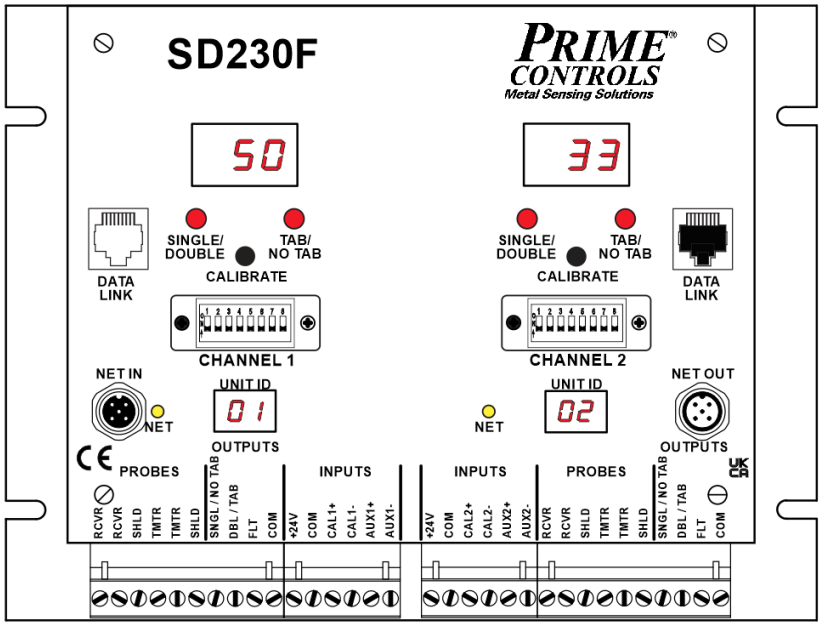
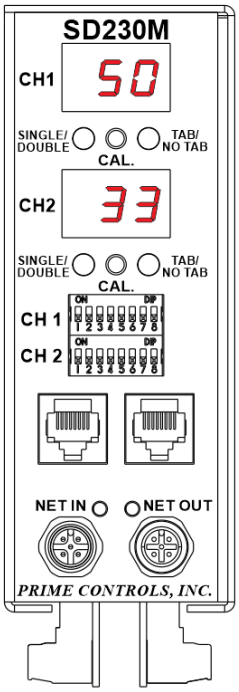
OPERATING INSTRUCTIONS

MODEL SD230M/SD230F SHELL AND TAB DETECTOR

2022.05.02





ORIGINAL INSTRUCTIONS

Table of Contents

DESCRIPTION

The SD230 family of double shell and missing tab detectors for conversion press applications are rugged but sensitive dual channel instruments designed specifically to detect and report missing blanks or double blanks at the infeed to a conversion press and to detect and report ends that exit the press without tabs. The SD230F maintains the formfactor and features of its predecessors, the SD230, SD232, and SD233, adding the ability to independently configure each of its channels' detection modes for double shells or missing tabs. The SD230M has all the features of a SD230F in a smaller DIN-rail mountable package.

Control Module

The control module allows for fast and easy setup and for quick diagnosis of system errors or problems. Setup is achieved through the simple press of a push-button switch or an external contact closure. Faults are reported on digital displays on the control module and through FAULT outputs that may be connected to a PLC or system controller.

Outputs may be switch selected as sinking or sourcing drivers. An eight position DIP switch, accessible on the front panel, allows the installer to select several operational options as described in the installation section of this document.

The AUX inputs provide a means to switch between two different setups, such as sensing steel shells and sensing aluminum shells, without recalibrating or changing the DIP switch settings.

When the unit first powers up, if probes are properly connected, the digital displays indicate the operational mode of the unit, i.e. whether set up for sensing **Al**uminum, **St**eel, or **A**luminum on **S**teel by displaying the characters "**Al**", "**St**" or "**AS**" for a period of approximately two seconds. Which mode comes up is determined by the setup of the unit through the DIP switches and the state of the AUX input. See setup (page 7) later in this document.

Calibrate Pushbutton Operation

The push-button switches on the front panel of the control module serve to initiate the calibration process and to adjust system setup.

To initiate calibration, simply press the appropriate pushbutton and release it within 3 seconds.

To view the current value of a parameter, press the pushbutton and hold it for more than 3 seconds until the appropriate parameter identifier appears on the digital display. After the parameter identifier appears, release the pushbutton and the current value of the parameter displays for 5 seconds. To retain the current value of the parameter, simply allow the 5 second display interval to elapse. The display reverts to displaying the gauge signal.

To change the value of a parameter, press the pushbutton and hold it for more than 3 seconds until the appropriate parameter identifier appears on the digital display. After the parameter identifier appears,

release the pushbutton and the current value of the parameter displays. Press the pushbutton while the parameter is displaying and the value increments, first slowly then more rapidly. For more precise control of the value adjustment, simply tap the pushbutton repeatedly until the desired value is displayed. All parameters roll back to their minimum values after reaching the maximum value. To retain the adjusted value of the parameter, simply allow the 5 second display interval to elapse. The display reverts to displaying signal strength.

When a channel is configured for off-press missing tab detection, and the press is running (ends are passing between the probes), the calibration button can be pressed to toggle the display between showing the measurement results or time ends spend between the probes in milliseconds. When speed is displayed, the display will toggle between displaying the measured speed and "SPd." The speed will also be displayed anytime the reading falls below 8 milliseconds.

Status LEDs

The controller has two status LEDs ("SINGLE / DOUBLE" and "TAB / NO TAB") per channel to indicate the status of what is being detected. The meaning of the LED colors depends on what the channel is configured to detect.

Double End Detection

SINGLE / DOUBLE	TAB / NO TAB	Meaning
Yellow	Off	Detecting no end at probes
Green	Off	Detecting a single end at probes
Red	Off	Detecting double ends at probes

On Press Missing Tab Detection

SINGLE / DOUBLE	TAB / NO TAB	Meaning
Off	Yellow	Detecting no end at probes
Off	Green	Detecting end and tab at probes
Off	Red	Detecting end but no tab at probes

Off Press Missing Tab Detection

SINGLE / DOUBLE	TAB / NO TAB	Meaning
Off	Yellow	Detecting no end at probes
Green	Yellow	Detecting end at probes
Green	Red Flash	Detected end without tab at probes (only flashes once per end)

Probes

The SD230M/SD230F controllers may be used with any P15 or P70 series two wire probes or with older model three wire probes including AV, AY, AZ, AZA, and CB probes. When used with older three wire probes, the white wire in the probe cable is not used and must remain disconnected.

Application Considerations

Sensing tabs in off-press mode requires that the ends be constrained such that the tabs pass between the probes. Typically, the probes are centered on a narrow channel. The algorithm requires that the ends move rapidly past the probes, i.e. the end is between the probes for 10 to 50 milliseconds. For a two-inch diameter end, this translates to a velocity of 40 to 200 inches per second (1 to 5 meters/second).

OPERATION

Operation of the detector involves only two processes: calibration, and fault message interpretation. These processes are described below.

Calibration

Calibration requires the following steps:

1. Stop the press in the dwell portion of the cycle with a single end between the infeed probes of channels configured to detect double ends and a good tabbed end between the discharge probes of channels configured to detect missing tabs. For channels configured for off-press missing tab detection, no can end should be placed between the probes.

2. Observe that no error conditions are being reported on any display of the detector control module.

3. Press and release the CALIBRATE pushbutton on each channel of the control module and observe that channel's LEDs flash and "**CAL**" displayed on its display. If the calibration is successful, the LED flashing stops in less than three seconds and the display shows a number between 48 and 52 (for channels configured to detect ends), between 28 and 33 (for channels configured to detect tabs on-press), or 100 (for channels configured to detect tabs off-press).

   If the display flashes alternately "**CAL**" and "**Lo**", the calibration was unsuccessful due to insufficient signal at the receiving probe. This can be an indication that the probes are too far apart or that the unit is not set to the appropriate frequency for the material being sensed, e.g. frequency set to aluminum when steel ends are present. If the display flashes alternately "**CAL**" and "**Hi**", the receiver signal is too strong indicating nothing between the probes.

   If the calibration problem is not resolved and the calibration switch is not pressed again within 30 seconds, calibration mode is aborted and the previous calibration values are reinstated.

If both channels calibrate successfully, calibration is complete. The calibration process may also be initiated through an external switch or signal controlling the CAL+ and CAL- inputs to the controller. Activation of these inputs performs the same function as pressing the CALIBRATE push-button switch for the corresponding channel.

Fault Message Interpretation

Probe Faults

The controller monitors the probe connections on a continuous basis and reports what it detects to be disconnected or malfunctioning probes. The probe faults are reported as follows:

Alternately flashing "**PR**" and "**1**" - transmitter probe disconnected or failing
Alternately flashing "**PR**" and "**2**" - receiver probe disconnected or failing
Alternately flashing "**PR**" and "**3**" - both probes disconnected or failing

During calibration:

Alternately flashing "**CAL**" and "**Lo**" indicates a low signal at the receiving probe.
Alternately flashing "**CAL**" and "**Hi**" indicates the signal at the receiver is too strong, likely no end between the probes.

Speed Faults

For channels configured to detect missing tabs off-press, ends must not pass between the probes too fast. If the velocity of the ends passing the tab sensors exceeds 250 inches per second (6.35 meters/second), i.e. the end passes between the probes in less than 8 milliseconds, the controller displays the transition time as a warning. If the velocity increases to 400 inches per second (10 meters/second) the controller activates the FAULT output for a minimum of 100 milliseconds or for as long as the high velocity persists. When the velocities are brought within the allowed operating range, the fault output resets to the no-fault state.

Self-Diagnostics

The system performs extensive self-diagnostics at power up and more limited diagnostics while running. Most fatal faults, if not involving the display subsystem, are reported on the digital displays through the alternate flashing of "**Err**" and "**nnn**" where "**nnn**" is a one to three digit number indicating the source of the fault. These faults are not field repairable and require the change-out of the control module.

Any detected fault causes the FLT output to be turned OFF until the fault is cleared.

INSTALLATION

Installation comprises four basic steps: 1) Installing the probes, 2) Mounting the control module, 3) Wiring the unit, and 4) Setting system options. Each of these steps is further expanded below.

Safety

Power

When performing installation, service, or maintenance on the equipment, disconnect power to the machine and Lock Out/Tag Out the power in accordance with your plant standard operating procedures.

Hazardous Locations

This equipment is suitable for operation in non-hazardous locations only.

Installing the Probes

1. When used to detect double ends, mount the probes, one above and one below the centerline of the track carrying the ends into the press. The probes must be positioned such that they are centered on the can end during the dwell portion of the press cycle. In the vertical, the track should run midway through a gap of approximately 5/8 inch (16mm) between the probes.

2. When used to detect missing tabs, mount the tab detecting probes, one above and one below the tabbed ends as they are carried on the track from the press. The probes must be positioned such that they are centered on the tab ring during the dwell portion of the press cycle. In the vertical, the track should run midway through a gap of approximately 5/8 inch (16mm) between the probes.

   Positioning of tab detecting probes is more critical than the positioning of the infeed probes. For most tabbed ends, the optimum position for the probes is above and below the ring of the tab, not centered on the rivet. Centering on the rivet only works on some older tab designs where the tab formed a ring around the rivet. If positioning of the tab sensing probes is uncertain, contact Prime Controls for help.

3. Run the probe cabling through conduit back to the cabinet housing the control module. *Do not run the sensor cables through conduit carrying high level or noisy signals.*

Mounting the Control Module

SD230F

Mount the control module on the back panel of a grounded industrial enclosure. Ensure that the mounting screws make good electrical contact between the module housing and the grounded control enclosure back panel. Alternatively, connect a grounding wire to one of the mounting screws to provide a ground. In the case of grounding the controller to a panel door, ensure that the door is properly grounded in accordance with best practices. The footprint is 8.25 inches (210 mm) by 6.25 inches (159 mm) with mounting slot locations on a rectangle 7.625 inches (194 mm) in the horizontal and 4.0 inches (102 mm) in the vertical. See drawing at the end of this document. To avoid an electrical hazard while operating the unit inside the enclosure, all live parts in the enclosure shall be IP2X or better.

If the control module is mounted external to an enclosure or on an enclosure door, an adequate cover must be installed over the exposed connectors to achieve IP4X protection or better. The door must be

permanently grounded and good electrical contact between the control module and grounded door must be achieved.

SD230M

The SD230M mounts on a 35mm wide DIN rail. Install the unit by tilting the top of the unit away from the DIN rail while engaging its mounting flange with the bottom of the rail. Push up then tilt the unit to engage the top flange and allow the unit to slide down slightly to fully seat the unit on the DIN rail.

Wiring the Control Module

Probe cable routing must follow best practices to isolate the sensitive probe signals from sources of interference such as AC mains, variable frequency drives, digital switching signals and other high current, high voltage or high speed signals. Power wiring to the unit should also follow best practices to isolate the low-voltage DC power from AC mains and other high voltage or high current wires. Where paths must cross, their intersection should be perpendicular.

1. Connect +24V DC power between both sets of the +24V and COM terminals of the control module. The left and right side modules are electrically independent and must be powered independently. The two +24V terminals are NOT internally connected. The supply must be capable of delivering 0.250 amps continuously with a startup surge of 0.500 amps for 2 milliseconds.

2. For each channel, connect the transmitter probe's wires to the channel's TMTR terminals and the receiving probe's wires to the channel's RCVR terminals of the control module. The probe connections are not polarized. Connect the shield wires to the terminal labeled SHLD.

   Though both the transmitting and receiving probes are identical, it is preferred practice to choose the transmitting probe as the one that will remain farthest from the track as it moves and stretches.

   On retrofit installations where older three wire probes are installed, cut back and do not connect the third (white) wire. If in doubt about which wires to use, measure the resistance between the wires in pairs, and then use the pair that produces the highest resistance reading (typically 24 ohms).

3. Connect the SNGL / NO TAB, DBL / TAB, and FLT (fault) outputs to the system controller and/or interlocking circuitry as required. These outputs may be sinking or sourcing as determined by the setting of SW 5. See setting switch options (page 7).

   The FLT outputs are always ON for no fault. The active states of the other outputs may be affected by the setting of the compatibility DIP switch as described later in this document. The outputs should not be wired to each other.

4. If calibration is to be activated remotely, connect the CAL+ and CAL- inputs appropriately. Connect a *sinking* driver or contact to the CAL- terminal and connect CAL+ to the +24V power source. Connect a *sourcing* driver to the CAL+ terminal and connect CAL- to COM.

5. If the application may involve switching between steel and aluminum blanks, the AUX inputs may be wired to provide external control of the sensing mode of the detector. Connect a *sinking* driver or contact to the AUX- terminal and connect the AUX+ terminal to the +24V supply. Connect a s*ourcing* driver to the AUX+ terminal and connect the AUX- terminal to COM.

Setting Switch Options

To access the DIP switches in the middle of the front panel, swing the hinged plastic window to the side. The left-most switch is SW1, the right-most is SW8. The switches are on when in the up position. The function of option switches 2 and 6 depends upon a channel's mode (double shell or missing tab detection). Below is the meaning of each switch in the context of the channel's mode.

Double Shell Switch Options (SW8 off)

Switch	OFF	ON
SW1	Sense aluminum ends	Sense steel ends
SW2	Not used	Not used
SW3	Select fail-safe mode	Select compatibility mode
SW4	Fixed thresholds	Adjustable thresholds
SW5	Sourcing outputs	Sinking outputs
SW6	No overlap allowed	Overlap allowed if Off-press sensing
SW7	On-press sensing	Off-press sensing
SW8	Double shell detect mode	Missing tab detect mode

Missing Tab Switch Options (SW8 on)

Switch	OFF	ON
SW1	Sense aluminum ends	Sense steel ends
SW2	Sense aluminum tabs	Sense steel tabs
SW3	Select fail-safe mode	Select compatibility mode
SW4	Fixed thresholds	Adjustable thresholds
SW5	Sourcing outputs	Sinking outputs
SW6	Enable tab profiling (on-press sensing) No overlap allowed (off-press sensing)	Disable tab profiling (on-press sensing) Overlap allowed (off-press sensing)
SW7	On-press sensing	Off-press sensing
SW8	Double shell detect mode	Missing tab detect mode

NOTE: DIP switch settings are only read on power-up of the unit. After changing switch setting, power the unit down and back up again to activate the change.

Selecting Metal Types and Detection Mode

SW8 is used to configure a channel to detect the presence of single or double ends before they go into a press or missing tabs on ends coming out of a press. To detect double ends, SW8 should be off. To detect missing tabs, it should be on.

SW1 and SW2 are used to inform the controller of the types of metals used in the manufacture of the can ends and are generally set according to the metals used. However, metals with coatings, in

particular steels with coatings, may not produce significant differences in measured values between tab/no-tab and single/double conditions. In these cases, it is acceptable to select a metal setting different from the metals in use. Typically, this means, using the aluminum ends and/or tabs settings when using particular coated steels.

Channel Detection Mode	SW1	SW2	SW8
Sensing Aluminum Ends	OFF	IGNORED	OFF
Sensing Steel Ends	ON	IGNORED	OFF
Sensing Aluminum Tabs on Aluminum Ends	OFF	OFF	ON
Sensing Aluminum Tabs on Steel Ends	ON	OFF	ON
Sensing Steel Tabs on Steel Ends	ON	ON	ON

Note: See paragraph above on Selecting Metal Types.

Set Sinking or Sourcing Outputs

The setting of SW5 determines whether the output drivers are sinking or sourcing. SW5 off selects sourcing, SW5 on selects sinking.

Set Outputs for Failsafe or Compatibility

When SW3 is on, the sourcing outputs of the controller provide the same logic levels as the outputs of older double shell units such as the DS33 and DS35, allowing for quick and easy retrofit installations. When SW3 is off, the output states are defined to provide maximum protection against loss of connection between the detector and the controlling PLC. The loss of connection is sensed as the fault condition.

The table below defines the output states for all combinations of SW3 and the possible sensing states. Also, see the Output Signal Drawings (page 17).

		OUTPUT STATES			
Switch	**In Gap**	**SINGLE**	**DOUBLE**	**NO TAB**	**TAB**
OFF	missing	OFF	ON	ON	OFF
OFF	single	ON	ON	OFF	OFF
OFF	double/tab	ON	OFF	ON	ON
ON	missing	ON	OFF	ON	OFF
ON	single	OFF	OFF	OFF	OFF
ON	double/tab	OFF	ON	ON	ON

Enable or Disable Tab Profiling

The detector uses two different methods for determining the absence or presence of tabs. The most basic method is simple thresholding of the sensor signals. As the shape of the beverage ends and tabs evolved and the speed of presses increased, it became necessary to implement a redundant test that recognizes the profile of a tab as it moves through the machine. This feature, however, is not compatible with larger and steel ends or with machines that have stainless steel belts. The stainless steel belts can change the sensor signal sufficiently to interfere with the tab profiling algorithm and cause the system to report self-check errors. Profiling is most effective in the detection of aluminum tabs on aluminum ends on high-speed presses. SW6 enables and disables tab profiling when a channel is configured for missing tab detection.

Setting Options Through the Front Panel

Adjusting the Tolerance

1. Insure that SW4 is on. If necessary, change the switch position and power the unit down and back up.

2. Press and hold the channel 1 calibrate pushbutton for at least 3 seconds until "**tL"** appears on the display.

3. Release the pushbutton and observe the current value of the threshold (in percent).

4. If the current value is ok (typically 35 for double shell or 15 for missing tab detection), wait 5 seconds and the display reverts to displaying the gauge value and retains the current tolerance.

5. To change the value, press and hold or tap the calibration pushbutton until the desired value is displayed. After the value reaches 90, it rolls over to 10 and increases.

6. When the desired value is on the display, wait 5 seconds and the display reverts to displaying the gauge value and retains the last displayed tolerance value.

Set Display Direction

By default, the digital display values follow the strength of the receiver signal, increasing for stronger signal and decreasing for weaker signal. In this mode, the signal increases for thinner materials between the probes and decreases for thicker materials. The display may be inverted so that the values are proportional to material thickness rather than signal strength. To invert the display:

1. Press and hold the calibrate pushbutton until "**do"** appears on the display.

2. Release the pushbutton and the display changes to "**0"** or "**1"**.

3. At this point, with each press of the pushbutton the display toggles between "**0"** and "**1"**. The **0** selects normal display mode, **1** selects inverted mode.

4. When the desired value is on the display, wait 5 seconds and the display reverts to displaying the signal value in the selected mode.

Set Quick Calibration Changeover

The AUX input may be used to quickly change between sensed metal types. When enabled (**AU**=0), the AUX input works in conjunction with SW1 and SW2 to select the target tab and shell material combinations as presented in the Quick Calibration Changeover section below.

To change the Quick Calibration Changeover setting:

1. Press and hold the calibrate pushbutton until "**AU"** appears on the display.

2. Release the pushbutton and the display changes to "**0"** or "**1"**.

3. At this point, with each press of the pushbutton the display toggles between **0** and **1**. The **0** enables quick changeover, **1** disables it.

4. When the desired value is on the display, wait 5 seconds and the display reverts to displaying the signal value and the parameter is saved.

Parameter Ranges

The range of values available for the adjustable parameters are as follows:

ID	Function	Range of Values
tL	Double Tolerance	10% to 90% for double (default is 35%)
tL	Tab Tolerance	10% to 90% for tab (default is 15%)
do	Display Direction	**0** for signal strength (default), **1** relative thickness
AU	Aux Metal Select	**0** AUX controls sensing mode (default), **1** AUX does not control sensing mode
oL	Overlap Percentage	0% to 90% for off-press sensing
dL	Delta Tolerance	10% to 15% for off-press sensing
id	Network ID	Read-only Network ID and Error code (SD230M only)

Special Functions

The controller offers two sets of optically isolated inputs on each channel that provide added control over the unit. These are the remote calibration input terminals labeled CAL+ and CAL- and the sensing mode inputs labeled AUX+ and AUX-.

CAL Input Connections	Sinking Driver: Connect signal to CAL-, and +24V power source to CAL+ Sourcing Driver: Connect signal to CAL+, and COM to CAL-
AUX Input Connections	Sinking Driver: Connect signal to AUX-, and +24V power source to AUX+ Sourcing Driver: Connect signal to AUX+, and COM to AUX-

Remote Calibration

The remote calibration inputs perform the same function as the CALIBRATE push-button switches on the front panel of the control module.

Quick Calibration Changeover

The AUX input works in conjunction with SW1 and SW2 (when configured for tab detection) to select the target tab and shell material combinations as presented in the tables below.

When the AUX input is activated or deactivated, the controller changes to accommodate the new material combination and displays, for approximately 2 seconds, a two-character abbreviation indicating the selected targeted materials. The display interpretation is as follows:

Al – aluminum shell / aluminum tab on aluminum shell

St – steel shell / steel tab on steel shell

AS – aluminum tab on steel shell

The two-character indication also displays at powerup indicating the current selection.

Double Shell Detection Material Selection

SW1	AUX	Shell Material
OFF	OFF	Aluminum
OFF	ON	Steel
ON	OFF	Steel
ON	ON	Aluminum

Missing Tab Detection Material Selection

SW1	SW2	AUX	Material Combination
OFF	OFF	OFF	Aluminum tab on aluminum end
OFF	OFF	ON	Aluminum tab on steel end
OFF	ON	OFF	Aluminum tab on aluminum end
OFF	ON	ON	Steel tab on steel end
ON	OFF	OFF	Aluminum tab on steel end
ON	OFF	ON	Aluminum tab on aluminum end
ON	ON	OFF	Steel tab on steel end
ON	ON	ON	Aluminum tab on aluminum end

If quick calibration changeover is to be activated remotely, connect the AUX+ and AUX- inputs appropriately. Connect *sinking* drivers or contacts to the AUX- terminal and connect AUX+ to the +24V power source. Connect *sourcing* drivers to the AUX+ terminal and connect AUX- to COM.

Determining Firmware Version

From time to time, as improvements are made to Prime Controls products, the firmware controlling the units is revised. When setting a unit up or troubleshooting, it may be necessary to determine the version number for the firmware installed in your unit. The version numbers are of the form 1.00 and are incremented either by tenths (1.01, 1.02, etc.) for small revisions or by the integer digit (1.00, 2.00, etc.) for more significant revisions.

To determine the version of the firmware running in your unit, hold the calibration pushbutton in as power is applied to the unit. The revision number is displayed directly on the digital display.

The two channels of the controller are independent and may be running different versions of firmware. Each must be checked separately.

MAINTENANCE

The system requires no periodic maintenance beyond maintaining general cleanliness of the controller, connections, and probes. Probes should be inspected and cleaned to prevent build up of ferrous particles on the sensing surfaces. The frequency of inspection depends on the operating conditions of the probes. Use a damp, not wet, cloth or sponge to clean the painted surfaces of the controller. Mild soap or detergent may also be used. Dry with a soft rag.

TROUBLESHOOTING

If the display is not on, check the +24V DC power applied to the unit. Once the display is operational, refer to displayed fault codes according to “Fault Message Interpretation” under Operation, Calibration (page 3). If the displayed values rapidly change while the machine is static, check for loose or damaged probe cables or improper routing of the cables, such as, routing the cables with other high voltage, or high current wires, power wires, or other noise sources.

DECOMMISSIONING

If the machine or parts of the machine have to be permanently put out of service, laws and directives in force at the time of the dismantling have to be strictly observed and complied with. In any case, check which materials can be recycled. These must be sent to an appropriate waste collecting company.

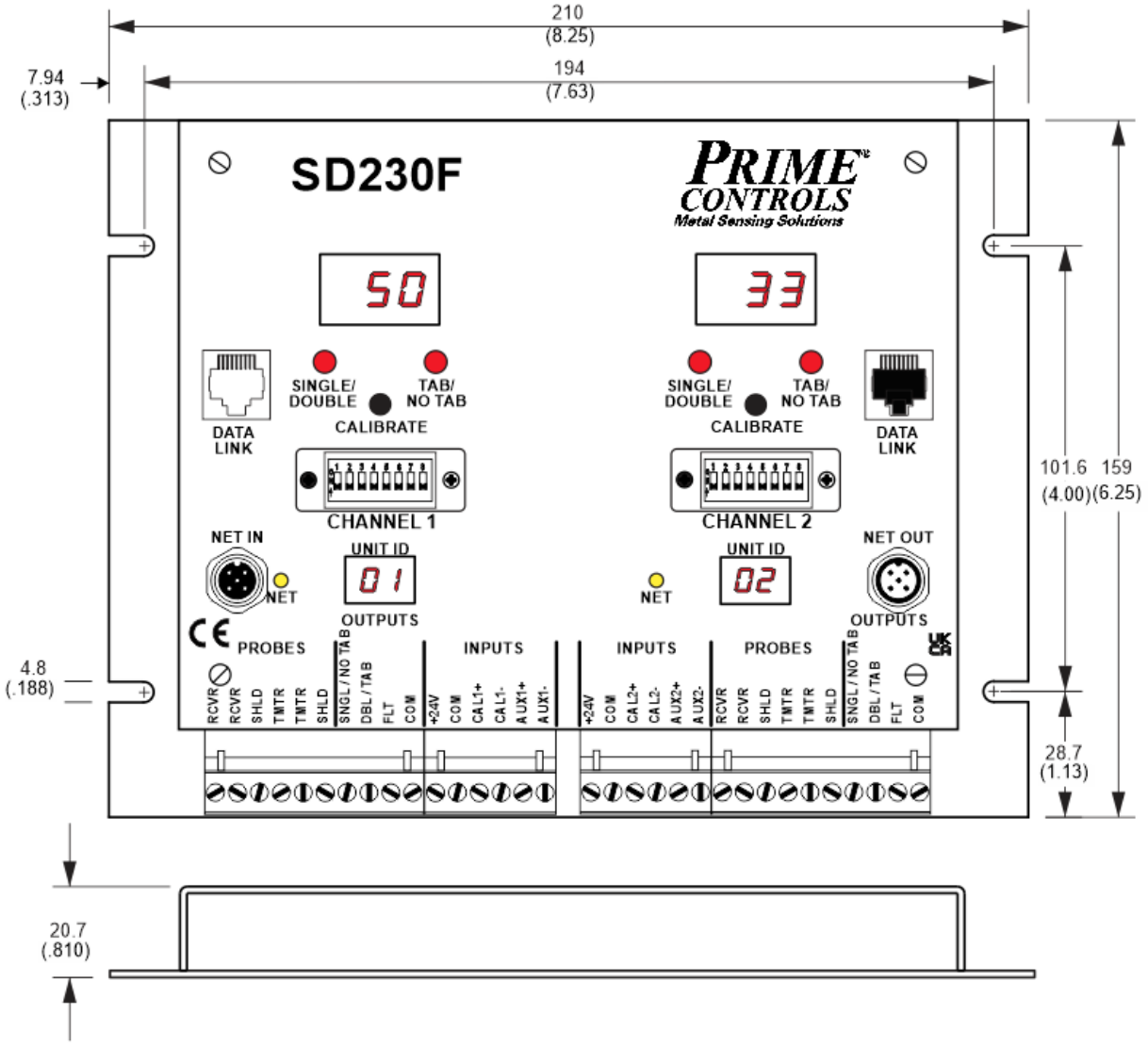
DOCUMENT APPLICABILITY

This document applies to SD230F and SD230M units running firmware Version 1.14 and greater.

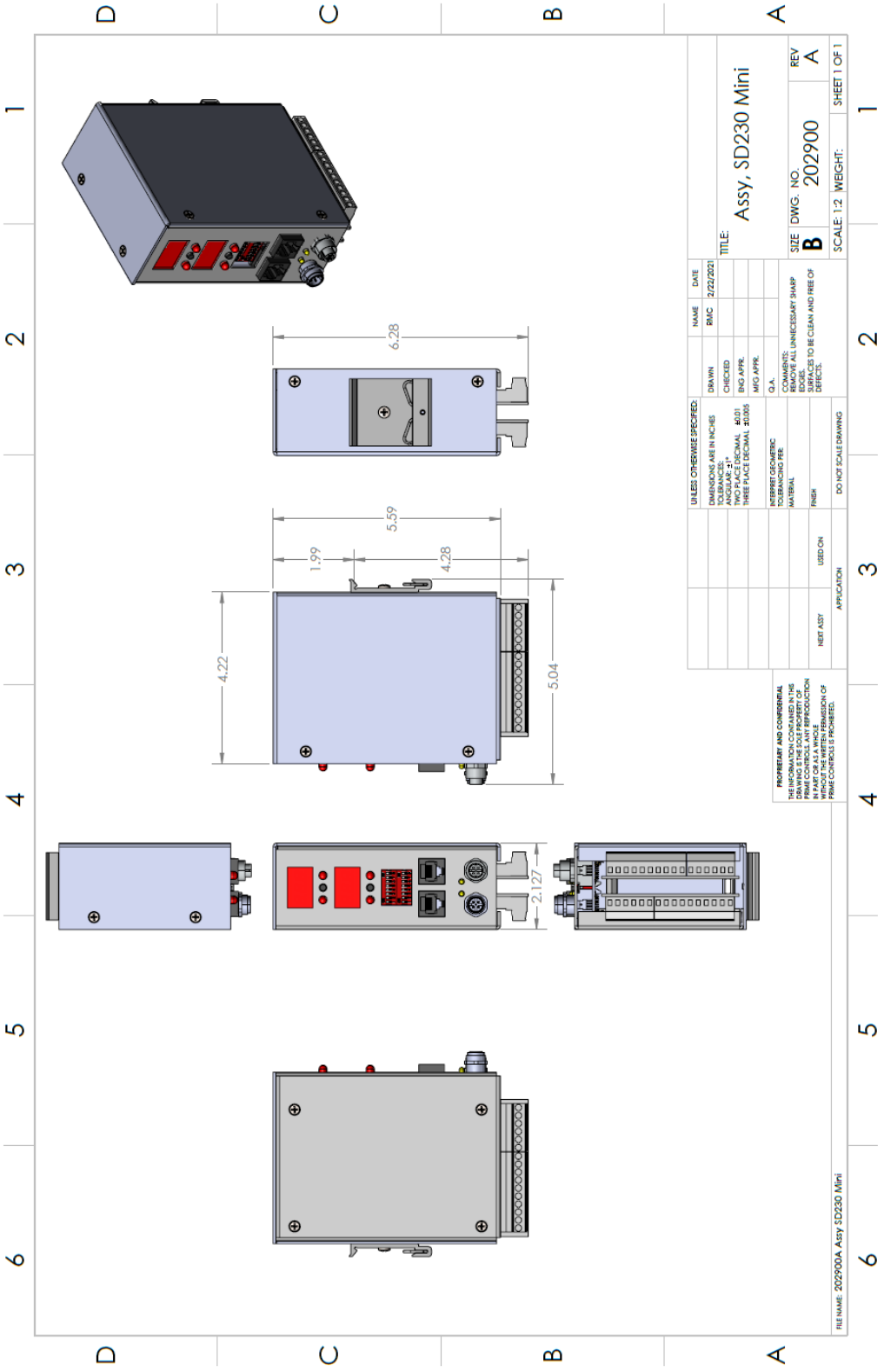
ELECTRICAL SPECIFICATIONS

Supply Voltage:	+24V DC plus or minus 10%	
Supply Current per Channel:	130 mA plus sourcing output load	
Inrush Current at Startup:	500 mA for 3 milliseconds per channel	
AUX and CAL Max Input Voltage:	30V	
AUX and CAL Input Impedance:	3300 ohms	
Sourcing Outputs:	On voltage:	Supply Voltage – 1.0 volt
	Off voltage:	0 volts
	Max current:	50 mA
Sinking Outputs:	On voltage:	0 volts
	Off voltage:	Load pullup dependent
	Max current:	50 mA
Output Overload Protection:	Self-resetting thermal fuse	
Input and Output Transient Protection:	30 volt transient absorber	
NET Input and NET Output:	Isolated 5V half-duplex RS485 Modbus transceiver	

SD230F CONTROL MODULE DIMENSIONS

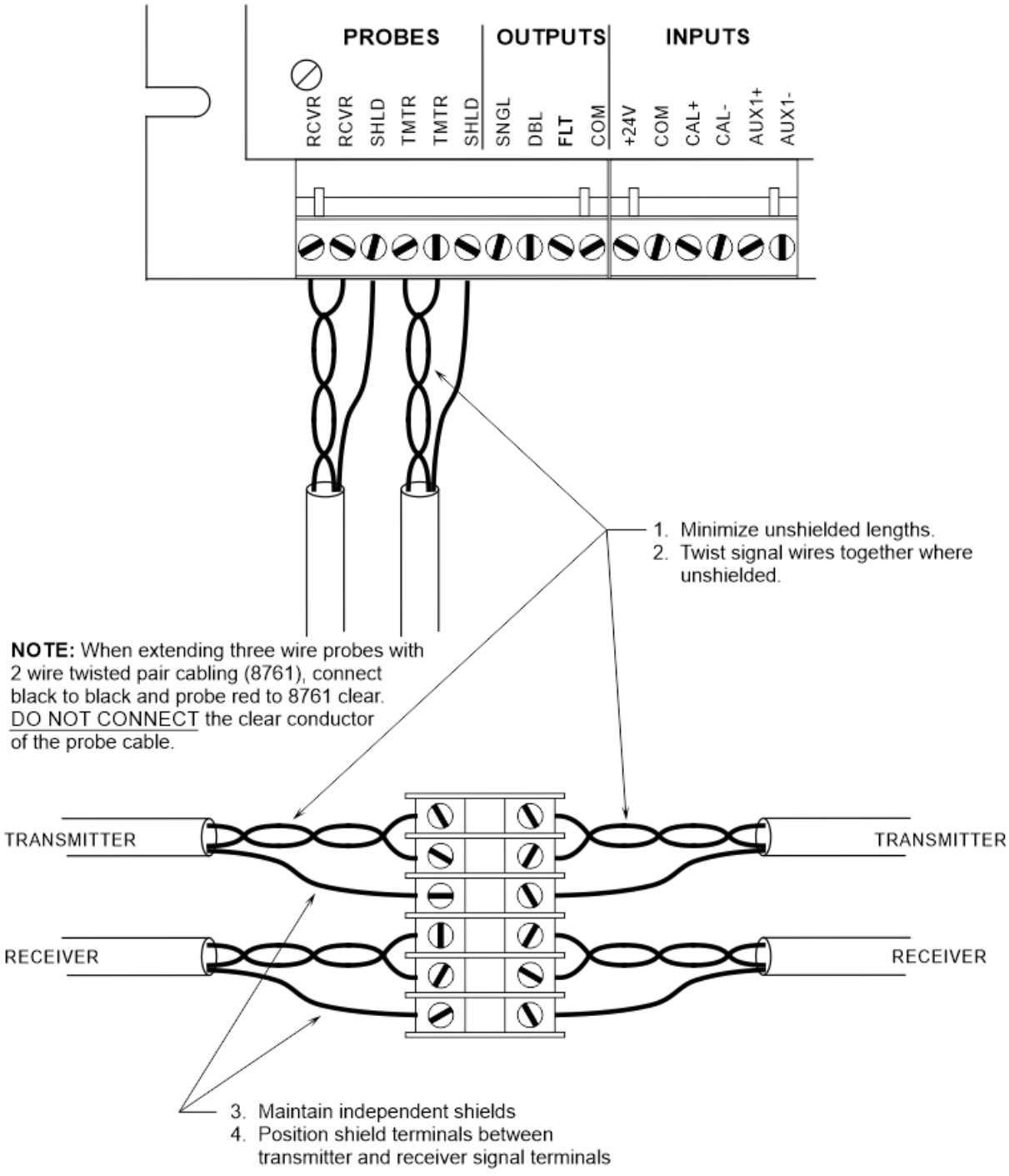


SD230M CONTROL MODULE DIMENSIONS



PROBE WIRING RECOMMENDATIONS

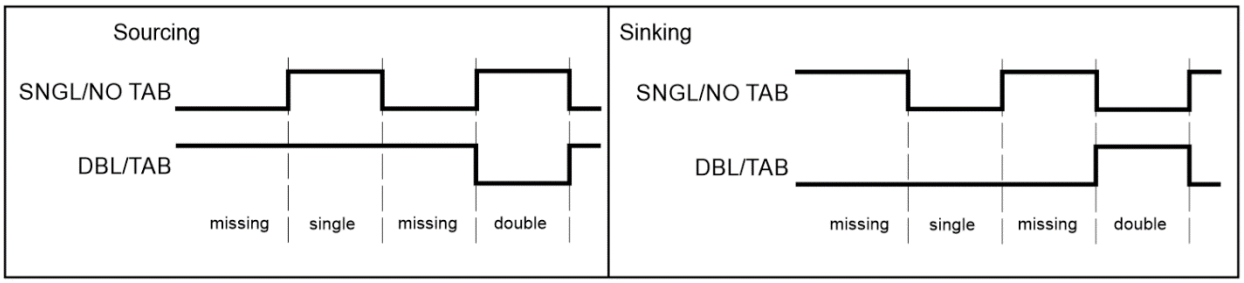
For maximum noise immunity, splice or terminate cables only when absolutely necessary. Where extension is necessary, use Belden 8761 or equivalent shielded twisted pair cable. The SD230M/C family of products is designed to provide high common mode noise rejection. Common mode rejection is realized most effectively with twisted pair cabling.



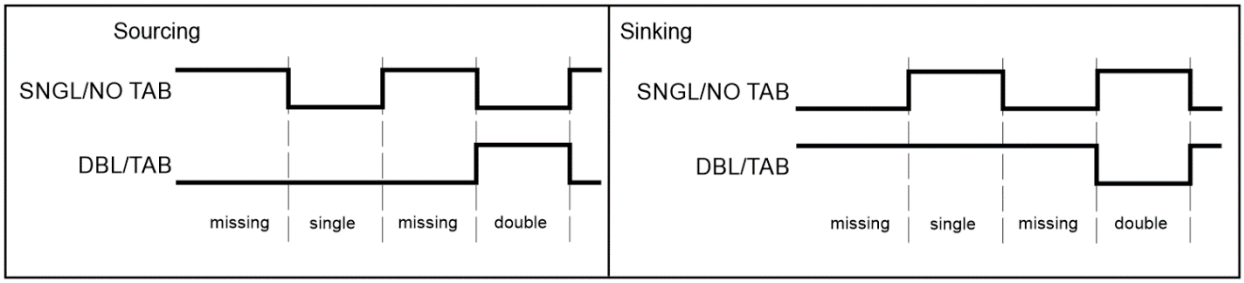
OUTPUT SIGNALS

Channel Configured for Double End Detection

Failsafe Mode

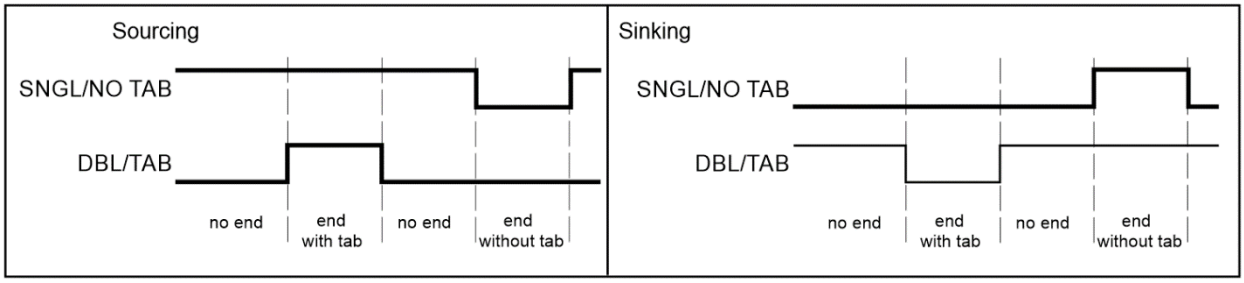


Compatibility Mode

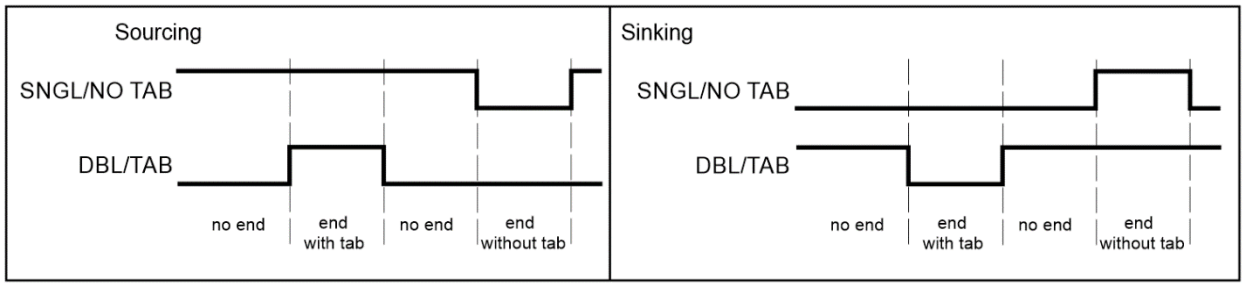


Channel Configured for On-Press Missing Tab Detection

Failsafe Mode

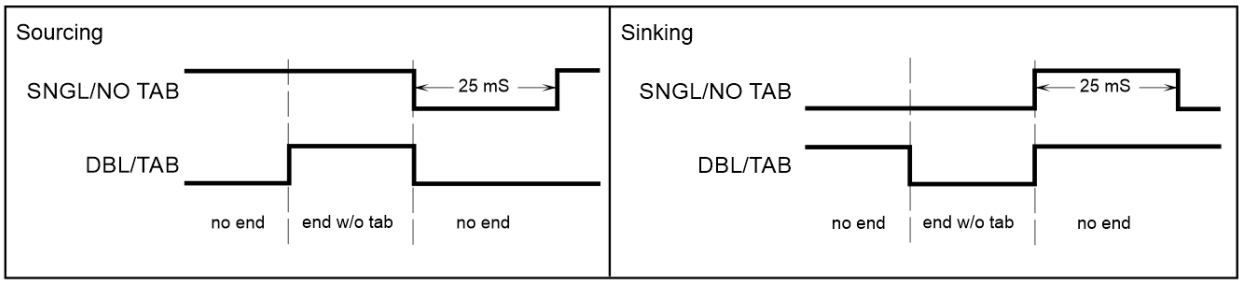


Compatibility Mode

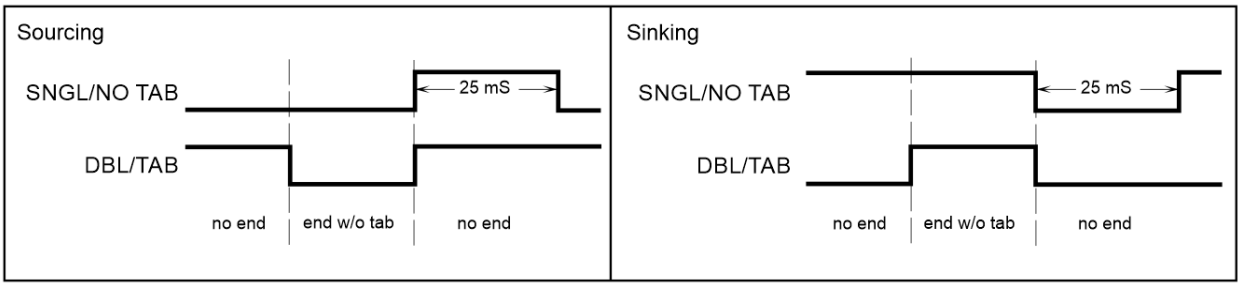


Channel Configured for Off-Press Missing Tab Detection

Failsafe Mode



Compatibility Mode



MIGRATION FROM OTHER SYSTEMS

SD230, SD232, SD233, SD220, SD222, SD223, and SD225

The SD23x family of detectors is a superset of the SD22x family, adding a network interface. The SD230F is a superset of the entire SD23x family, adding the flexibility to independently configure each channel to detect double ends or missing tabs. The SD230F's status lights have been upgraded to multicolored LEDs to enable this configurability. All share the same basic physical packaging. The SD230M is functionally identical to the SD230F, but in a DIN rail mounted package.

The SD230F and SD230M do not support the LH200 in TriSense mode. This is instead accomplished with a SD230F or SD230M and a LH200H.

The SD225's "NO TAB" output is in a different position than all other products in the SD23x and SD22x family of detectors including the SD230F and SD230M. If migrating from a SD225, swap the 2 wires connected to the outfeed channel's outputs at the plug. All other signals are unchanged. If migrating from any of these other devices, simply plug the SD230F or SD230M into the existing harness and configure it with the suggested settings.

Suggested Settings

Following are the suggested configuration settings to use when migrating from an SD23x or SD22x product family. Many settings can be copied over. Where settings have been added or moved, suggestions on how to set them based on the settings of the unit being replaced are provided.

	SD230 SD220	SD232 SD222	SD233 SD223	SD225
	Channel 1			
SW1	copy	copy	copy	copy
SW2	off	off	copy	off
SW3	copy	copy	copy	copy
SW4	copy	copy	copy	copy
SW5	copy	copy	copy	copy
SW6	copy	copy	copy	copy
SW7	copy from SW2	copy from SW2	off	copy from SW2
SW8	off	off	on	off
tL	copy [1]	copy [1]	copy [1]	copy [1]
oL	copy [1]	copy [1]	N/A	copy [1]
dL	N/A	N/A	N/A	N/A
do	copy	copy	copy	copy
AU	copy	copy	copy	copy
	Channel 2			
SW1	copy	copy	copy	copy
SW2	copy	off	copy	copy
SW3	copy	copy	copy	copy
SW4	copy	copy	copy	copy
SW5	copy	copy	copy	copy
SW6	copy	copy	copy	copy
SW7	off	copy from SW2	off	on
SW8	on	off	on	on
tL	copy [1]	copy [1]	copy [1]	N/A
oL	N/A	copy [1]	N/A	N/A
dL	N/A	N/A	N/A	copy
do	copy	copy	copy	copy
AU	copy	copy	copy	0

1. may not be present depending on certain DIP switch settings

SD200, SD202, SD203, and SD205

When upgrading from an SD20x family device to a SD230F or SD230M some differences should be noted. Power, AUX, and Fault are no longer shared between the controller's channels. The SD20x family shared 4 DIP switches between the two channels to change settings. The SD230F/SD230M have 8 DIP switches per channel. The DIP switches are now accessible without removing the front panel of the device. The jumpers used to select sinking/sourcing for the SD20x's outputs are now a single DIP switch setting. The SD230F and SD230M also add communication interfaces.

Suggested Settings and Wiring

Replacement of installed SD200 units by SD230M/SD230Fs requires the following wiring changes:

1. +24V and COM must be connected to both channels of the SD230M/SD230F.
2. SD20x family device's fault outputs are internally slaved together. The fault signals on the two channels of the SD230M/SD230F are totally independent. Both must both be monitored if previously only one channel was monitored.
3. If your installation uses the AUX input to quickly change between calibrations on different shell materials, it is necessary with the SD230M/SD230F to activate the AUX input on both channels by wiring them together.
4. If migrating from a SD205,
    a. connect the "CAN END" output to the SD230F/M's "DBL / TAB" output.
    b. connect the "NO TAB" output to the SD230F/M's "SNGL / NO TAB" output.

Following are the suggested settings to use when configuring a SD230F or SD230M as a replacement for an SD20x family device based on the settings and model of the device being replaced.

SD200

	Channel 1	Channel 2
SW1	SW1	SW1
SW2	off	channel 2 SU=0: on channel 2 SU=1: off [2]
SW3	SW3	SW3
SW4	version 2.20-2.99: SW4 version 4.00-up: SW4 all other versions: off	version 2.20-2.99: SW4 version 4.00-up: SW4 all other versions: off
SW5	channel 1 jumpers set to sourcing: off channel 1 jumpers set to sinking: on [1]	channel 2 jumpers set to sourcing: off channel 2 jumpers set to sinking: on [1]
SW6	off	version 1.00-2.34: on version 3.00-4.18: on all other versions: channel 2 Pd=0: off channel 2 Pd=1: on [3]
SW7	off	off
SW8	off	on
tL	version 2.20-2.99: copy from channel 1 [4] version 4.00-up: copy from channel [4] all other versions: N/A	version 2.20-2.99: copy from channel 2 [4] version 4.00-up: copy from channel 2 [4] all other versions: N/A
oL	N/A	N/A
dL	N/A	N/A
do	SW2=off: 0 SW2=on: 1	SW2=off: 0 SW2=on: 1
AU	0	0

1. Not all jumper combinations are possible. Sinking/sourcing for SD230F/M is per channel and per output on SD200.
2. SU parameter not available in older versions or when SW1 == off, in which case SU = 0 can be assumed.
3. Pd parameter not available in some versions or when SW1 == on, in which case Pd = 0 can be assumed.
4. May not be present depending on certain DIP switch settings.

SD202

	Channel 1	Channel 2
SW1	SW1	SW1
SW2	off	off
SW3	SW3	SW3
SW4	version 2.20-2.99: on version 4.00-up: on all other versions: off	version 2.20-2.99: on version 4.00-up: on all other versions: off
SW5	channel 1 jumpers set to sourcing: off channel 1 jumpers set to sinking: on [1]	channel 2 jumpers set to sourcing: off channel 2 jumpers set to sinking: on [1]
SW6	version 2.37-2.99: on version 4.22-up: on all other versions: off	version 2.37-2.99: on version 4.22-up: on all other versions: off
SW7	SW4	SW4
SW8	off	off
tL	version 2.20-2.99: copy from channel 1 [2] version 4.00-up: copy from channel 1 [2] all other versions: N/A	version 2.20-2.99: copy from channel 2 [2] version 4.00-up: copy from channel 2 [2] all other versions: N/A
oL	version 2.37-2.99: copy from channel 1 version 4.22-up: copy from channel 1 all other versions: N/A	version 2.37-2.99: copy from channel 2 version 4.22-up: copy from channel 2 all other versions: N/A
dL	N/A	N/A
do	SW2=off: 0 SW2=on: 1	SW2=off: 0 SW2=on: 1
AU	0	0

1. Not all jumper combinations are possible. Sinking/sourcing for SD230F/M is per channel, and is per output on SD202.
2. May not be present depending on certain DIP switch settings.

SD203

	Channel 1	Channel 2
SW1	SW1	SW1
SW2	channel 1 SU=0: on channel 1 SU=1: off [2]	channel 2 SU=0: on channel 2 SU=1: off [2]
SW3	SW3	SW3
SW4	version 2.20-2.99: SW4 version 4.00-up: SW4 all other versions: off	version 2.20-2.99: SW4 version 4.00-up: SW4 all other versions: off
SW5	channel 1 jumpers set to sourcing: off channel 1 jumpers set to sinking: on [1]	channel 2 jumpers set to sourcing: off channel 2 jumpers set to sinking: on [1]
SW6	version 1.00-2.34: on version 3.00-4.18: on all other versions: channel 1 Pd=0: off channel 1 Pd=1: on [3]	version 1.00-2.34: on version 3.00-4.18: on all other versions: channel 2 Pd=0: off channel 2 Pd=1: on [3]
SW7	off	off
SW8	on	on
tL	version 2.20-2.99: copy from channel 1 [4] version 4.00-up: copy from channel 1 [4] all other versions: N/A	version 2.20-2.99: copy from channel 2 [4] version 4.00-up: copy from channel 2 [4] all other versions: N/A
oL	N/A	N/A
dL	N/A	N/A
do	SW2=off: 0 SW2=on: 1	SW2=off: 0 SW2=on: 1
AU	0	0

1. Not all jumper combinations are possible. Sinking/sourcing for SD230F/M is per channel, and is per output on SD203.
2. SU parameter not available in older versions or when SW1 == off, in which case SU = 0 can be assumed.
3. Pd parameter not available in some versions or when SW1 == on, in which case Pd = 0 can be assumed.
4. May not be present depending on certain DIP switch settings.

SD205

	Channel 1	Channel 2
SW1	SW1	SW1
SW2	off	channel 2 SU=0: on channel 2 SU=1: off [2]
SW3	SW3	SW3
SW4	SW4	off
SW5	channel 1 jumpers set to sourcing: off channel 1 jumpers set to sinking: on [1]	channel 2 jumpers set to sourcing: off channel 2 jumpers set to sinking: on [1]
SW6	off	off
SW7	off	on
SW8	off	on
tL	copy from channel 1 [3]	N/A
oL	N/A	N/A
dL	N/A	copy from channel 2
do	SW2=off: 0 SW2=on: 1	SW2=off: 0 SW2=on: 1
AU	0	0

1. Not all jumper combinations are possible. Sinking/sourcing for SD230F/M is per channel, and is per output on SD205
2. SU parameter not available in older versions or when SW1 == off, in which case SU = 0 can be assumed
3. May not be present depending on certain DIP switch settings.

MODBUS NETWORK

Description

The SD230F/SD230M features network communications capability, either directly over Modbus to a Pro-face HMI or indirectly through a gateway (ET230) to EtheNet/IP connected PLCs and HMIs. The network connection provides access to all status information from the system and allows for remote activation of the calibrate function. Additionally, diagnostic functions may be invoked, and profiles of tested shells may be displayed.

The controllers, when daisy-chained on the Modbus network, automatically assign their own device ID numbers starting with 01 for the left channel of the unit connected to the HMI or gateway, through N for the right channel of the last unit in the chain. For a four-out press, the assigned IDs would be from 01 through 08. The device ID appears on the two-digit display in the lower half of the front panel of the SD230F or in the parameter menu of the SD230M. To view the ID on an SD230M, hold down the CALIBRATE button until "**id**" appears, and then release the button. The display will then display the network ID.

The LEDs located adjacent to the network connectors on the SD230, indicate status of the communication with the channel on which they appear. The LED flashes yellow when a packet is received, green when a packet is transmitted, and red when an error occurs.

For details of Pro-face HMI operation see SD230 Pro-face HMI User Instructions.

Installation

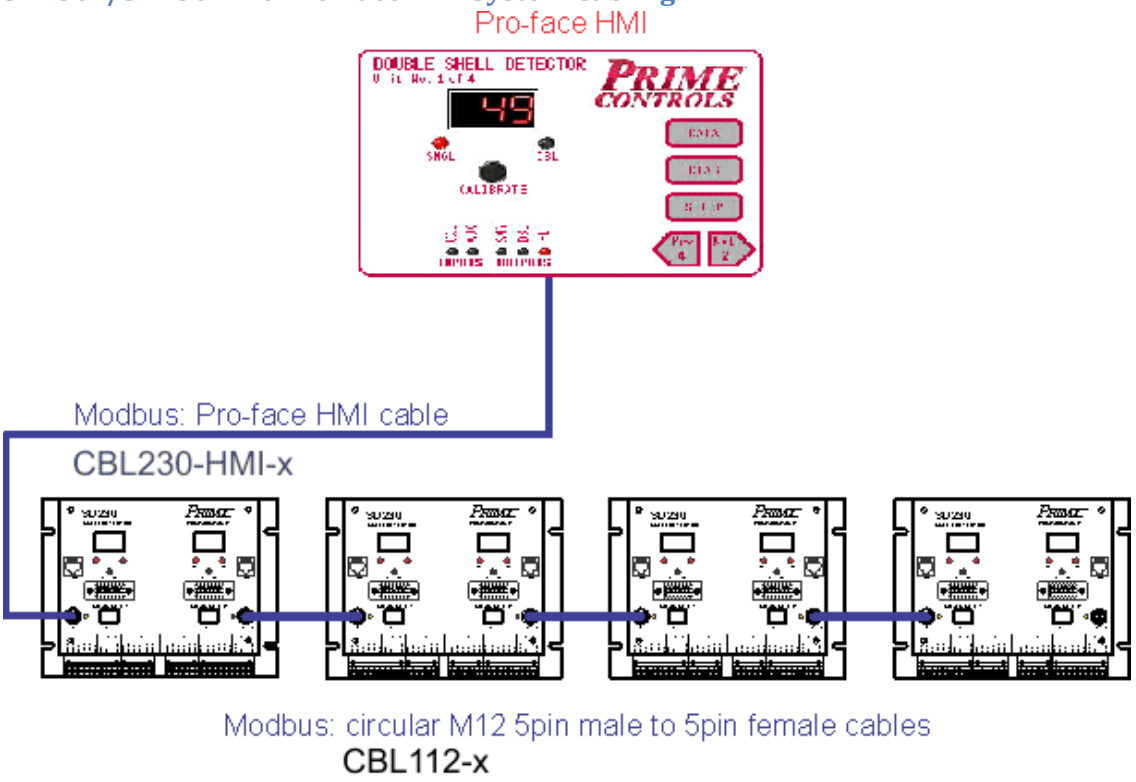
Standard five conductor M12 male-female cables are used to daisy-chain from one controller to the next. The daisy-chain cables are typically Prime Controls part number CBL112-1 for 0.3 meter or CBL112-2 for 2 meters. The cable requirement to the left channel of the lead unit depends upon the device being connected. The figures that follow show the cable required from the controller to a Pro-face HMI or ET230 gateway. Part number choices for the Pro-face HMI cable are CBL230-HMI-2 (2 meter, no field attachable connectors), or a CBL230-HMI-X-FA with field attachable M12 connectors for easier routing through conduits. The -X- is ordered as a 2, 5, or 10 for convenient lengths in meters.

Setup

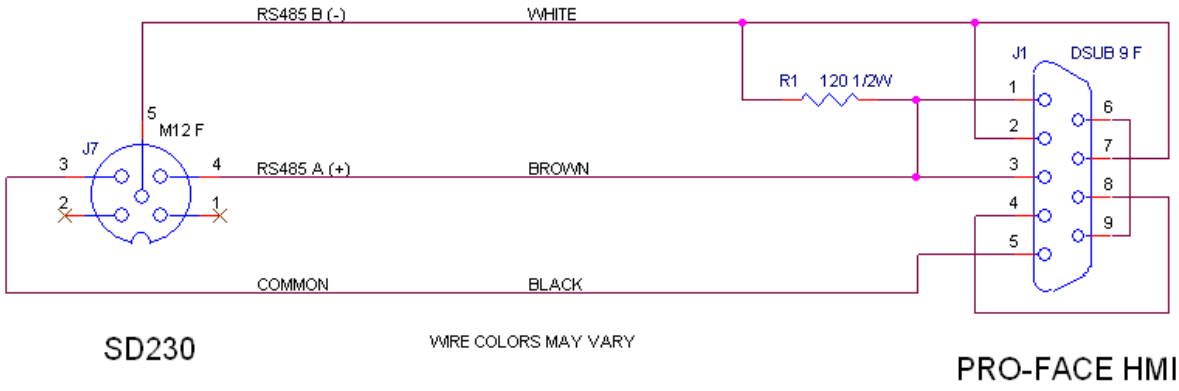
Setup of the system for networking requires only that the appropriate five conductor cables connect all units in a daisy-chain configuration. At power up, the units display their ID numbers from one to 2xN where N is the number of connected units.

Cabling

SD230F/SD230M To Pro-Face HMI System Cabling



SD230F/SD23M To Pro-Face HMI Cable



EtherNet/IP Gateway Interconnect

See ET230 Operating Instructions for documentation on connecting a network of SD230F/SD230M controllers with an ET230.

ModBus Entities

All ET230 Tags must be prefaced with Prime_RdChn[index] or Prime_WrChn[index] where index is the channel number (1-8).
Prime_RdChn[index] is used for reading the respective tags while Prime_WrChn[Index] is used to trigger a write operation to R/W tags. To read the LeftLED of channel 3, one uses tag Prime_RdChn[3].BitGroup1,FrontPanel.0.

Discrete Coil Outputs (000001) (Read/Write)

Entity Number	ET230 Tags	Name	Meaning
000001	BitGroup1.FrontPanel.0	LeftLED	Single/No-Tab LED
000002	BitGroup1.FrontPanel.1	RightLED	Double/Tab LED
000003	BitGroup1.FrontPanel.2	Single/No-Tab	Single/No-Tab Output
000004	BitGroup1.FrontPanel.3	Double/Tab	Double/Tab Output
000005	BitGroup1.FrontPanel.4	Fault	Fault Output
000006	BitGroup1.FrontPanel.5	TxProbeFault	Transmitter Probe Fault
000007	BitGroup1.FrontPanel.6	RxProbeFault	Receiver Probe Fault
000008	BitGroup1.FrontPanel.7	VelocityFault	Shell Velocity Fault (SD235 only)
000009	BitGroup1. HMIControls.0 & CalValue & CalStrobe	NetCalReq	Calibration request from HMI
000010	BitGroup1.HMIControls.1 & ForceHighOutputsValue & ForceHighOutputsStrobe	ForceHighOutputs	Force all outputs high from HMI

Entity Number	ET230 Tags	Name	Meaning
000011	BitGroup1.HMIControls.2 & ForceLowOutputsValue & ForceLowOutputsStrobe	ForceLowOutputs	Force all outputs low from HMI
000012	BitGroup1.HMIControls.3	NetFreezeScan	Freeze Scan Control Bit
000013	N/A	Reserved	
000014	N/A	Reserved	
000015	N/A	Reserved	
000016	N/A	Reserved	

Discrete Coil Inputs (100001) (Read Only)

Entity Number	ET230 Tags	Name	Meaning
N/A	Prime_ModbusFault	Modbus Fault	Modbus Fault detected by PLC (PLC tag)
100001	BitGroup2.DIPsw.0	DIPSw1	DIP Switch 1 input
100002	BitGroup2.DIPsw.1	DIPSw2	DIP Switch 2 Input
100003	BitGroup2.DIPsw.2	DIPSw3	DIP Switch 3 input
100004	BitGroup2.DIPsw.3	DIPSw4	DIP Switch 4 input
100005	BitGroup2.DIPsw.4	DIPSw5	DIP Switch 5 input
100006	BitGroup2.DIPsw.5	DIPSw6	DIP Switch 6 input
100007	BitGroup2.DIPsw.6	DIPSw7	DIP Switch 7 input
100008	BitGroup2.DIPsw.7	DIPSw8	DIP Switch 8 input
100009	BitGroup2.SD230_IO.0	InputReg1	Calibrate pushbutton input
100010	BitGroup2.SD230_IO.1	InputReg2	External CAL input
100011	BitGroup2.SD230_IO.2	InputReg3	AUX input
100012	BitGroup2.SD230_IO.3	RunFlag	Machine is running flag
	N/A	Reserved	

Register Inputs (300001) (Read Only)

Entity Number	ET230 Tags	Name	Meaning
300001		NetworkID	Modbus network ID (1-32)
300002	GageAttrFlag	GageAttrFlag	Gauging attributes
300003	MaterialCode	MaterialCode	Shell and tab material code
300004	ScaledGageDispVal	ScaledGageDispVal	Gage value (0 to 255)
300005	FaultReg	FaultReg	Fault reporting register
300006	WatchdogCounter	WatchdogReg	Watchdog counter register
300007	NuOfChan	NodeCt	Count of SD units on the network
300008			Not used
300009			Not used
300010	SwLabels[0]	SwLabel1	DIP Switch 1 label text (Packed Bytes)
300020	SwLabels[1]	SwLabel2	DIP Switch 2 label text (Packed Bytes)
300030	SwLabels[2]	SwLabel3	DIP Switch 3 label text (Packed Bytes)
300040	SwLabels[3]	SwLabel4	DIP Switch 4 label text (Packed Bytes)
300050	SwLabels[4]	SwLabel5	DIP Switch 5 label text (Packed Bytes)
300060	SwLabels[5]	SwLabel6	DIP Switch 6 label text (Packed Bytes)
300070	SwLabels[6]	SwLabel7	DIP Switch 7 label text (Packed Bytes)
300080	SwLabels[7]	SwLabel8	DIP Switch 8 label text (Packed Bytes)
300091	ProfileSize	ProfileSize	Number of data points in the profile
N/A	Prime_ProfileEnableChn	Profile Channel Select	Selects channel for active profile capture (PLC tag)
300092	ProfileData & Prime_ProfileEnableChn	ProfileData	Data buffer (200 packed bytes read as 100 16 bit registers), data set selected by ProfileIndex
300292	N/A	FirmwareVersion	Firmware version no (dd.dd x 100)
	N/A	Reserved	

Interpretation of the Gage Attrib Flag 300002

Bits	Parameter
B0..B2	Gage Type Code 0 -> Single/Double Detection 1 -> On-Press Tab Detection 2 -> Off-Press Tab Detection
B3	Tolerance Adjustment Allowed
B4	Overlap Adjustement Allowed
B5	Delta Adjustment Allowed

Holding Registers (400001) (Read/Write)

Entity Number	ET230 Tags	Name	Meaning
400001	GageTolRd & GageTolValue & GageTolStrobe	GageTol	Gauging tolerance in percent
400002		Delta	Minimum panel to tab delta (SD225 only)
400003	OverlapPercentage	Overlap	Off-press shell overlap allowance in percent
400004	DataInvertContrlRd & DataInvertControlValue & DataInvertControlStrobe	DisplayInv	Display invert (100 to 0 vs 0 to 100)
400005	SD230Gain	Gain	Receiver gain (0 to 255)
400006	GageThreshold	GageThreshold	Single to double or tab to no-tab threshold
400007	GapThresh	GapThresh	Shell to no shell data threshold
400008	DAcqGadThresh & DAcqGapThreshValue & DAcqGapThreshStrobe	DAcqGapThresh	Shell/no-shell threshold for data acquisition
400009	Frequency	Frequency	Transmitter frequency
400010			Not used
400011	TotalMsgCnt & ClearDiagStrobe	BusMsgCt	Modbus total message count

Entity Number	ET230 Tags	Name	Meaning
400012	HandledMsgCnt & ClearDiagStrobe	HandledMsgCt	Modbus handled message count
400013	CRCerrorCnt & ClearDiagStrobe	CRCErrCt	Modbus CRC error count
400014	ExceptionMsgCnt & ClearDiagStrobe	ExceptionCt	Modbus exception response count
400015	NoResponseMsgCnt & ClearDiagStrobe	NoRespCt	Modbus no-response count
400016	CharOverrunCnt & ClearDiagStrobe	CharORCt	Modbus character overrun count
400017	NAKresponseCnt & ClearDiagStrobe	NAKRespCt	Modbus NAK response count
400018	BusyResponseCnt & ClearDiagStrobe	BusyRespCt	Modbus busy response count
400019	ProfileIndex & ProfileIndexValue & ProfileIndexStrobe	BufferIndex	Profile index for retrieval of current and past profiles: 0 to 9, 0 is most recent
	N/A	Reserved	

In cases where three PLC tags are listed as in: GageTolRd & GageTolValue & GageTolStrobe. The first PLC tag (GageTolRd) is the current value of this parameter. The second PLC tag (GageTolValue) is the value that will be written to the unit when the third value (GageTolStrobe) is set to minus one (-1). The third tag is set to zero upon completion of the writing action.

In cases where two PLC tags are listed as in: TotalMesageCnt & ClearDiagStrobe. The first PLC tag (TotalMesageCnt) is the current value of this parameter. The second PLC tag (ClearDiagStrobe) is set to minus one (-1) to reset the associated value(s) to zero (TotalMesageCnt). This tag is set to zero upon completion of the clear action.

In cases where one PLC tag is listed, setting or clearing mechanisms have not been implemented for the PLC and the value is effectively read only.

LIMITATION AND EXCLUSION OF WARRANTIES

All goods purchased from PRIME CONTROLS, INC. shall be free from defects in materials, design and workmanship under normal conditions of use for one year from the date of shipment. THIS WARRANTY IS THE SOLE WARRANTY AND IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED, WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE. THE LIABILITY OF PRIME CONTROLS TO ANY PURCHASER SHALL BE LIMITED EXCLUSIVELY TO THE COST OF REPLACEMENT OR REPAIR OF DEFECTIVE PARTS, AND SHALL NOT INCLUDE LIABILITY FOR ANY DIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES WHATSOEVER, WHETHER FORESEEN OR UNFORESEEN, INCLUDING BUT NOT LIMITED TO LOST PROFITS, LOST SALES, OR INJURY TO PERSONS OR PROPERTY.

NAME PLATE INFORMATION

Prime Controls, Inc.
4528 Gateway Circle
Dayton, OH 45440-1712
USA

Shell/Tab Detector

Model: SD230M/SD230F

+24V DC @ 500mA per channel

EC DECLARATION OF CONFORMITY

PRIME CONTROLS, INC.
4258 Gateway Circle
Dayton, OH 45440
USA

***Name and address of the company established in European Community and authorized to compile the Technical File*:**

ACC - Services Contact
78 Allée Preimavera
Centre Ubidoca 2402
74370 Annecy
FRANCE

PRIME CONTROLS, INC. declares under our sole responsibility that the product described as:

Equipment Name: Shell / Tab Detector
Generic Equipment Description: Used to detect defects on conversion presses
Model /Type: SD220 SD230

Complies with the requirements of the following European Union Directives:

Machinery Directive 2006/42/EC
Radio Equipment Directive 2014/53/EU
RoHS Directive 2011/65/EU

Main standards considered:

EN ISO 12100:2010
EN 61010: 2010
EN 50364: 2010
EN 301-489-1 V2.1.1, EN 301 489-3 V2.1.0
EN 300 330 V2.1.0
EN 50581:2012

Date: 2020-12-09 **At: Dayton, Ohio USA**

Name of authorized company representative: Ms. Beth Graves, President
Signature: Beth Graves {Electronic Signature}

UKCA DECLARATION OF CONFORMITY

PRIME CONTROLS, INC.
4258 Gateway Circle
Dayton, OH 45440
USA

***Name and address of the company established in European Community and authorized to compile the Technical File*:**

ACC - Services Contact
International House
10 Churchill Way
Cardiff CF10 2HE
UNITED KINGDOM

PRIME CONTROLS, INC. declares under our sole responsibility that the product described as:

Equipment Name: Shell / Tab Detector
Generic Equipment Description: Used to detect defects on conversion presses
Model /Type: SD220 SD230

Complies with the requirements of the following European Union Directives:

The Supply of Machinery (Safety) Regulations 2008
The Radio Equipment Regulations 2017
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Main standards considered:

BS EN ISO 12100:2010
BS EN 61010: 2010
BS EN 50364: 2010
BS EN 301-489-1 V2.1.1, BS EN 301 489-3 V2.1.0
BS EN 300 330 V2.1.0
BS EN 50581:2012

Date: 2020-12-09 **At: Dayton, Ohio USA**

Name of authorized company representative: Ms. Beth Graves, President
Signature: Beth Graves {Electronic Signature}