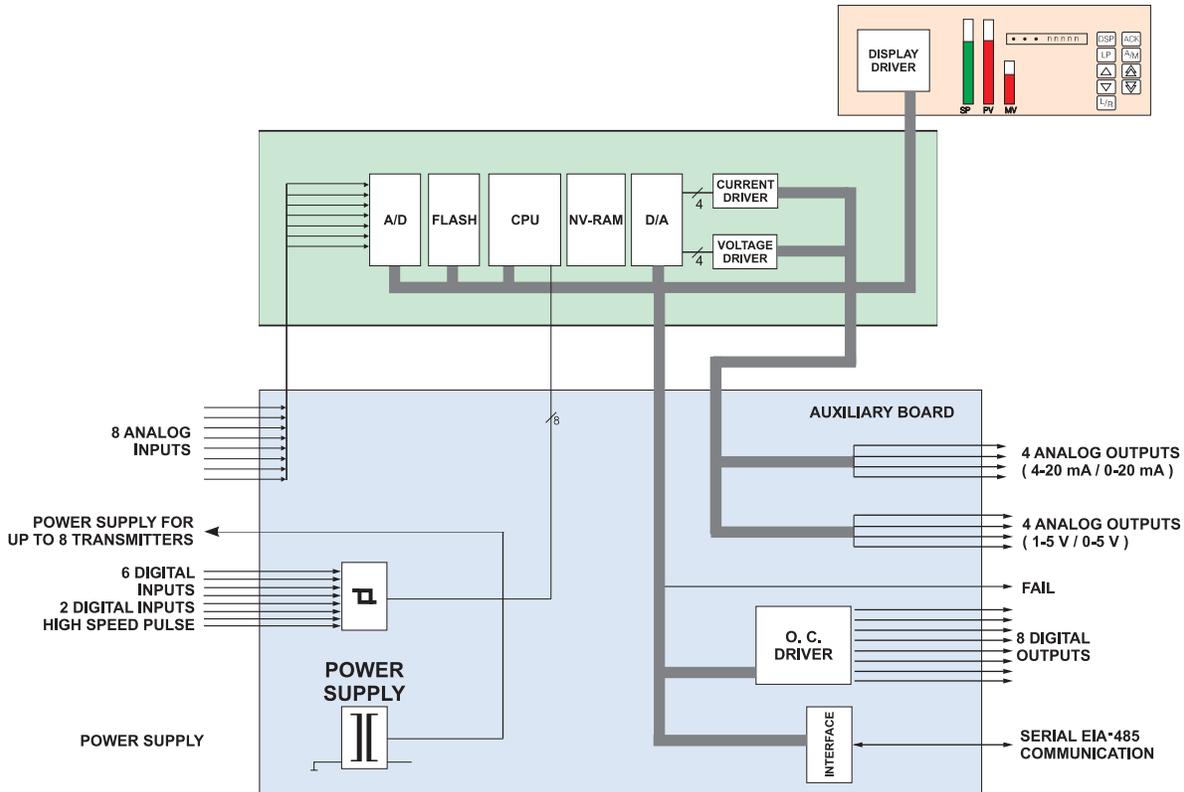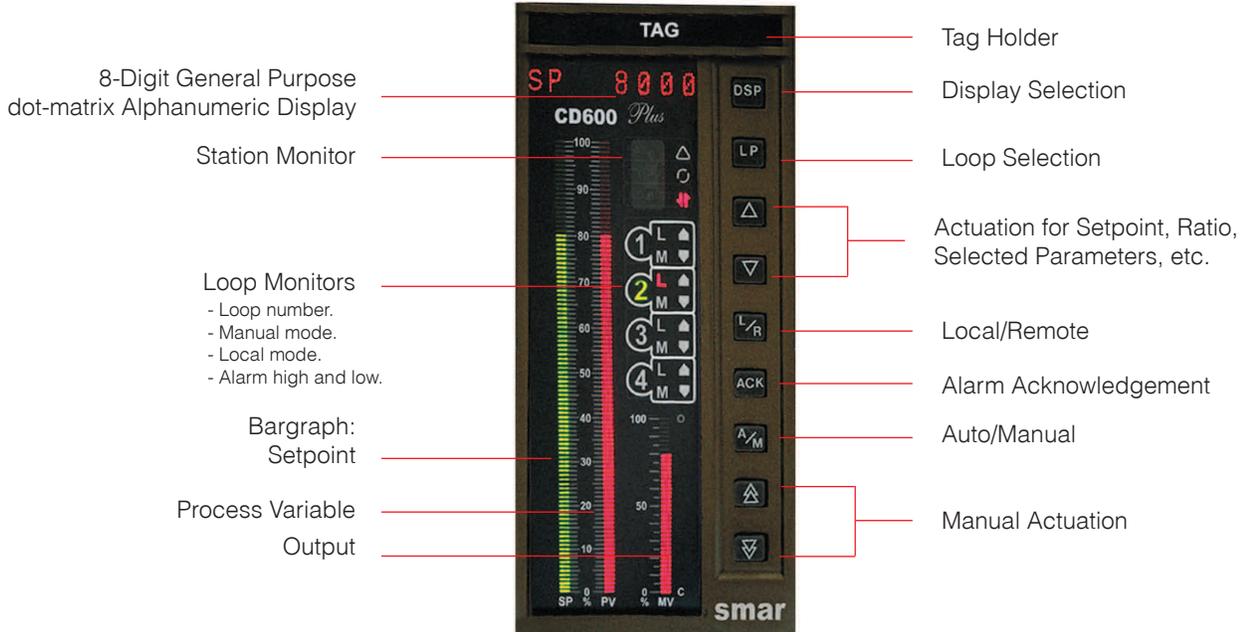
The CD600 has many more I/O points than regular single loop controllers. Enabling it to support not only four loops, but loops that have several auxiliary variables, input voting, and requires sophisticated interlocks. These are loops that cannot be controlled by single-loop controllers. These I/Os consist of:

8 AI: Current or voltage: 4-20 mA / 1-5 V / 0-20 mA / 0-5 V;
8 DI: 2 of which may have the frequency of up to 10 kHz;
8 AO: 4 for current 4-20 mA / 0-20 mA, 4 for voltage 1-5 V / 0-5 V;
8 DO: Open collector transistor;
Fail indication: Relay.

The CD600Plus is ideal for regulatory control with continuous or step output, but can also perform discrete Boolean logic, on/off control, and may also be part of batch applications.

It is a panel mounted single station controller with the power of a "micro DCS". When a regular single loop controller lacks the capacity, and a DCS is overkill or a PLC is unsuitable, the CD600Plus is ideal for the task.

Function Block Library

The CD600Plus's wide library of powerful function blocks, which makes it easy to build simple as well as sophisticated control strategies. This makes it a multifunction device, that among other things can do:

• Regulatory control: continuous PID control, PID step, ratio, tracking, override etc.

• Discrete logic: Boolean logic, timer, on/off control.

• Batch control: PID control, logic, setpoint ramp generation, timing, batch totalizer.

• Flow computing: Compensation, cumulative and batch totalization.

• Signal conditioning: Selection, switching, fixed and dynamic limiting, alarming, linearization, filtering, dynamic compensation, sample-hold, calculation etc.

Single loop controllers control only basic PID and cannot be programmed with sophisticated strategies.

Complex processes can be handled with gap control, nonlinear and scheduled gains, as well as sampling. In the past cascade and ratio loops require multiple controllers and auxiliary signal conditioners. The CD600Plus has 8 PIDs and comfortably handles four cascaded loops and many other functions at the same time.

The groundbreaking function block language in this versatile controller allows sophisticated control strategies limited only by your imagination to be built. The CD600Plus enables an exceptionally large degree of freedom of configuration and tailoring to process needs. Bumpless transfers without oscillation, reset windup protection, safety, and restart conditions are all handled internally.

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CD600 *Plus*

TERMINALS

F01 - ANALOG INPUT (AI)
BLK 001/002/003/004/005/006/007/008

18A / 17A
16A / 15A
1B / 2B
3B / 4B

CALIBR. · DIGITAL FILTER · CURVE n · CH1 · CH2 · BURNOUT

1/3/5/7/9
11/13/15
2/4/6/8/10
12/14/16
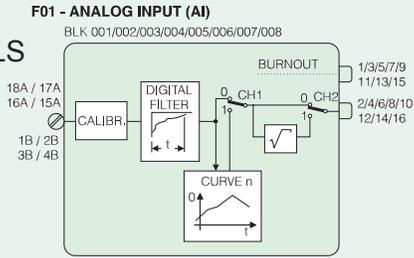
F02 - CURRENT OUTPUT (CO)
BLK 009/010/011/012

A · CALIBRATION · CURRENT DRIVER · FEEDBACK · DEVIATION

6B/7B/8B/9B
17/18/19/20
0 %
100 %
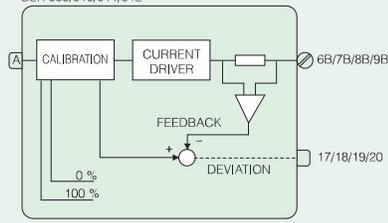
F03 - VOLTAGE OUTPUT (VO)
BLK 013/014/015/016

A · CALIBRATION · VOLTAGE DRIVER

13A/12A
11A/10A
0 %
100 %
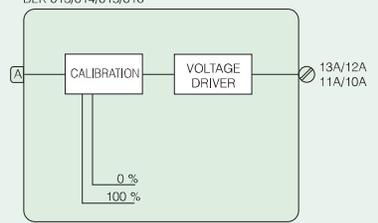
LOOPS

F09 - ADVANCED PID (APID)
BLK 039/040/041/042

A SP
B PV
SP PV DEV OUT
C EXT
D FEEDBACK
CURVE n
PI,D PID I,PD SAMPLING
GAIN
DEVIATION WITH TIME-OUT ALARM
TRACK FB
E

47/49
51/53
48/50
52/54
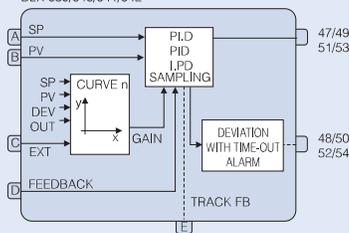
F10 - SIMPLE PID (PID)
BLK 043/044/045/046

A SP
B PV
C FB
PI,D PID I,PD
TRACK FB
D

55/56
57/58
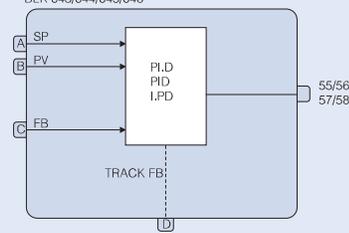
F11 - STEP CONTROLLER (STEP)
BLK 047/048/049/050

A ΔMV
CH1
LAST OPEN CLOSE
STEP ON/OFF
MANUAL
B C
ON
OFF

59/61
63/65
60/62
64/66
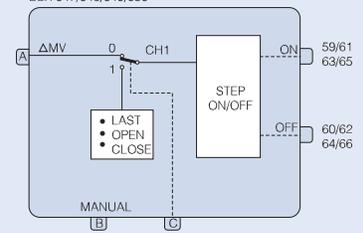
F16 - PRESSURE AND TEMP. COMPENSATION (PTC)
BLK 063/064

A P
B t
C Q_L
D Q_H

$GÁS: Q_L = Q \sqrt{\dfrac{P}{T}\dfrac{K}{AP+BT+C}}$

$LIQ: Q_H = Q \sqrt{\dfrac{A+BT_f+CT_f{}^2}{K}}$

79/80
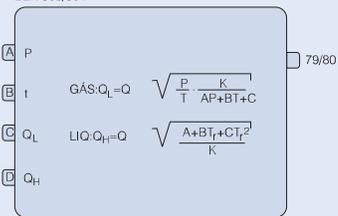
F17 - POLYNOMIAL (POL)
BLK 065/066

A
B
C

F0) A-B

F1) $K_4(A-B)^4 + K_3(A-B)^3 + K_2(A-B)^2 + K_1(A-B) + K_0 + C$

F2) $K_3A + K_2B + K_1C + K_0$

81/82
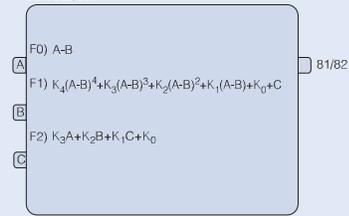
F18 - TOTALIZATION (TOT)
BLK 067/068/069/070

A
$\int \dfrac{MFL}{100} \cdot Adt$
4 DIGITS + UPPER
4 DIGITS - LOWER
CLEAR
B

ΔI
83/85
87/89
84/86
88/90
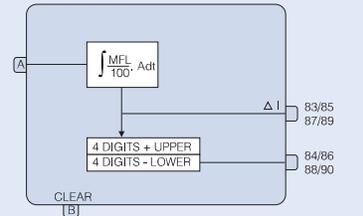
F26 - HIGH / LOW SELECTOR (H/L)
BLK 093/094/095/096

A
B
C
SELECTOR
INVERTER
D

HIGH
139/141
143/145
LOW
140/142
144/146

F25 - TIMER (TMR)
BLK 091/092
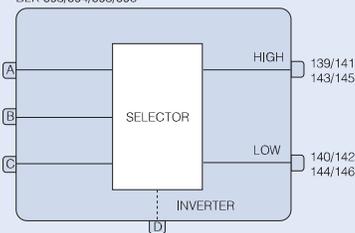
INPUT
1
2
3
4
5
A
OUTPUT
137/138
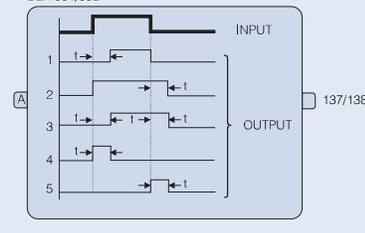
F29 - INPUT SELECTOR (ISEL)
BLK 103/104/105/106

A
B
CH1
C

237/238
239/240
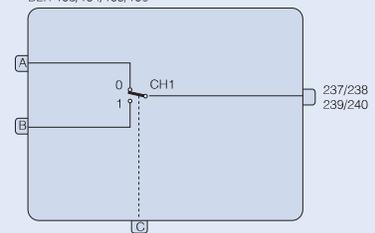
PANEL

F06 - FRONT VIEW (FV)
BLK 027/028/029/030

A
B
C
D
E
F
G
DSP
SP PV MV
COUNTER 4/8 DIGITS
BARGRAPH FLASHING
H
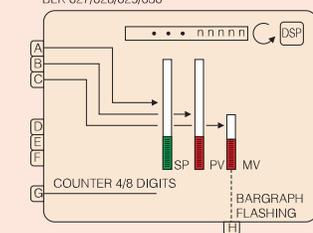
F07 - LOCAL / REMOTE SP SELECTOR (L/R)
BLK 031/032/033/034

A
B
RATE-OF-CHANGE LIMITER
L/R
0-R 1-L CH1
0-R 1-L CH2
DSP
REGISTER
REMOTE
LOCAL
C

225/226
227/228
31/33
35/37
32/34
36/38
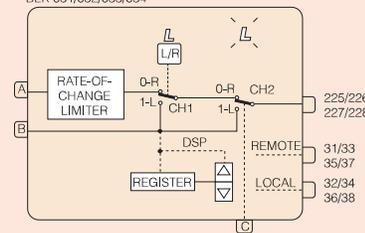
F08 - AUTOMATIC / MANUAL STATION (A/M)
BLK 035/036/037/038

A
B
CH3
RATE-OF-CHANGE LIMITER
A/M
0 1 CH1
0 CH2
MANUAL
C D

39/41
43/45
40/42
44/46
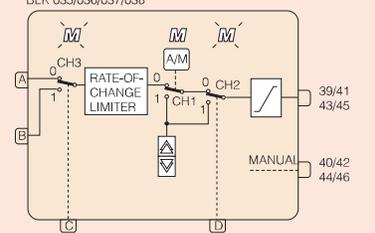
GENERAL

F31 - LINEARIZATION CURVE (PNT)
BLK 109/110/111/112/113/114/115/116

X	Y
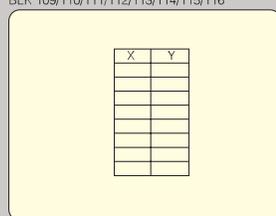
F32 - GENERAL VISUALIZATION (GV)
BLK 117

A
B
C
D
00000000
DSP

F33 - CONSTANTS (K)
BLK 118

K01	151
K02	152
K03	153
K04	154
K05	155
K06	156
K07	157
K08	158
K09	159
K10	160

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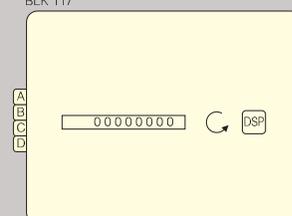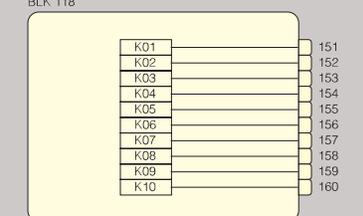
F04 - DIGITAL INPUT (DI)
BLK 017/018

3 - 24V OR OPEN CONTACT (HIGH LEVEL)
0 - 1,7V OR CLOSED CONTACT (LOW LEVEL)

11B
12B

CH1
0
1

21/22
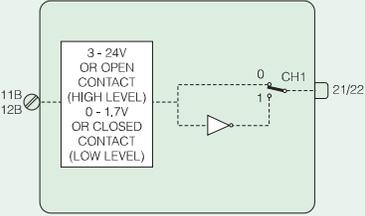
F05 - DIGITAL OUTPUT (DO)
BLK 019/020/021/022/023/024/025/026

0 3
1 4
2 5

CH1
0
1

A B C D

6A/5A
4A/3A
13B/14B
15B/16B

23/24
25/26
27/28
29/30
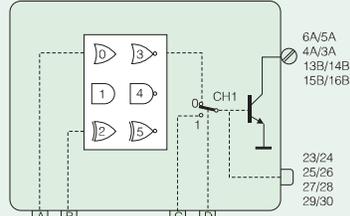
F19 - PULSE TOTALIZATION INPUT (P/DI)
BLK 071/072

8A/7A

DIGITAL INPUT 0 CH1
2

PULSES FSV FACTOR $\frac{1}{FE}$ TOT v

DENSITY A

Δ I B

X TOT m

CLEAR C

Δ I

91/95
92/96
93/97
94/98
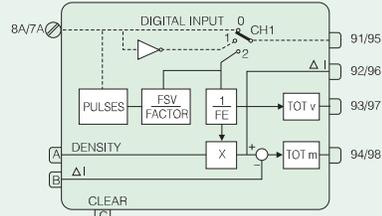
F37 - DIGITAL INPUT WITH CONTROL TEMPORIZATION
BLK 122/123/124/125

32/31
30/29

HIGH LEVEL · 5 - 40 V OR OPEN CONTACT

0 CH1
NOT
1

0 CH1
TIME DELAY
1 NOT CH2

A

171/173
175/177

172/174
176/178
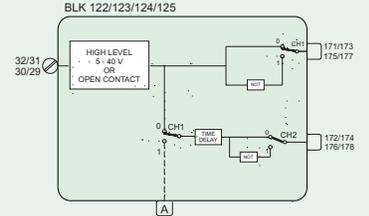
F12 - MULTIPLIER-DIVIDER-ADDER-SUBTRACTOR (ARTH)
BLK 051/052/053/054/055/056

A
B
C
D

$$\frac{G1 * A * (B + BIAS\ 1)}{(C + BIAS\ 2)} + G2 * D + BIAS\ 3$$

67/68/69
70/71/72
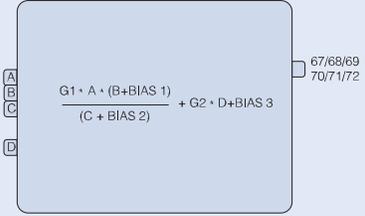
F13 - SQUARE ROOT (SQR)
BLK 057/058

A

73/74
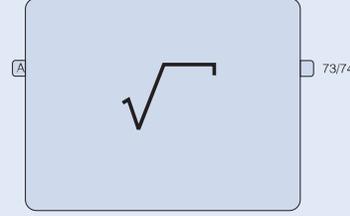
F14 - LINEARIZATION (LIN)
BLK 059/060

CURVE n

OUTPUT

INPUT

A

75/76
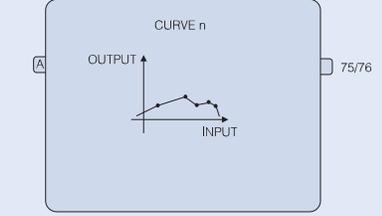
F15 - DERIVATIVE / LEAD-LAG (LL)
BLK 061/062

A

$$\frac{T_D\ S}{1 + T\ s} \qquad \frac{1 + T_D\ S}{1 + T\ s}$$

77/78
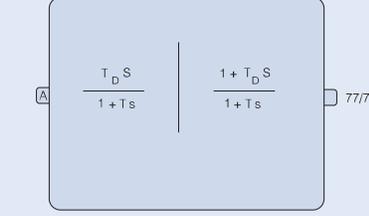
F20 - BATCH COMPARATOR (BAT)
BLK 073/074

A Δ I $\frac{1}{G1}$ CYCLE TIME

BAT 1 B1

TOT

B 0 - 32000 BAT 2 B2

CLEAR START
C D

99/103
100/104
101/105
102/106
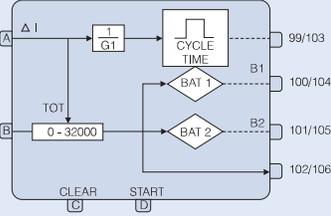
F22 - DOUBLE ALARM (ALM)
BLK 077/078/079/080

A LOW HIGH EQUAL
B RG1 + B

C LOW HIGH EQUAL
D RG2 + D

111/113
115/117

112/114
116/118
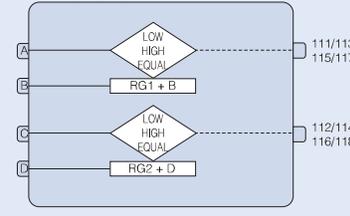
F23 - LIMITER WITH ALARM (LIMT)
BLK 081/082/083/084

A $G_L * B + B_L$

i
O

$G_H * B + B_H$

LIMITER ALARME

RATE-OF-CHANGE ALARM

B

t

119/122
125/128

120/123
126/129

121/124
127/130
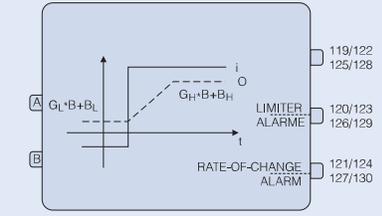
F24 - LOGIC (LOG)
BLK 085/086/087/088/089/090

0 3
1 4
2 5

A B C

131/132/133
134/135/136
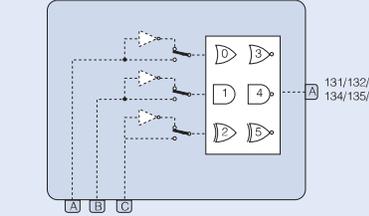
F30 - OUTPUT SELECTOR (OSEL)
BLK 107/108

A CH1 0
1

B

147/149

148/150
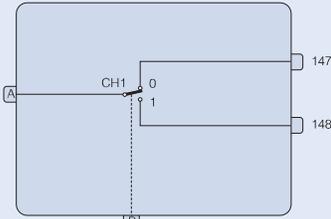
F21 - SETPOINT GENERATOR (SPG)
BLK 075/076

A DEVIATION

O CURVE n t O

PAUSE

B REGISTER TIME PROGRAMMER

DSP

PAUSE RESET
C D

END

107/109
229/230
108/110
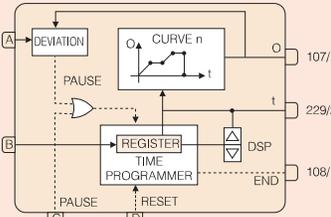
F27 - INTERNAL / EXTERNAL SELECTOR (SSEL)
BLK 097/098

A 0 CH1
1

DSP

REGISTER

B

231/232
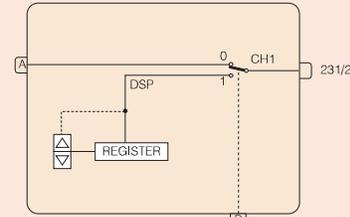
F28 - CONSTANT ADJUSTER (ADJ)
BLK 099/100/101/102

DSP

REGISTER

233/234
235/236
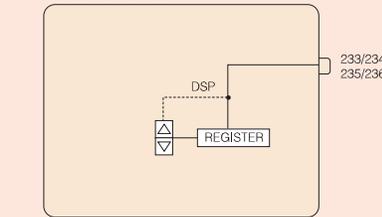
COMMUNICATION
BLK 119/120/121

F34 - 119 - SCAN (SCN)

F35 - 120 - SCAN / ACTUATION PID (PRM)

F36 - 121 - ACTUATION (ATU)

smar
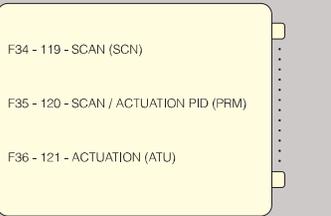
The programming tools provide offline control strategy building and online parameterization, calibration, tuning, troubleshooting, and monitoring all in a single application. Offline configuration allows creation of the strategy even before the installation of the controller, giving a head-start on the project. Online monitoring, tuning, parameterization, diagnostics and calibration, shorten the plant start up time.

CONF600Plus Programming Software
The CONF600Plus is a system control strategy programming with easy to use graphic interface. It can store configurations on a disk, print function block diagrams, control strategies, parameter listings and can communicate with the CD600Plus as well as the old CD600. It is also possible to upload strategies from the CD600 to the CD600Plus. The change of parameters can be done on-line. The inputs and outputs of each block can be monitored simultaneosly on-line.

CONF600Plus runs on the Windows NT operating system, which is the powerful basis for the information architecture for today's control systems. Windows is in fact the standard for workstations. The CONF600Plus takes full advantage of the popular Windows NT operating system including graphics on all kinds of display devices, mouse and other pointing devices, an almost infinite selection of fonts, and printing, on just about any printer etc.

The configuration of a control loop is made graphically, through diagrams similar to the ISA P&I diagrams, enabling the user to easily implement and visualize the control strategy.
Inserting and linking blocks is a point-and-click operation. You can quickly build the control strategies you need for optimum control.

Controllers in Multidrop, are named by tags for easy identification. Because configurations can be saved on disk and printed, projects are easy to manage and document.

The documentation process is traditionally a very time consuming task in project engineering. To manually document the work, or do it in a third party software, is too time consuming and costly, and is error prone. Therefore the CONF600 software has full documentation capability built-in, allowing you to document as you are configuring. The documentation including graphics and parameter listings is generated automatically, ready for printout any time, and very handy during verification. Easy screen captures can also be used in documentation. The download of a configuration to a CD600 is done in less than two seconds.

The function Blocks can be viewed in real time and the parameters can be edited online.
This makes problem solving and tuning optimization much easier. Using the CONF600Plus, eliminates the need to consult the manual, since most of the block information is displayed on screen. Debugging a configuration becomes much quicker and simpler.

It is also possible to include additional explanatory text and graphics such as title blocks and notes. The colors for blocks and lines, can be user defined for easy identification. Inserting blocks is a point-and-click operation. Blocks can be dragged and dropped into place. Linking blocks is also a simple point and- click operation. Block inputs already used are clearly marked and protected from duplicate connections. Online help shows detail diagrams of the internal function of the block when linking. Broken "jump" links have automatic identification of which loop and block the link goes to and comes from. Multi-level zoom makes it easy to see function block output and input terminals. It is easy to select block options, make adjustments and verify block links. The software only allows valid entries and checks every user entry to prevent illegal configurations. The configuration is validated before the download in order to assure that it is free of problems.

Online help shows detail diagrams of the internal function of the block when setting parameters. Help also includes information about valid ranges and options for each parameter.

In the list mode the execution of the function blocks can be changed for optimum performance and to ensure correct logic sequences.

smar
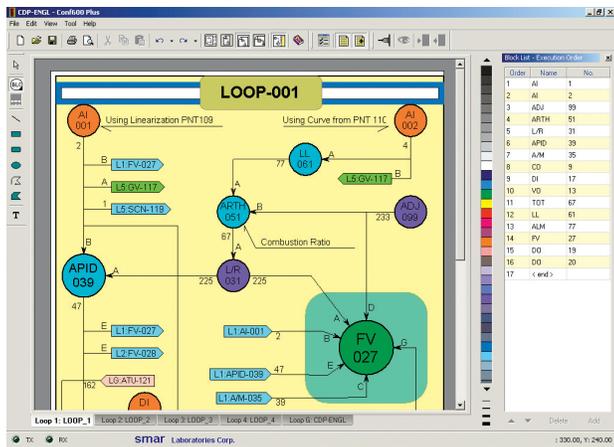
| Power Supply		24 Vdc, 85-264 Vac 47-65 Hz. Maximum consumption: 18 VA (ac) / 12 W (dc).
Loops Controlled	4	Simple or complex loops with up to 8 PIDs.
Analog Inputs	8	1 to 5 Vdc or 0 to 5 Vdc, with input impedance of 1 MΩ 4 to 20 mAdc or 0 to 20 mAdc, with 250 Ω shunt resistors (removable). Conversion accuracy: ±0.010 V.
Digital Inputs	8	Open contact: 10 kΩ minimum or 3 to 24 Vdc or Closed contact: 200 Ω maximum or 0 to 1.7 Vdc maximum. 2 inputs may be used for frequency, from 0 Hz to 10 kHz.
Analog Outputs	8	4 - 4 to 20 mAdc or 0 to 20 mAdc, with maximum load of 750 Ohm Resolution: ±0.050 mA. 4 - 1 to 5 Vdc or 0 to 5 Vdc, with minimum load of 1500 Ohm Resolution: ±0.015 V.
Digital Outputs	8	Transistor open collector, 30 Vdc, 400 mA maximum on resistive load.
Auxiliary Power Supply	1	24 Vdc, 200 mA maximum for up to 8 field transmitters.
Front Panel Indication and Control	2 1 1 23 9	101-element LED bargraphs for Setpoint and Process Variable indication. 41-element LED bargraph for Output indication. 8-digit, general purpose alphanumeric display. LEDs for alarm, status and loop monitoring. Function keys.
Processing Cycle Time		Adjustable (100 - 250 ms).
Serial Communication Port	1	EIA-485 (isolated) TCP/IP using ENET-710 OPC Server available
Configuration Definition		Software function blocks (programming) or pre-programmed control configurations.
Configuration Entry		Computer.
Installation Conditions		Ambient: 0 to 60° C, 5 to 90% RH.
Dimensions		2.834 x 5.669 x 10.724 (inches)/ 72 x 144 x 272.4 (mm) DIN 43700.
Weight		1.6 kg.
Ingress Protection		IP 20.

CD600 *Plus*

Dimensions are mm (in)

BACK PANEL

161.5
(6.358)

272.4
(10.724)

137.5
(5.413)

144
(5.669)

72
(2.834)
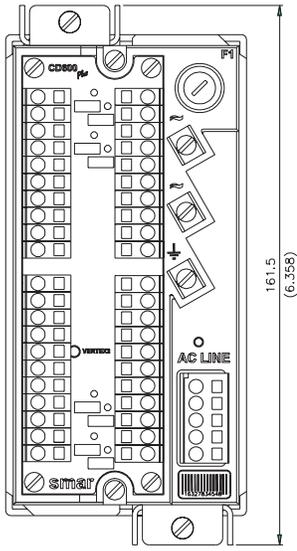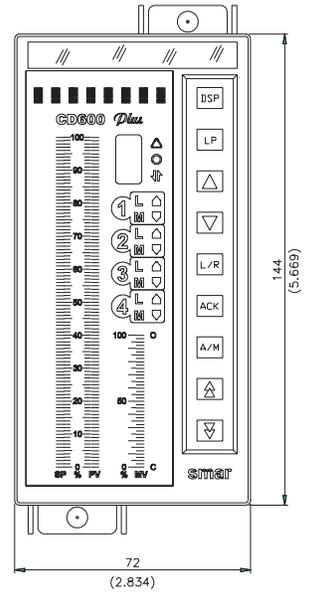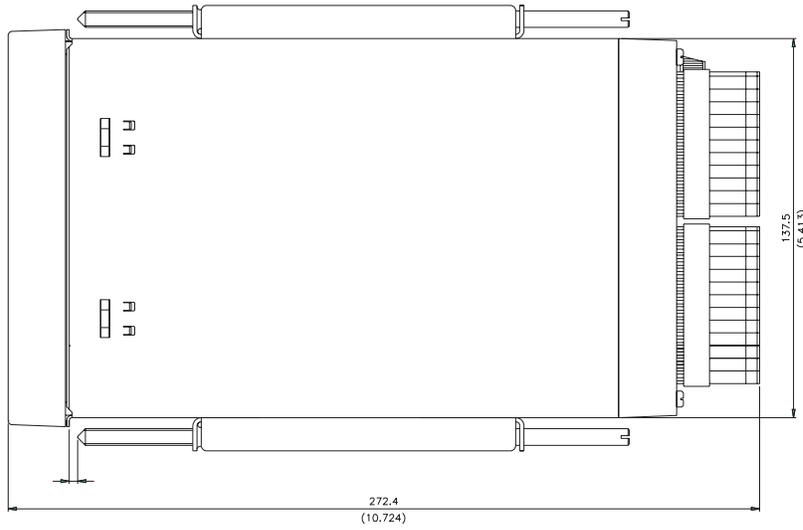
FRONT PANEL

PANEL CUT OUT

138 $^{0}_{+1.0}$
(5.4.33) $^{0}_{+0.039}$

68 $^{0}_{+1.0}$
(2.677) $^{0}_{+0.039}$

22.1
(0.870)

67.5
(2.657)
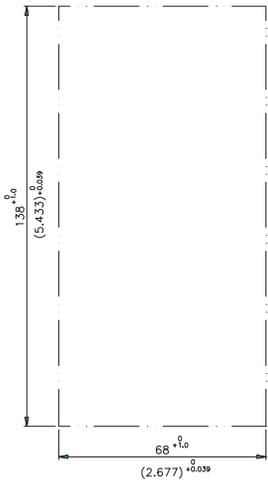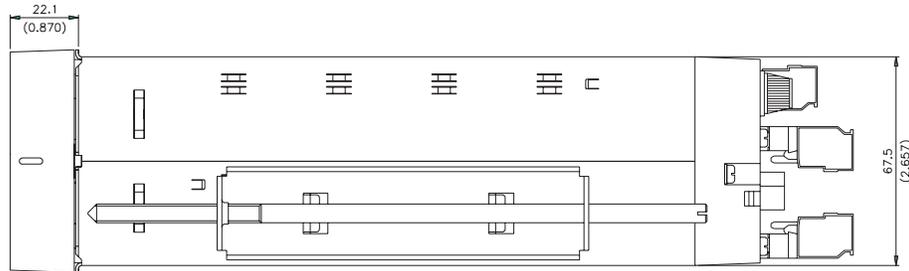
ORDERING CODE

MODEL CD600Plus	DIGITAL CONTROLLER - Multi Loop	
	CODE	**Voltage**
	A	85 to 264 Vac / 50 - 60 Hz
	D	24 Vdc

CD600Plus	-	A	TYPICAL MODEL

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www.smar.com

Specifications and information are subject to change without notice.
Up-to-date address information is available on our website.

web: www.smar.com/contactus.asp

CD600PLUCE