GEFRAN

850

1/16 DIN DOUBLE PID TEMPERATURE CONTROLLER

Dimensions 48×48×100 mm (1/16 DIN)

Main features

- *Operator interface with large LCD Display*
- *Scrolling diagnostics messages, configurable, in the selected language*
- *Easy, guided configuration, copy/paste parameters even with power off*
- *Preventive maintenance with energy counters (kWh) and load switching*
- *32 function block applications*
- *8 math application blocks*
- *Timer, setpoint and algorithm programmer for controlling motorized valves*
- *Advanced tuning of control parameters*
- *Different password levels*
- *2 Universal input configurable for thermocouples, resistance thermometers, linear inputs*
- *2 PID control loop*
- *2 setpoint programmers (128 steps in 16 programs)*
- *Relay, logic, isolated analog outputs*
- *Up to two CT inputs for interrupted load diagnostics*
- *RS485 serial communication in Modbus RTU*
- *Removable faceplate for immediate replacement*
- *Sampling time 60 ms*

PROFILE

Operator interface
Large LCD display with customization of plastic front panel color and logo.
Scrolling alphameric display of 25 messages (32 letters each), completely configurable and savable, in three languages.
Thanks to language selection and clear scrolling messages for diagnostics, alarms, and process state, the controller speaks the user's language.

Control
Double loop, two configurable universal inputs for thermocouples, resistance thermometers, linear inputs.
Second input can be configured as remote setpoint of single loop.

Easy Configuration
Guided configuration for manual-free programming, with a few essential parameters and on-line help messages.
Ability to clone configuration among controllers, even with power off and in the field, thanks to a mini portable configurator with Zapper battery.
Extended configuration, creation of work recipes, and firmware updates via PC and GF_eXpress software, even without powering the controllers.
Thanks to the Smart Configurator function, you obtain the required parameter recipe by answering a few simple questions.
Local configuration and operation with only four keys assigned to LEDs that serve as feedback for the pressed key and as guide to specify appropriate steps.
The initial parameters can always be reset, both from the keypad and from the GF_eXpress Software tool.

Diagnostics, Preventive Maintenance, and Energy Monitor
Complete diagnostics for broken or incorrectly connected probe, total or partial load break, out of range variables, and control loop faults.
Thanks to the switching count and to the settable alarm thresholds, you can program preventive maintenance to replace worn actuators.
An internal energy counter with alarm for abnormal variations totalizes energy consumptions and costs for constant control.

Function block applications
32 AND, OR, Timer Function Blocks let you create customizable logic sequences for complete and flexible machine control.
The controller's hardware resources are exploited completely, without any need for external devices such as timers and small PLCs.
There are 8 math Function Blocks to process analog variables and add/subtract/multiply/divide, calculate average, root, logarithms and control functions in cascade, and ratio check.

Tuning
Advanced tuning algorithms ensure stable and accurate control even with critical or very rapid thermal systems, engaging automatically when necessary.

Timer
Three types of timers let you set delay times before activating the control, hold times on the setpoint value, and timed changes of programmed setpoints.

Setpoint Programmer
Models with 128 steps (each step consisting of a ramp and a hold), groupable in a maximum of 16 programs, are available for applications with setpoint profiles.
Enable inputs, event outputs, and messages to display can be assigned to each step.
Double Programmer with synchronous and asynchronous base times for activating two setpoint profiles (even separate) assigned to the two loops.
On-board configuration and graphic configuration with GF_eXpress.

Valve Positioner
Models to control motorized valves, with or without feedback. The position is calculated for floating valves. For valves with potentiometer via auxiliary input you can control and display the position.

Connectivity
Modbus RTU on RS485 2 wire connection.

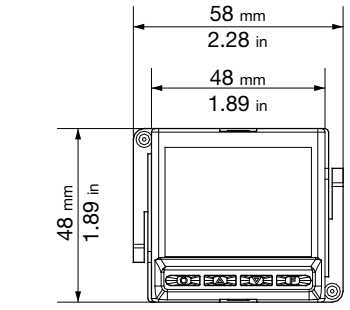
General characteristics
The controller is completely software configurable without accessing the internal electronics.
The main input and the auxiliary input sensors are universal and accept thermocouple sensors, resistance thermometers, and linears.

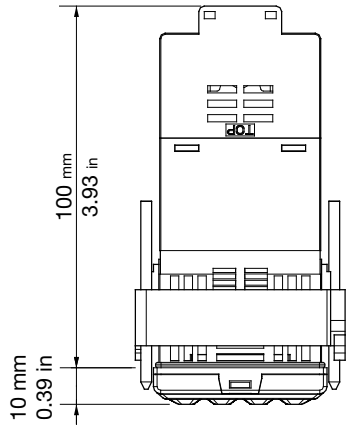
The controller can be replaced at any time simply by removing the faceplate, without any additional procedures.

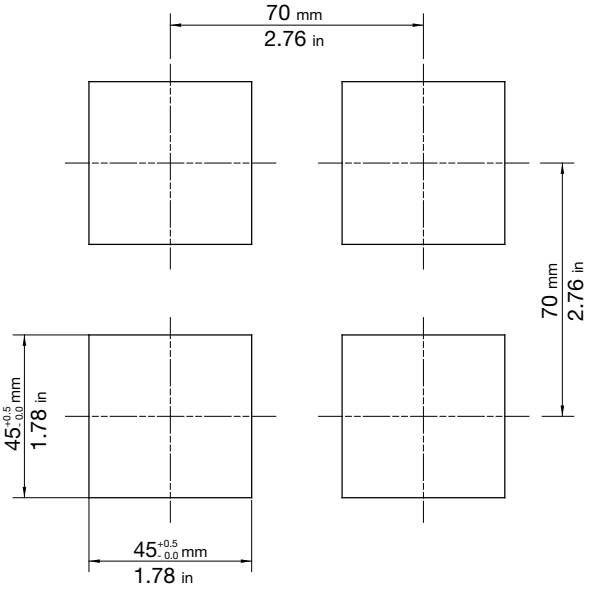
DISPLAY AND KEYS

1. Temperature unit of measurement or number of program running or loop number displayed.
2. State of outputs OUT1, OU2, OUT3, OUT4.
3. Controller function states:
   - RUN = functioning (flashing = normal functioning, steady on = program running);
   - _/- = setpoint ramp active;
   - TUN = PID parameters tuning active;
   - MAN = manual/automatic (off = automatic control, on = manual control);
   - REM = remote setpoint enabled;
   - SP1/2 = setpoint active (off = setpoint 1, on = setpoint 2).
4. Work mode key (manual/automatic) in standard mode. A function can be assigned via parameter but1. The key is active only when the display shows the process variable
5. Up/down keys: raise/lower the value of the parameter displayed on the SV or PV display.
6. F key: lets you navigate among controller menus and parameters. Confirms the parameter value and selects the next parameter.
7. Key pressed signals.
8. SV display: setpoint value, description of parameters, diagnostics and alarm messages. Configurable with parameter dS.SP (default = setpoint).
9. PV display: process variable, parameter values.

DIMENSIONS AND DRILLING TEMPLATE







Dimensions mm/inc

TECHNICAL DATA

OPERATOR INTERFACE		
DISPLAY	Type	LCD black background
	Screen area (L x H)	35 × 30 mm
	Lighting	Backlit with LEDs, life > 40.000 hours @ 25 °C (with brightness level backl = 8)
	PV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 17 mm Color: white
	SV display	Number of digits: 5 to 14 segments, with decimal point Digit height: 7.5 mm Color: green
	Unit of measurement	Selectable, °C, °F or custom [1] Color: same as PV display
	Controller state signals	Number: 6 (RUN, MAN, _/-, REM, SP1/2) Color: amber
	Output state signals	Number: 4 (1, 2, 3, 4) Color: red
KEYPAD		Number of keys: 4 silicon (Man/Auto, INC, DEC, F) Type: mechanical
INPUTS		
MAIN INPUT	Sensor type	TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor
	Accuracy	**TC input** Calibration accuracy: < ± (0,25% of reading in °C +0,1°C) Linearization accuracy: 0,1% of reading Cold junction accuracy: < ± 1°C a 25°C ambient temperature Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **RTD input** Calibration accuracy: < ± (0,15% of reading in °C +0,4°C) Temperature drift: < ± (0,005% of reading in °C +0,015°C)/°C from 25°C ambient temperature Linearization accuracy: 0,1% of reading **Linear input**: Calibration accuracy: < 0,1% F.S. Temperature drift: < ± 0,005% F.S. /°C from 25°C ambient temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit of measurement	Degrees C / F, selectable from keypad
	Signal interval	Type: linear Scale: -1999...9999, settable decimal point
	TC (thermocouple) input	Thermocouple: J, K, R, S, T, C, D Linearization: ITS90 or custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 30 kΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 70 kΩ 0...1 V input impedance (Ri): > 15 kΩ 0...5 V / 0...10 V input impedance (Ri): > 30 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom

1) Programming is done with the GF_eXpress configuration program.

AUXILIARY INPUT	Sensor type	TC, RTD (PT100, JPT100), sensor IR ES1B, linear DC
	Accuracy	**TC input** Calibration accuracy: < ± (0,25% of reading in °C +0,1°C) Linearization accuracy: 0,1% of reading Cold junction accuracy: < ± 1°C a 25°C ambient temperature Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **RTD input** Calibration accuracy: < ± (0,15% of reading in °C +0,4°C) Temperature drift: < ± (0,005% of reading in °C +0,015°C)/°C from 25°C ambient temperature Linearization accuracy: 0,1% of reading **Linear input**: Calibration accuracy: < 0,1% F.S. Temperature drift: < ± 0,005% F.S. /°C from 25°C ambient temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit	°C / °F, selectable from keyboard
	Range of indication	Type: linear Range: -1999...9999, decimal point position
	TC (thermocouple) input	Thermocouples: J, K, R, S, T, C, D Linearization: ITS90 or custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 10 MΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 10 MΩ 0...1 V input impedance (Ri): > 300 kΩ 0...5 V / 0...10 V input impedance (Ri): > 300 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom
	Isolation	Functional isolation
CT (ammeter) INPUT	Type	Isolated via external transformer
		Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
	Accuracy	±2% f.s. ±1 digit @25 °C
DIGITAL INPUTS	Type	voltage-free contact, or NPN 24 V - 4,5 mA, o PNP 12/24 V - max 3,6 mA *for detail see electrical connections*
	Isolation	250 V
	Number	3 max

1) Programming is done with the GF_eXpress configuration program

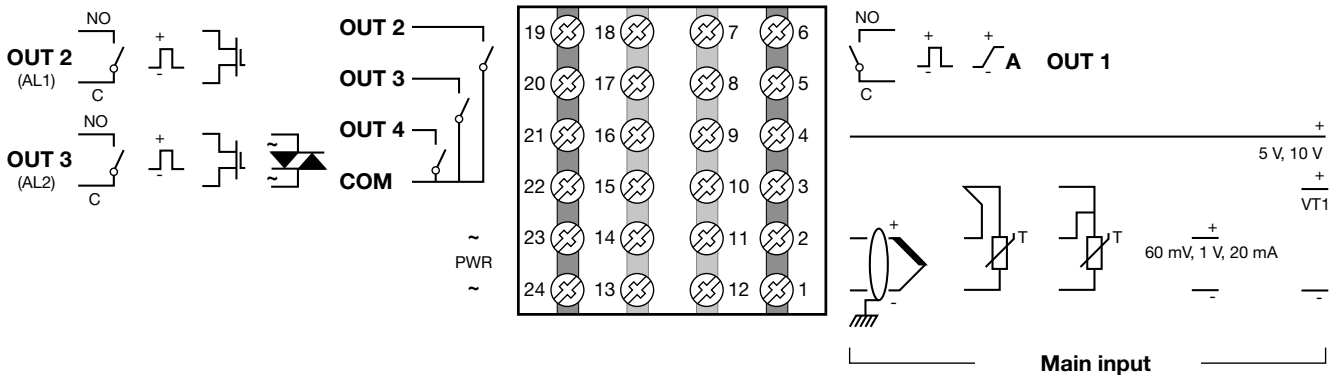
OUTPUTS		
	Relay (R)	Number: 3 max (4 max with 3 relays with contact in common) Type of relay contact: NO Max. current: 5A (2A for certification UL), 250VAC Minimum load: 5 V, 10 mA Life cycle: > 100.000 operations Double isolation
	Logic (D)	Number: 4 max Type: for solid-state relays Voltage: 24 V ±10% (min 10 V @20 mA) Isolated from main input
	Isolated logic (M)	Number: 2 max Type: MOS optically isolated inputs for PLC and AC / DC Voltage: 30 V AC/DC max Current: 100 mA max Resistance ON: 0,8 Ω max Isolation: 1500 V
	Triac (long life relay) (T)	Number: 1 max Load: resistive Voltage: 75...240 VAC Current max: 1 A Isolation 3 kV snubber circuit integrated zero crossing switching
	Continue (A)	Number: 1 max 0...10 V, max 20 mA, R_{out}: > 500 Ω 0...20 mA, 4...20 mA, R_{out}: < 500 Ω Resolution: 12 bit Insulation compared to main input
	Analog retransmission (A1)	Number: 1 max 0...10 V, max 20 mA, R_{out}: > 500 Ω 0...20 mA, 4...20 mA, R_{out}: < 500 Ω Resolution: 12 bit Insulation compared to main input
ALARMS	Number of alarm functions	4 max, assignable to an output
	Possible configurations	Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, HB HBB Hold Back Band if enabled with Programmer function Power variation alarm
POWER SUPPLY	For sensor VT1, VT2	Voltage: 24 VDC ±10% Current max: 30 mA
	For potentiometer VP	Voltage: 1 VDC ±1% Current max: 30 mA
CONTROL FUNCTIONS		
CONTROL	Type	Single loop, double loop
	Control	PID, ON/OFF, single action heat or cool, double action heat/cool
	Control output	Continuous or ON/OFF Cycle time: constant or optimized (BF)
	Control output for motorized valves	OPEN/CLOSE for floating motorized valve or with feedback with position control by potentiometer on Relay, Solid-state, Triac outputs.
SETPOINT PROGRAMMER (double Programmer if double loop)	Number of programs	Max 16 (if double loop 8 + 8) Start / Stop / Reset / Skip via digital inputs and/or outputs from logic operations Output state: Run /Hold / Ready / End
	Number of steps	Max 128, each with own setpoint, ramp time and hold time Times settable in HH:MM or MM:SS Max 4 consents, configurable for ramp and for hold Max 4 events, configurable in ramp and in hold
MULTIPLE SETPOINTS	Number of setpoints	Max 4, selectable from digital input Each setpoint change is subject to set ramp, different for up and down ramp
LOGIC OPERATIONS [1]	Digital function blocks	Max 32, with 4 input variables per block. The result can act on the state of the controller, of the programmer on alarms and outputs. Each function has an AND, OR with TIMER block.
OPERATIONS MATHEMATICAL [1]	Analog function blocks	Max 8, with 2 input variables per block, with operators such as + , - , × , : , average, square root, ... The result may act on analog variables in input to PID loops (controlled variable, setpoint) or analog outputs .

TIMER FUNCTION	Number timer	Standard: 1 If double loop: 2 independent
	Modes	START / STOP STABILIZATION (timer is on when PV enters a band set around setpoint; at end of count you can activate an output, shut down SW or change SP1/SP2) FIRING (timed activation of control after power on)
ENERGY COUNTER		Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT
DIAGNOSTIC		Short circuit or open circuit (LBA alarm) Interrupted or partially interrupted load (HB alarm) Short circuit of control output (SSR alarm)
RETENTIVE MEMORY	Type	FRAM
	Writes	Max. number: > 10^{10} cycles Retention: > 10 years
GENERAL DATA		
POWER SUPPLY	Operating voltage	100...240 VAC/VDC ±10%, 50/60 Hz (20...27 VAC/VDC ±10%, 50/60 Hz)
	Power dissipation	10 W max
	Protections	Overvoltage 300 V / 35 V
	Connection	Screw terminals and crimp connector, max. wire section 1 mm^2
CONNECTIONS	Serial configuration port	Connector: microUSB
	RS485 (option)	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Insulation respect to main input Screw terminals and crimp connector, max. wire section 2,5mm^2
	Inputs and outputs	Screw terminals and crimp connector, max. wire section 2,5 mm^2
AMBIENT CONDITIONS	Use	Internal
	Altitude	2000 m max
	Operating temperature	-10 ... +55 °C (as per IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (as per IEC 68-2-14)
	Relative humidity	20...85% RH non-condensing (as per IEC 68-2-3)
PROTECTION LEVEL		IP 65 on front panel (as per IEC 68-2-3)
ASSEMBLY	Positioning	On panel, removable faceplate
	Installation regulations	Installation category: II Pollution degree: 2 Isolation: double
DIMENSIONS		48 X 48 mm (1/16 DIN), Depth: 100 mm
WEIGHT		0,16 kg
CE STANDARDS	EMC conformity (electromagnetic compatibility)	Conforms to Directive 2014/30/EU norme EN 61326-1 Emissions in industrial environment classe A
	LVD safety	Conforms to Directive 2014/35/EU norme EN 61010-1

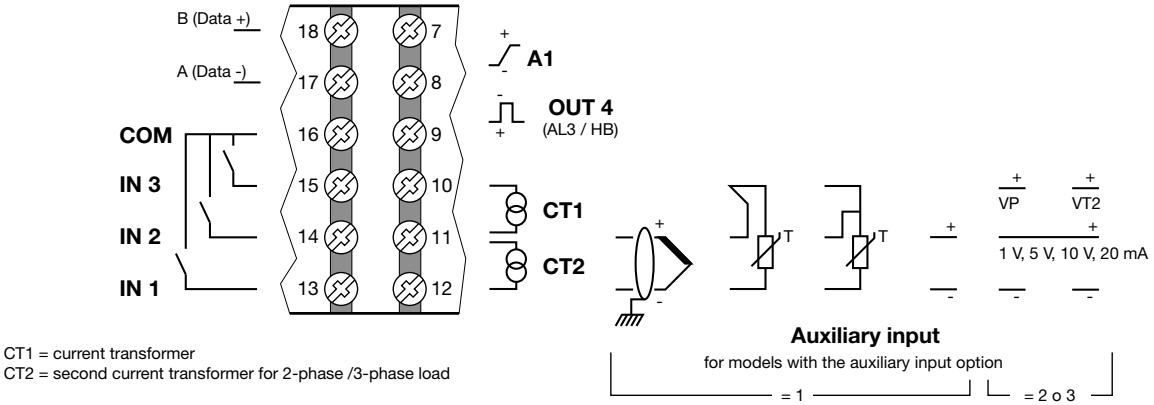
ACCESSORIES

Code	Description
F060800	Cable for programming with PC, USB-TTL 3 V with USB – microUSB connectors, length 1.8 m
F043958	“GF_eXpress” software CD
F060909	Configuration kit for new instruments GF_eXK-3-0-0
51968	Rubber gasket 48×48 front-box
51250	Fastening box to panel
51294	Protection of contacts at box bottom
51453	24 contacts at box bottom
51454	18 contacts at box bottom
330200	Current transformer (CT) 50/0.05 A
330201	Current transformer (CT) 25/0.05 A

CONNECTION DIAGRAM



with Modbus communication option RTU (M) = M0



CT1 = current transformer
CT2 = second current transformer for 2-phase /3-phase load

LEGEND

~ PWR ~ *Power supply*

Linear input voltage / current

Input for current transformer

AUX *Auxiliary input*

Isolated digital inputs

Thermocouple input

Input PT100 JPT100 2 / 3 wires

NO C *Relay output*

Long-life solid state relay output

Logic output

Isolated logic output

Isolated analog output

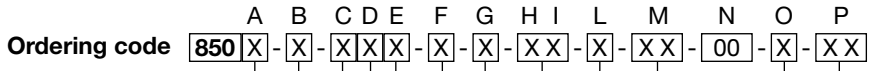
B (Data +)
A (Data -)
RS485 serial line

VT *Supply transmitter*

VP *Supply potentiometer*

ATTENTION: For correct installation, read the warnings in the instruction manual.

ORDER METHODS



Model (A)	
Controller	
Programmer	P
Valve [6]	V
Programmer+valve [6]	PV

Output 1 (B)	
Relay	R
Logic	D
Analog	A

Output 2 (C) - Output 3 (D)	
Relay - Relay	R R
Logic - Logic	D D
Isolated logic - Isolated logic	M M
Isolated logic - Long Life relay	M T

Output 4 (E)	
Absent	0
Logic	D
Relay [1]	R

Power supply sensor VT1 for main input (F)	
Absent	0
VT1 24 V [2]	1

Fonction (P)	
00	Absent
FB	Logical + mathematical operations

Supply (O)	
0	20...27 VAC / VDC
1	100...240 VAC / VDC

Communication (M)	
00	Absent
M0	RS485 Modbus RTU

Digital inputs (L)	
0	Absent [5]
3	3 DI

CT Inputs Auxiliary inputs (H-I)	
00	Absent
20	CT1 + CT2
01	Input Aux [4]
02	Input Aux + VP 1 V [3]
03	Input Aux + VT2 24 V [3]

Retransmission (G)	
0	Absent
1	Analogue A1

Notes

1) Only with: (C) = R and (D) = R
2) Alternative PT100
3) Input Aux type 1V/5V/10V/20mA
4) Input Aux type TC/RTD/60mV
5) Only with option H-I = 0
6) V and PV models required (CD) =RR

Check before each request a list of codes available on the following pages

Power supply 100...240 VAC

Code F	Model	Valves	Programmer	Inputs					Outputs							Communications			Mathematical + logic functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	Isolated logic		Analog V/I	Sensor supply	RS485 modbus RTU					
F067072	850-A-DD0-0-0-00-0-M0-00-1-00										2			1		•					3 outputs
F067073	850-R-DD0-0-0-01-3-00-00-1-FB			3		•			1		2								•		
F067074	850-R-DD0-0-0-03-3-00-00-1-FB			3				•	1		2								•		
F067075	850-R-DD0-0-0-01-3-M0-00-1-FB			3		•			1		2					•			•		
F067076	850-R-DD0-0-0-03-3-M0-00-1-FB			3				•	1		2					•			•		
F064460	850-D-RR0-1-0-00-0-00-00-1-00								2		1				•						
F064461	850-A-RR0-0-0-00-0-00-00-1-00								2					1							
F064489	850P-D-RR0-0-0-01-3-M0-00-1-00		•	3		•			2		1					•					
F067078	850P-D-RR0-0-0-03-3-M0-00-1-00		•	3				•	2		1					•					
F064459	850-R-RR0-1-0-00-0-00-00-1-00								3						•						
F064477	850-R-RR0-1-0-00-3-M0-00-1-00			3					3						•	•					
F064484	850-A-RRD-1-0-00-3-00-00-1-00			3					2		1			1	•						4 outputs
F067080	850-D-RRD-1-0-01-3-M0-00-1-00			3		•			2		2				•	•					
F067081	850-D-RRD-1-0-03-3-M0-00-1-00			3				•	2		2				•	•					
F064606	850-A-RR0-0-1-01-3-00-00-1-FB			3		•			2					2					•		
F067082	850-A-RR0-0-1-03-3-00-00-1-FB			3				•	2					2					•		
F064607	850-A-RR0-0-1-01-3-M0-00-1-FB			3		•			2					2		•			•		
F067083	850-A-RR0-0-1-03-3-M0-00-1-FB			3				•	2					2		•			•		
F064482	850-D-RRR-1-0-00-3-00-00-1-00			3					3		1				•						
F064481	850-R-RRR-1-0-00-3-00-00-1-00			3					4						•						
F064493	850V-R-RRR-1-0-00-3-00-00-1-00	•		3					4						•						
F064616	850V-R-RRR-0-0-02-3-00-00-1-FB	•		3			•		4										•		
F064486	850-A-RRD-1-1-01-3-00-00-1-00			3		•			2		1			2	•						5 outputs
F067084	850-A-RRD-1-1-03-3-00-00-1-00			3				•	2		1			2	•						
F064487	850-A-RRD-1-1-01-3-M0-00-1-00			3		•			2		1			2	•	•					
F067085	850-A-RRD-1-1-03-3-M0-00-1-00			3				•	2		1			2	•	•					
F064494	850V-R-RRR-1-1-00-3-00-00-1-00	•		3					4					1	•						

Power supply 20...27 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs							Communications			Mathematical + logic functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	Isolated logic		Analog V/I	Sensor supply	RS485 modbus RTU					
F067088	850-A-DD0-0-0-00-0-M0-00-0-00										2			1		•					3 outputs
F067089	850-R-DD0-0-0-01-3-00-00-0-FB			3		•			1		2								•		
F067090	850-R-DD0-0-0-03-3-00-00-0-FB			3				•	1		2								•		
F067091	850-R-DD0-0-0-01-3-M0-00-0-FB			3		•			1		2					•			•		
F067092	850-R-DD0-0-0-03-3-M0-00-0-FB			3				•	1		2					•			•		
F064498	850-D-RR0-1-0-00-0-00-00-0-00								2		1				•						
F064499	850-A-RR0-0-0-00-0-00-00-0-00								2					1							
F064514	850P-D-RR0-0-0-01-3-M0-00-0-00		•	3		•			2		1					•					
F067094	850P-D-RR0-0-0-03-3-M0-00-0-00		•	3				•	2		1					•					
F064500	850-R-RR0-1-0-00-0-00-00-0-00								3						•						
F064501	850-R-RR0-1-0-00-3-M0-00-0-00			3					3						•	•					
F064508	850-A-RRD-1-0-00-3-00-00-0-00			3					2		1			1	•						4 outputs
F067096	850-D-RRD-1-0-01-3-M0-00-0-00			3		•			2		2				•	•					
F067097	850-D-RRD-1-0-03-3-M0-00-0-00			3				•	2		2				•	•					
F064625	850-A-RR0-0-1-01-3-00-00-0-FB			3		•			2					2					•		
F067098	850-A-RR0-0-1-03-3-00-00-0-FB			3				•	2					2					•		
F064626	850-A-RR0-0-1-01-3-M0-00-0-FB			3		•			2					2		•			•		
F067099	850-A-RR0-0-1-03-3-M0-00-0-FB			3				•	2					2		•			•		
F064506	850-D-RRR-1-0-00-3-00-00-0-00			3					3		1				•						
F064505	850-R-RRR-1-0-00-3-00-00-0-00			3					4						•						
F064517	850V-R-RRR-1-0-00-3-00-00-0-00	•		3					4						•						
F064635	850V-R-RRR-0-0-02-3-00-00-0-FB	•		3			•		4										•		
F064510	850-A-RRD-1-1-01-3-00-00-0-00			3		•			2		1			2	•						5 outputs
F067100	850-A-RRD-1-1-03-3-00-00-0-00			3				•	2		1			2	•						
F064511	850-A-RRD-1-1-01-3-M0-00-0-00			3		•			2		1			2	•	•					
F067101	850-A-RRD-1-1-03-3-M0-00-0-00			3				•	2		1			2	•	•					
F064518	850V-R-RRR-1-1-00-3-00-00-0-00	•		3					4					1	•						

UL	Conformity C/UL/US File no. E216851
CE	EMC: Compliance with Directive 2014/30 / EU, with reference to EN 61326-1 emission in industrial environment class A Security LVD: Compliance with Directive 2014/35 / EU, with reference to EN 61010-1

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