MANUAL DIFUSSION CLEAN STATION

SERIAL# 1974

FOR:

UNIVERSITY OF UTAH

Salt Lake City, Utah

USER'S MANUAL

BOLD TECHNOLOGIES

SPECIALISTS IN MANUFACTURING SURFACE PREPARATION EQUIPMENT

1455 West 8120 South
West Jordan, UT 84088

TABLE OF CONTENTS

GETTING STARTED

Introduction

The Company

Bold Technologies, located near Salt Lake City, Utah, is a manufacturer and innovator of high quality chemical processing equipment. Bold's products range from simple etch baths to fully automated process equipment. Bold employs highly skilled craftsmen, engineers, technicians, and designers in the development and manufacture of their products.

With over twenty years experience in the semiconductor equipment industry, Bold Technologies understands the unique equipment demands of the semiconductor industry. Bold is in a position to provide the best products designed to your exact specifications.

Products & Services

The quality you will find in Bold's products represents many years of development by knowledgeable and experienced people. The highest quality materials and technologies, compatible with chemical processes, have been used to ensure safety and long life.

Bold's products are designed to meet or exceed customer-provided specifications. Every effort is made to gather necessary information prior to the design process. Design modifications always require customer approval. Bold's service team is always ready to assist customers in the event of needed repairs or modifications. All designs are fully documented and are backed by a one year limited warranty.

Design Features

- Secondary Containment Standard with Open Drains
- White Poly Propylene Shell Construction
- Integrated Safety Interlocks
- Front Maintenance Access Design
- Emergency Power Off *(EPO)* System
- Photohelic Low Exhaust Alarm System
- High Purity Teflon DI Plumbing
- PFA Teflon Spray Guns for N2 & Dl Water
- ICD/Heateflex Submergible Heaters
- Manual Chemical Tank Lid
- Cascade Rinser

What's in this Manual

This manual is organized to help product users easily locate information. The best tool for locating information is the Table of Contents. Most products manufactured by Bold Technologies are custom and unique. User manual organization is common to all products while the actual content varies depending on the product's configuration and applications.

Information on the following is included in every user manual unless for a particular product configuration, in which it may not apply.

- Introduction to product features
- Safety hazard communication
- Unpacking & product inspection
- Start-up and installation
- System operating instructions
- Safety interlocks
- Troubleshooting
- Preventive maintenance
- Warranty, repairs, and return policies
- OEM equipment information
- Quality assurance records
- Calibration and setup records
- Drawings

Safety Hazard Communication

In this manual, all *warnings* refer to potential safety risks to the user while all *cautions* refer to potential damage to the equipment or serious loss of customer product. The *user is* defined as anyone who operates, maintains, or configures the equipment for operation. It is the user's responsibility to know and understand the risks involved with the use of this product.

In the manual, this box, with attention symbol is used to indicate important safety WARNINGS, CAUTIONS, DANGERS and NOTES to the operation of this equipment.

To ensure the user's safety and the reliable operation of this equipment, please read and understand the following general warnings and cautions prior to operating this equipment.

GENERAL WARNINGS:

- Do not penetrate any part of the housing or structural elements of this equipment. Serious potential risks to the user and/or equipment exist if not heeded.
- Set proper exhaust before operating this equipment.
- Wear proper safety apparel during operation and maintenance activities.
- Do not raise heater temperatures above the specified settings for their intended process application. **Never heat solvents above their flash points.**

GENERAL CAUTIONS:

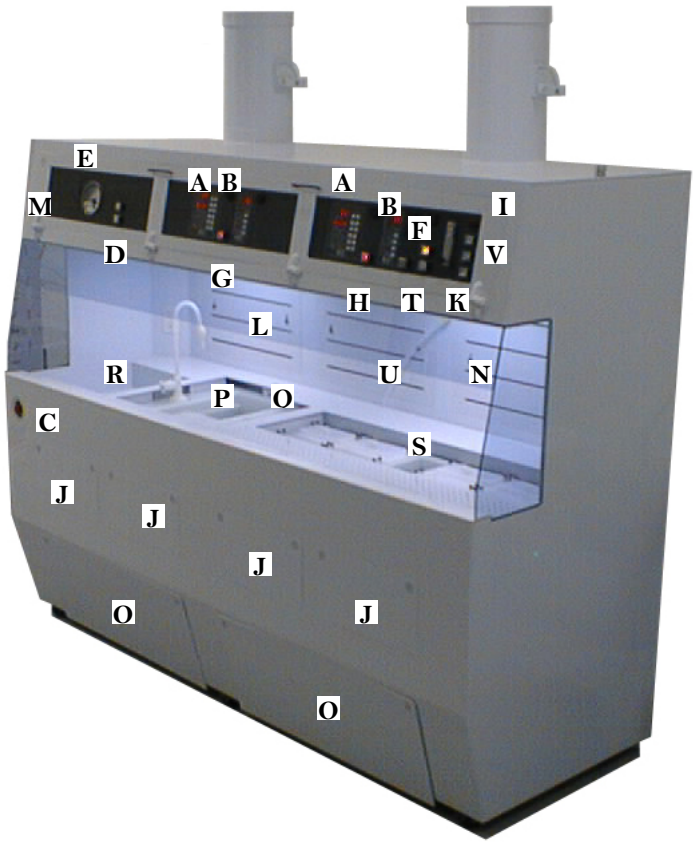
- Handle all equipment and components with extreme care and caution during operation and maintenance related activities.
- Modifications to the equipment are not encouraged. If modifications are necessary, contact Bold Technologies' Technical Service department.
- Do not operate equipment if chemicals and other process fluids are below minimum levels.
- Allow chemicals to cool to safe temperatures before draining.

Preliminary Equipment Inspection

Bold Technologies inspects and tests its products for proper operation and cosmetic defects prior to shipment to the customer. This product was found to be free of significant cosmetic defects and operational errors. Bold Technologies makes reasonable efforts to adequately package its products, however, during shipment, there may be potential for damage.

Prior to operation, inspect all equipment, related accessories, and components, for visible signs of damage. If damage or modification during shipment or installation is suspect, please refer to instructions in the section entitled *"Servicing / Warranties, Repairs, & Returns / Damaged Shipment Procedure". (See "Table of Contents")*

Equipment Functions and Features

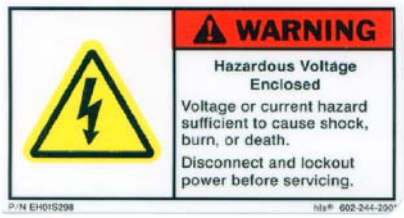


A. 625C High Temp Bath Controller
B. 625T Timer
C. EPO Button
D. DI Gooseneck Control
E. Exhaust Pressure Gage
F. Deck Light
G. Tank 1 Heater Fault
H. Tank 6 Heater Fault
I. Blocked Main Drain
J. Plenum Access Panels
K. Alarm Silence
L. Exhaust Vents
M. Electrical Access Doors
N. Plumbing Access Doors
O. Exhausted Storage
P. Gooseneck Sink
Q. Glove Wash/DI/N2 Gun
R. Recessed Hot Plate Area
S. Chemical & Rinse Tanks
T. Neutralization Alarm
U. Hand Held Aspirator
V. Magnetic Stirrer Control

Hazard Warnings

The following are Hazard Warning Labels placed on the equipment.

Used on Labeled “M” and “T” on Equipment Functions and Features Page



Used on Labeled “S” on Equipment Functions and Features Page

Start-Up Procedures

General Start-Up

The following steps are *general* start-up procedures for Bold Technologies' wet processing stations.

(Some of these steps may not apply to your particular product configuration.)

1. Turn the main power switch to the "On" position. Set any individual breakers to the "On" position.

2. Check the exhaust pressure gage *(Photohelic®)* for proper exhaust flow *(see, "Getting Started I Equipment Functions and Features").*

3. Check for presence of all applicable fluid supplies and verify proper pressures and flow rates. These usually include de-ionized water (DI), nitrogen (N_2), clean dry air *(CDA),* city water (CW), and applicable process chemicals.

4. Test all tanks for proper functions such as draining, cleaning, heating, and recirculation.

WARNING: Be sure to fill process tanks to proper and safe levels before testing these functions.

5. Check controllers and remote switches for proper operation.

6. Verify that low liquid level sensors in chemical tanks initiate a power shut down.

7. Test the EPO button to verify an immediate power shutdown.

8. Check all timers for proper fill and drain sequences.

The following are *specific* start-up procedures for devices, equipment and systems typically integrated into Bold Technologies' wet processing stations. *(Some of these devices and systems may not be included in your particular product configuration.)*

Heated Bath Start-Up

Bold Technologies uses many types of heated bathes *(hot pots)* in wet processing stations. Some of them consist of quartz, Teflon®, PVDF, polypropylene, stainless steel, and Halar®. The material used depends on the user's specifications, the process chemicals used and the applied temperature ranges.

Below are instructions for properly starting up a heated bath:

1. Fill the tank and press the Power key on the 625C (or *625CP*) temperature controller. If the alarm sounds, press the SIL key to silence the alarm. The controller will power-up in the Hold mode. Press the Enter key to access the setup stack.

2. Press the Save key after setting each parameter in order to store it in memory. Press the Enter key to move to the next parameter.

3. Set the desired parameters for the temperature controller. Refer to the Setup section of the 625C/CP temperature controller manual before proceeding further.

4. When all parameters are set, press the Return key to exit the stack. Press the Hold key to disable the Hold function and the system will begin to heat up. Allow time for the system to reach setpoint and stabilize.

CAUTION: Be sure to check the temperature with a calibrated thermometer.

5. If applicable, adjust the DI flowmeter for desired flow during DI injection. If the temperature differs, re-enter the setup stack and do the following:

    - Go to parameter "CA" *(Calibrate)*

- Adjust the temperature offset according to the amount of temperature error
- Press Save and Return

6. Now that the system is stable, cooling the system down may be accomplished by disabling the heater. To do this, press the Hold key.

7. Pressing the ASP key will cause the unit to acknowledge with four beeps. The key must be pressed a second time for a cycle to be activated. If the initial function was in error, the Return key should be pressed to cancel the ASP command. When the aspiration cycle is activated, it will begin to drain unless the temperature is above the drain temperature. In this case, it will automatically drain when the bath cools to an acceptable level. Observe while the bath drains to check liquid level alarm. The alarm should sound before the bath is completely drained.

Cascade Rinser Start-Up

Press the Enter key on the 625TM rinse controller. This will allow you to enter the program stack for set-up. If the "CD" *(cycle drain)* parameter is indicated, enter the programmed access number using the Up/Down keys, enter "99" if you do not know the number. Press the Setup key after each selection.

Set desired parameters for the 625TM Rinse Controller. Refer to the "Setup" section of the 625TM user manual before proceeding further.

After setup is accomplished, press the Stop key to exit the stack. Press the Start key to run the system.

Chemical Bath Start-Up

Press the Power key on the 625C Temperature Controller. The controller will go into Hold mode. Press the Enter key to access the parameter stack. After each parameter is set, you must press the Save key to store it in memory. Press the Enter key to advance to the next stack parameter.

Set desired parameters for the 625C Temperature Controller. *(Refer to the "Setup" section of the 625C Temperature Controller manual before proceeding further.)*

When all parameters are set, press the Return key to exit the stack. Press the Return key to take the unit out of Hold mode. Allow the system to reach setpoint and stabilize.

CAUTION: Be sure to check the etch bath temperature with a calibrated thermometer.

If the etch bath and controller temperatures differ, access the stack and adjust the "CA" parameter and calibrate the temperature accordingly.

Process Timer Start-Up

The Setup mode is accessed via a *buried* key. Enter the Setup mode by pressing and holding the Stop/Reset key and then pressing the Run key. While in this mode, the Start key is used to step through the parameters. Once the bottom of the stack is reached, the display will wrap around back to the first parameter.

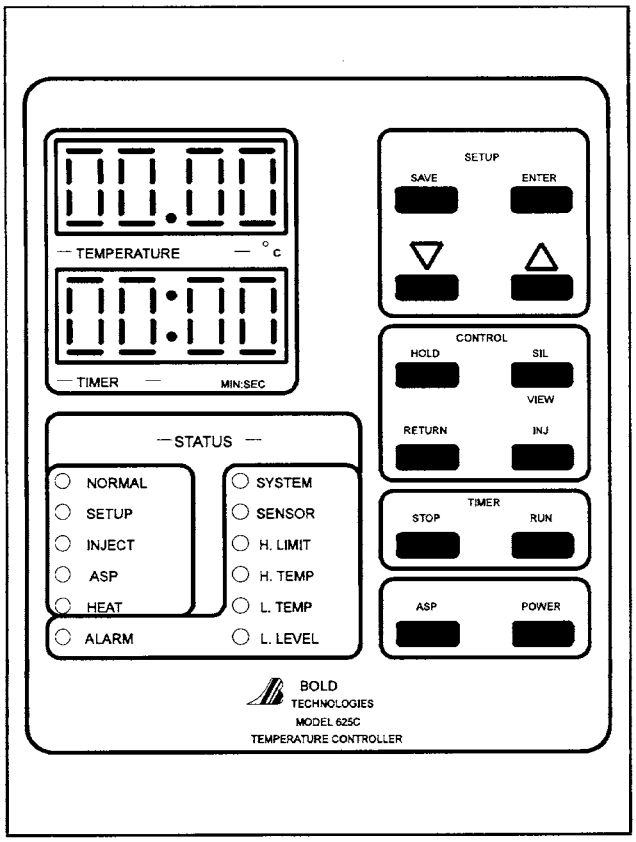
Set desired parameters for the 625TM Process Timer. Refer to the Setup section of the 625TM Process Timer manual before proceeding further.

To exit the Setup mode, press the Reset key. Upon exiting, the unit automatically enters the Save mode. This stores the setup parameters in EEPROM memory.

If more information is required, please refer to the 625TM Process Timer manual.

OPERATION

625C High Temp Bath Controller



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Introduction

The 625C is a microprocessor-based controller / timer. It monitors temperature using a type J thermocouple sensor and controls bath temperature with standard three mode (*PID*) control scheme, with anti-reset windup. Numerous status and alarm functions are incorporated to monitor various system parameters. Additionally, a down - count / up-count programmable timer, with accumulative over-time and pre-warn is integrated into the system. Relay outputs are provided for the special Injector / Aspirate and Timer functions

A built-in 15 amp, photo-isolated, solid state power controller is used to regulate the heater. This allows the microprocessor to maintain the most accurate temperature possible without any concern for excess cycling. The power controller contains a zero cross detection scheme. This insures no RFI (*Radio Frequency Interference*) is generated when the load is switched ON and OFF.

An independent high limit circuit is provided. It is powered by an isolation transformer that draws power from the primary side of the master relay. The sensor is a type J thermocouple. This circuit turns off the internal master relay should an over-temperature condition occur.

Located on the side of the controller is a trimpot. Turning it counterclockwise increases the high limit temperature. Turning it clockwise will decrease it.

NOTE: One full revolution is equal to 10° C.

Twelve discrete LED'S are utilized to indicate system and display status, as well as indicate various alarms. A 12 key membrane switch is incorporated in the face panel to allow for a user setup and adjustment of the system, plus full timer control.

Two numeric displays are used to allow viewing of both process temperature and the timer simultaneously. Additionally, each of the displays have multiple diagnostic and setup functions that can be activated by the keyboard or by the microprocessor during various setup and alarm conditions.

Optically isolated remote Start and Stop inputs are provided which can be connected to remote switches, to operate the timer.

The microprocessor section consists of three printed circuit boards, one for display, one for control, and one auxiliary. The control board contains two transformers and provides isolated DC power supplies (*+5 and +12 volts*) necessary to run the system. In addition, it contains an instrumentation amplifier, A / D converter, EEPROM memory and the microprocessor. The display board contains all of the seven segment and LED displays as well as the audio transducer. The auxiliary board contains an isolated + 12 VDC power supply that is utilized in interfacing the remote switches, as will as driving the two output relays.

Status

The six primary status modes are indicated by LED'S on the face panel and are marked, "Normal", "Inject", "Alarm", "Setup", "Heat" and "Aspirate". Following are descriptions of their functions.

Normal

This mode is the normal condition for the system. It indicates the system is operating within the defined parameters. When blinking, it indicates that the system is in the WARMUP mode.

Inject

This LED is illuminated whenever the INJECT RELAY is active.

(Hold)

This is a buried mode; it is the standby condition for the unit. It allows all normal monitoring and timing functions, but disables the heater. The only way to exit this mode is by pressing the "HOLD" key.

IMPORTANT NOTE: For safety, the unit always starts up in this mode initially or after a power failure. When in this mode the process display reads "HOLD".

Alarm

The various alarm conditions are activated by many sources and indicated by both the displays and audio tone. The mode indicator shows that an alarm has occurred and the system is still performing under the special conditions required by that alarm. The only way to exit this mode is to clear the alarm.

Heat

This LED is illuminated whenever the heater is on.

NOTE: When the unit is near the setpoint, the LED will continually cycle ON and OFF.

ASP

This LED is illuminated whenever the aspirate relay is active.

Setup

CAUTION: Fill the hot pot before beginning any operation with the 625C.

Press the "POWER" key on the 625C Temperature Controller. If the alarm sounds, press the silence ("SIL") key to turn off the audible alarm. The controller will power up in the "HOLD" mode. Press "ENTER" to access the set-up stack.

NOTE: You must press the "SAVE" key after each parameter is entered in order to store it in memory.

Press the "ENTER" key to go to the next parameter code. This is the setup mode. When in this mode, the "SETUP" key causes the controller to step through the parameters. The following is a table of the displays that will appear:

CODE	DESCRIPTION	SPECIFICATION RANGE
CS	Clock Setpoint	0:00 - 99:59 Mins:Secs
PA	Pre-Alarm Offset	:00 - :59 Seconds
PS	Process Setpoint	0.0 - 199.9° C
HI	High Alarm Setpoint	0.0 - 199.9° C
LO	Low alarm Setpoint	0.0 - 199.9° C

DI	DI Setpoint	0.0 - 199.9° C
DR	Drain Setpoint	0.0 - 199.9° C
DP	Drain Period	0:00 - 99:59 Mins:Secs
IL	Injector Logic	0 - 2 (*Logic Modes*)
IP	Injector Period	0:00 - 4:00 Mins:Secs
RL	Relay Logic	0 = Timer During 1 = Timer Done
AC	Access Code	0 - 9999
CR	Cycle Rate	0 - 19 Secs
PB	Proportional Band	0 - 19.9° C
RE	Reset	0 - 19.9 Minutes
RA	Rate	0 - 19.9 Minutes
CA	Calibration	±9.9° C
CD	Clock Direction	"UP" / "DN" (*Up or Down*)

After you have set all parameters, press the "RETURN" key. This will exit you from the stack. Press the "HOLD" key to take the controller out of "HOLD" mode. At this point, the system will begin to heat up. Let the system reach setpoint and stabilize (check with calibrated thermometer.)

If DI flowmeter is used in this system, adjust it for desired amount during D.I. inject function. If temperature is different, enter the stack, select "CA" parameter, adjust offset to the proper temperature, press "SAVE" and press "RETURN".

Now that the system is burned - in, you may cool the system down by pressing the "HOLD" key. This will disable the heater. After pressing the "ASP" key, the controller will acknowledge with four (4) beeps. Pressing the same key a second time will activate the aspiration cycle. If the initial function was in error, the "RETURN" key should be pressed to cancel the *aspirate* command. When the aspiration cycle is activated it will begin to drain, unless the temperature is above *drain temperature*. In this case it will automatically drain when the bath cools to an acceptable level. Watch while the bath

drains to check liquid level alarm. The alarm should sound before the bath is completely drained.

The following is a listing of each Parameter Code and a description of its use.

CS

The Clock Setpoint is the Preset for the timer. The value placed in this parameter will be inserted in the timer each time it is reset.

PA

The Pre-Alarm Setpoint is the time in which the audio warning will begin prior to the timer ending its programmed function. Its purpose is to alert the operator to the fact the Timed Function is about to expire. The tone will cycle ON and OFF until the timer destination is reached, at that time the tone will be solid.

PS

The Process Setpoint is the setting of the Temperature at which the controller will maintain the bath.

HI

The High Alarm Setpoint indicates the Temperature above which the High Alarm will be activated.

LO

The Low Alarm Setpoint indicates the Temperature below which the Low Alarm will be activated.

DI

The DI Setpoint is utilized generally on hot phosphorus systems. This parameter selects a temperature at which the DI Inject solenoid will be activated. This inject solenoid will be active anytime the process temperature exceeds this setting.

DR

The Drain Setpoint is a Drain or Aspirate temperature interlock. This parameter will not allow activation of the Drain / Aspirate solenoid until the temperature drops below this setpoint.

DP

The Drain Period is a parameter function which will time out and deactivate the Drain / Aspirate solenoid.

IL

The system has a programmable Injector Relay output, this output can be used for a number of functions. Its operation is controlled by a number of programming parameters. Its basic logic is controlled by the selection of the Injector Logic "IL":

IL = 0:

In this logic selection, the Injector Relay is active whenever the Process Temperature exceeds the "DI" setpoint parameter (*DI*).

IL = 1:

When this logic is selected and a time is programmed into the Injector Period (*IP*) setting, pressing the INJECTOR key will initiate a timed injection. At the end of this period, it will automatically turn the relay off.

IL = 2:

If this logic is selected, the system will function as described in IL = 1 above. Additionally, an automatic injection will be initiated at the beginning of every timer cycle. When the TIMER START key is pressed, the system timer will start as previously described. Also, the Injector Relay will close and the Injector period will begin to countdown. The relay will be deactivated at the completion of the Injection Period Countdown without affecting the system timer count. If the timer is halted or reset, the injector period is cleared.

In all these modes, the Injector Key can be used as a manual injector, activating the relay as long as it is held down. The "RETURN" key can be used to terminate any of the timed injections by pressing it while they are active.

NOTE: All automatic injections are locked out when the system is in "HOLD" mode.

IP

The Injector Period is a timed function and used with the Injection Logic #1 & 2. This is primarily used with such things as H_20_2 inject.

RL

A Relay output is provided for simple interfacing on the timer portion of the controller. The relay has a standard form C (*N/O - C - N/C*) set of contacts brought out to the rear panel. The "RL" parameter allows the output relay to be programmed to be active either during the timing cycle or at the completion of the timing cycle. In both conditions the relay is off when the timer is reset. If (*0*) is programmed, the relay will be active from the time the start key is pressed until the period has timed out. If (*1*) is selected, the relay will be active after the timing period has elapsed and prior to the reset key being pressed.

AC

In some cases it may be desirable to restrict access to the tune and program functions. Thus an "Access Code" system is incorporated into the design. In the program mode, AC can be set. If the code is set to 0000, the function is eliminated and the system operates as previously described.

The security code is simply a number from 0001 to 9999 as programmed into the system by the customer's authorized personnel. Once this code is entered into the EEPROM using the "SAVE" command, any attempt to use the MODE key to gain access to the control and setup functions will cause "CODE" to appear in the process display. The up and down keys are then used to set the proper code number. A second mode key entry is then required. Any other entry, the wrong code number, or no action for 30 seconds will return the unit to the normal operating mode.

CR

This parameter sets the Cycle Rate for the system, Since the controller is a standard proportional time base unit, the Cycle Rate sets the rate at which the heat output will cycle ON and OFF. The amount of time that the output is on during each period is controlled to match the heat requirements of the system, (*see the Tuning section for details*.)

PB

The Proportional Band is the parameter that determines the cycling range for the controller in° C. This band indicates the range in which the controller will proportion (*see the Tuning section for details*.)

RE

The Reset parameter sets the Integration time for the second mode in the three-mode control system (*PID*). If this parameter is set to 0.0, the Reset function is eliminated (*see the Tuning section for details*.)

RA

The Rate function sets the differentiation constants for the third mode of the three-mode control scheme. If this parameter is set to 0.0, the Rate function is eliminated (*see the Tuning section for details*.)

CA

The calibration adjustment allows the elimination of various sensor and system errors. Thermocouple sensors are manufactured within a specific tolerance. This tolerance may lead to a difference between the actual bath temperature and the temperature displayed. This error coupled with the differential error caused by sheathing the sensor in materials such as Teflon can cause a difference in the actual Bath Temperature and Display Temperature. This can simply be corrected by monitoring the Bath Temperature with a calibrated Thermometer and using this offset to add or subtract the appropriate number of degrees to bring the display into compliance with the actual Bath Temperature.

CD

The Clock Direction is a parameter of choice "UP or "DOWN" to give direction to the Process Timer.

While in the Set Up mode, pressing either the "UP or "DOWN" key will cause the display to advance or retard. Pressing the key once and releasing will allow the accurate setting of the least significant digit. Holding either key down will activate the automatic, rapid incrementing or decrementing of the display. To exit this mode press "Return".

While in the program mode, pressing the "SAVE" key will cause the setup parameters to be written into the EEPROM memory. This is a permanent (*10 year minimum life*) memory that does not require a battery backup. The save routine takes about two seconds to complete and is indicated by a series of dashes through the displays. This feature provides the O.E.M. with the ability to program in initial conditions prior to shipment. It then allows the user to modify these conditions and permanently save his new parameters all from the keyboard.

Alarms

This section will discuss in detail the response the controller will make to each of the alarm conditions that are outside the norms as prescribed by both the programmable parameters and certain over riding system parameters. Additionally, this information is presented in such a way as to first draw maximum flexibility in investigating the cause of the problem, while still maintaining an indication of the original reason for the alarm condition.

A combination of Audio and Visual indications is used. In all cases, the alarm LED in the status section will begin to flash. Along with this, the Detail LED in the alarm section will illuminate to indicate the type of alarm that has been activated. In most cases, an alpha code will begin to flash in the Process Display, alternating with the Process Temperature to call further attention to the specific problem. Also, an audio tone that has a 50 / 50 duty cycle will sound. An Alarm Silence key is provided to allow for the elimination of the audio portion of the alarm as well as the portion of the display that affects the Process Display. This essentially allows the unit to be returned to a functional condition where setpoints can be examined and reset without interference of the special Alpha Displays. However, the alarm status and alarm, and where applicable, the output to the heater is turned off to protect the equipment from any potential damage.

System

The System Alarm is a catch-all indicator for the miscellaneous diagnostics. An example would be the malfunction of the EEPROM save routine. This would simply indicate to the user that something has gone wrong and he or she should either repeat the command or reset the unit. If a malfunction persists, the unit should be disabled and returned for repair.

Sensor

The second alarm indicates a defective "SENSOR' (*thermocouple*). This indicates the sensor is either open or not connected. Special circuitry has been incorporated to

monitor the sensor for an open circuit. The processor will continually monitor the input, and if it detects an open sensor, it turns off the heater output and activates the "SENSOR" alarm. The process display will alternately flash the temperature and "OP for open sensor.

High Limit

The third alarm is the "HIGH LIMIT. This LED is wired directly to the high limit circuit and lights whenever the high limit turns the master relay off. Since it is powered by the high limit power supply it remains on even after the master relay has de-energized and shut the controller off. This alerts the operator that the system has shut down and why.

High Temp

The fourth alarm is the "High Temp" alarm. It is activated anytime the process temperature exceeds the high alarm setpoint. When activated, it turns off the heater output. The Process Display alternately displays the process temperature and the code "HI".

Low Temp

The "Low Temp" alarm acts much like the "High Temp" alarm, except it compares the process temperature to the low alarm setpoint. If the process temperature drops below the setpoint once it has initially come out of the warmup mode, this alarm will be activated. In this case, the code "LO" is alternately flashed with the process temperature.

Liquid Level

The sixth alarm is "Liquid Level". It monitors an optional remote liquid level sensing circuit and activates when a low liquid level is detected. The code "LL" is alternately flashed with the process temperature. If activated, it turns off the heater output.

View

The process display shows the sensor temperature at all times during normal operation, except when the "VIEW" key is pressed, when it displays the process setpoint.

The timer display shows the current count of the timer at all times during normal operation, except when the "VIEW" key is depressed, when it displays the timer preset valve.

Timer

The UP / DOWN count timer is preset-able and will count down form the reset time or count up to the preset time depending on the mode selected. In both cases it has the additional feature of accumulation overcount. In the countdown mode this means that once it counts down to zero it begins counting back up to record the time that has elapsed past the preset time. In the count-up mode once it has reached the preset value, it returns to zero and again counts up to record the time that has elapsed passed the preset time. In both cases, the display flashes to indicate the displayed count is an overcount. The "VIEW" key can be used to examine the Preset time. This value and the initial preset time are stored in the EEPROM memory, thus they automatically are ready when initially powered up.

The "START" key is used to start the timer. When this key is pressed, the timer will begin counting, if the unit is in the normal mode and the timer had been reset. The "STOP / RESET" key is used to stop the timer. Anytime the timer is in the RUN mode, this key will halt it's operation and the display will be frozen on the current timer value. If the count is "OVER", the display will flash. A second pressing of this key will cause the timer to reset. This will place the preset value in the timer display, stop the display flashing and cancel any timer audio tones. If the START key is hit when the timer is in the HALT mode, the timer will continue from its current count.

The pre-warn tone has a 50 / 50 duty cycle and a 1/2 second period. After the preset time has elapsed, the signal will be converted to a continuous tone. The timer must be stopped to enter the Program Mode. In the Program Mode the preset time and pre-warn time are entered (*see program section.*)

A Timer Relay is also provided, the "RL" parameter in the stack will select the logic function for this relay. The relay responds as follows:

RL = 0 (*Timer relay - During*) The relay will be active for the period that the timer is active. It will activate when the timer is started and deactivate when the timer has reached 0:00.

RL = 1 (*Timer relay - Done*) The relay will activate at the completion of the timer cycle (*0:00*). It will remain active until the timer is reset.
Aspirate or Drain

The aspirate function provides a Timed, Temperature interlocked Aspirate Cycle. In the setup parameters, the user can program the temperature (*DR*) above which the aspirate function will not begin. Also, the length of the Aspirate Period (*DP*) can be programmed. The Aspirate key can be used to start the Aspirate Cycle and also stop it.

If the cycle is not mechanically stopped before the timer elapses, the timer will automatically stop the aspirate.

To help prevent accidental aspiration, a dual key entry is necessary to initiate the cycle. When the Aspirate Key entry is first pressed, the unit will acknowledge with four beeps. The key must then be pressed for a second time for the cycle to be activated. If the initial pressing was in error, the Return Key can be pressed to cancel the Aspirate request.

If the ASPIRATE function is activated and the temperature has not yet dropped below the programmed setting (*DR*), the unit will go into a WAIT condition. The display will continually flash DRN. The system will remain in the condition waiting for the temperature to drop. Once the temperature falls below the programmed setpoint, the drain function will be automatically initialized. While in the wait condition the Aspirate function can be cancelled by either pressing the ASPIRATE or RETURN key.

Tuning

The general idea behind this controller is a standard PID system with anti-reset windup. This section will briefly explain PID control as it relates to this system. However, it should be noted, this explanation specifically relates to this device and may be somewhat different than other systems.

The term PID refers to a three-mode control system. The first mode of control, "P" (*proportional*) refers to the basic control scheme. The concept is, the controller will determine the percentage of heat required by the system and adjust the power input to the heater to balance the system. The power to the heater is either fully on or fully off. The proportioning is obtained by adjusting the amount of time on, to the amount of time off.

The cycle rate (*CR*) parameter is used to determine the rate at which power to the heater is turned ON and OFF. The proportioning of the output power is accomplished by varying the percentage of time the unit is on during the period. For example if CR =10, the unit will cycle ON and OFF once every 10 seconds. If the process has determined the system requires only half of the full power output of the heater to maintain a specific temperature, the output will be ON for 5 seconds, and OFF for 5 seconds in a continuous cycle. As the heat requirement varies, this percentage will increase or decrease accordingly, such as 5.1 seconds ON and 4.9 seconds OFF for an increase. When the system is at or near the setpoint, the heat LED in the status box will flash to indicate the proportioning of the heater.

To compute the required percentage of "ON" time, the system uses the Proportional Bank (*PB*) as set in the programming mode. It is within this band that the heat output will vary from 0 to 100%. If for example, the setpoint is 100° C and the Proportional Band is set at 10° C, the controller will time proportion the output from 100% to 0%

when the process Temperature varies from 90 degrees to 100° C. When the Process Temperature is at 90° C the output will time proportion from 100% down to 0%. At any temperature above 100° C, the output will be fully OFF.

At this point it is important to note that we are discussing systems in which the rate and reset functions are not used. Rate and Reset will cause a shifting in the Proportional Band and vary the percentages just discussed. However, Rate and Reset do not affect the basic theory, only the position of the Proportional Band.

Now we will tie the Proportional Band and the Cycle Rate together in the example used above. We had a cycle rate of 10 seconds with a Proportional Band of 10° C and a setpoint of 100° C. When the process temperature is at 96 degrees, you will note it is 40% into the Proportional Band.

Based on this position we require 40% heater output, with the 10 second cycle rate, this means the heater will be ON for 4 seconds and OFF for 6 seconds.

A proportional control requires a certain degree of error to have the heat on. Therefore, in the example just given if we find that only 10% of the heat will cycle 1 second on and 9 seconds OFF and the temperature will stabilize at 99 degrees. This difference between the actual 99 degrees and the actual 100 degrees is termed *droop*. Droop is the difference between setpoint and the control point in a proportional system.

To remove the droop, we need a 2nd mode. This is the "I" (*Integral*) mode or commonly termed Automatic Reset Mode. The program calculates the difference between the current process temperature and the desired setpoint and mathematically corrects the system to compensate for this error. How often this is done, is based on the parameter that is programmed in the "RE" (*Reset Adjustment*).

Anti-Reset Windup is a special feature incorporated in the software that locks out the Reset function when the system is outside the Proportional Band. Obviously, if the system were automatically adjusting the Droop before the system was nearing stability large errors would occur. Anti-Reset Windup is used to eliminate such potential errors.

The third mode in the PID scheme is the "D" (*derivative*) mode. Commonly referred to as Rate. When a system has large changes in heat requirements, it may require this third mode to compensate for such changes. It's primary function is to eliminate overshoots as the temperature is stabilizing. It is a control for the rate of change of the temperature when large temperature fluctuations occur.
On systems where overshoot is not a problem, the rate function can be eliminated for simplicity.

In all cases Bath control requires Reset. However, Rate may not be required and should be set to zero, overshooting occurs.

Specifications

PARAMETER	SPECIFICATION RANGE
Temperature Setting Range	0:0 - 199.9° C
Temperature Setting Resolution	0.1° C
Noise Rejection	NMR - 60 dB @ 60 Hz CMR - 120 dB @ 60 Hz
Time Setting Range	0:00 - 99:59 Mins:Secs
Time Setting Resolution	1 second
Measuring Time	4 conversions / 1 second
Display	8 ea. seven segment LEDs, .56" tall 12 discrete LEDs (*red, green, amber*)
Annunciator	2500 Hz audio tone
Setup Memory	EEPROM, all parameters
Memory Retention	10 years without power
Sensor Standard	Type J thermocouple, cold junction compensation, upscale break protection
Control	PID with anti-reset windup
Operating Temperature Range	0 - 50° C
Storage Temperature Range	-40 - 60° C
Construction Materials	Enclosure = Kydex Face = Lexan, back printed
Size	8.25"H x 6"W x 5.25"D (210 x 152 x 133mm)

Weight	4 lbs. (1.8 kg)
Connection	Rear, screw type, 3/8 inch centers, T /C - miniature, type J, jack
Output	Power pack: 15 amp, 208 VAC, optically isolated zero cross relay: 5 amps, 208 VAC
Power	11 VA, 208 VAC ±10%, 50 / 60 Hz

625TM Process Timer

BOLD TECHNOLOGIES
SPECIALISTS IN MANUFACTURING SURFACE PREPARATION EQUIPMENT
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625TM PROCESS TIMER

Rev. -, 7/28/00

Introduction

The Model 625TM is a microprocessor-based stand-alone timer with multiple programs. It can be programmed to perform either up or down count timing routines with count-thru and pre-alarm. A form C *(N/O - C - N/C*) type relay output is provided, that can be programmed to be active either during or after the time period.

This unit has five separate setpoint and pre-alarm parameters. These settings can be programmed and easily selected from the front panel.

The four-digit display is scaled in minutes and seconds and allows a maximum 99 minute: 59 second preset. The pre-alarm is scaled in seconds and can be set to a maximum of 59 seconds.

Displays

Four discrete LEDs are provided to indicate the current system status. They are labeled "Run", "Over", "Stop / Reset" and "Setup".

Run

Indicates that the timer is running.

Over

Indicates that the timer has counted through 0:00 and is counting back up.

Stop / Reset

Indicates that the system is either in the HOLD mode or RESET mode. When the LED is flashing, this indicates the Timer has been halted. The Timer may either be restarted (continued) or reset for a new run. If the LED is on and is not flashing, this indicated the Timer is RESET and is ready to run a new sequence.

Setup

Indicates that the system is in the SETUP mode. In this mode the system parameters are selected (see following pages.)

Keypad

The four keys marked: START, STOP / RESET, UP and down are used to operate and setup the unit. The following is a listing of each of the keys and their functions.

Run

This is a multi-function key that is used in both operation and programming. Its primary function is to start the Timer. It can start the Timer either from a reset or a halted condition. The second function for this key is in the setup mode (for information see the SETUP section to follow).

This is a multi-function key. Its primary functions are to stop the Timer and then reset it for another run. If the Timer is in the RUN mode, pressing the STOP /RESET key once will place it in the RESET mode. This key is also used in entering the SETUP mode (see the SETUP information section to follow).

Up

This is a multi-function key. In the SETUP mode, pressing the UP key will cause the display to advance. Pressing the key once and releasing will allow the accurate setting of the least significant digit. Holding the key down will activate the automatic, rapid incrementing of the display.

In the STANDBY mode, pressing the UP key will cause the clock setpoint to change to the next highest preprogrammed value.

Down

This is a multi-function key. In the SETUP mode pressing the DOWN key will cause the display to decrease. Pressing the key once and releasing will allow the accurate setting of the least significant digit. Holding the key down will activate the automatic, rapid decrementing of the display.

In the STANDBY mode, pressing the DOWN key will cause the clock setpoint to change to the next lowest preprogrammed value.

(Setup)

Setup is actually a buried key. The SETUP mode is entered by pressing and holding the STOP / RESET key and then pressing the RUN key. While in this mode the START key is used to step through the parameters. Once the bottom of the stack is reached, the display will wrap around to the first parameter.

The following is a listing of the Code prompts that will appear in the display when in the SETUP mode. The Code will alternately flash with the selected value to indicate to the user the parameter that is currently being viewed or set.

CODE	DESCRIPTION	SETTING RANGE
CS1	Clock Setpoint #1	0:00 - 99:59 Mins:Secs
CS2	Clock Setpoint #2	0:00 - 99:59 Mins:Secs
CS3	Clock Setpoint #3	0:00 - 99:59 Mins:Secs
CS4	Clock Setpoint #4	0:00 - 99:59 Mins:Secs
CS5	Clock Setpoint #5	0:00 - 99:59 Mins:Secs
PA1	Pre-Alarm #1	0:00 - 99:59 Mins:Secs
PA2	Pre-Alarm #2	0:00 - 99:59 Mins:Secs
PA3	Pre-Alarm #3	0:00 - 99:59 Mins:Secs
PA4	Pre-Alarm #4	0:00 - 99:59 Mins:Secs
PA5	Pre-Alarm #5	0:00 - 99:59 Mins:Secs
CD	Count Direction	UP or DN (*Up or Down*)
RL	Relay Logic	0 or 1 (*0 = after 1 = during)*

To exit the SETUP mode, press the RESET key. When exiting, the unit automatically enters a SAVE mode. This causes the parameters to be written into the EEPROM memory. This is a permanent (10- year minimum life memory that does not require battery backup.

Operation

The 625TM can be configured as either a preset-able countdown or count up Timer. The direction of the count is programmable in the SETUP stack.

In the SETUP mode, five (5) independent setpoints and Pre-Alarm offsets can be programmed. The system only utilizes 1 of these sets of parameters at a time. The user may manually select between these pre-sets utilizing the UP and DOWN keys when the unit is in the STANDBY mode.

The currently selected clock setpoint and associated Pre-Alarm offset, in conjunction with the count direction and relay logic parameters, configure the Timer for a specific function. Once the START key is pressed.

Count-Down Timer

The Timer will begin to count down in seconds. It will continue this process until it reaches the Pre-Alarm time setting. At this point an audio time that has a 50 / 50 duty cycle and a one (1) second period will sound. Once the unit has counted down to 0:00, the audio will change to a continuous tone and the display will begin to flash. If the Timer is not stopped, it will begin to count back up, accumulating the time that has elapsed.

Count-Up Timer

The Timer will begin to count up in seconds. It will continue this process until it reaches the set time minus the Pre-Alarm setting. At this point an audio tone that has a 50 / 50 duty cycle and a one second period will sound. Once the unit has counted up to the pre-set time, the audio will change to a continuous tone and the display will begin to flash. If the Timer is not stopped, it will reset to zero and count back up, accumulating the time that has elapsed.

The START key can be used as an audio silence without stopping the Timer. Pressing the START key once will silence the audio and the Timer will continue to count.

Pressing the STOP / RESET key will stop the Timer and freeze the display. Pressing the STOP /RESET key for a second time will reset the Timer and display the pre-programmed setpoint, and ready the Timer for another cycle,

A relay output is provided for simple interfacing. The relay has a standard form C (N/O - C N/C) set of contacts brought out to the rear panel. The RL parameter allows the output relay to be programmed to be active during the timing cycle or at the completion of the timing cycle. In both conditions the relay is off when the Timer is reset. If zero (O) is programmed, the relay will be active after the timing period had elapsed and prior to the reset key being pressed.

If one is selected, the relay will be active from the time the start key is pressed until the period had timed out.

If the continuous tone, signaling the end of the TIMER cycle is not silenced of the TIMER is not stopped within 30 seconds, the buzzer will go into the unattended alarm mode. In this node, the buzzer will shift from continuously ON to a 50 / 50 duty cycle with a 1/2 second period.

The Remote keys are optically isolated. Internally, an independent power supply and optical isolators provide maximum noise immunity for the remote timer keys.

Specifications

PARAMETER	**SPECIFICATION RANGE**
Range	0:00 - 99:59 Mins:Secs
Resolution	1 second
Display	Four, .56 inch high, seven segment, LED uniplanar numerals. Four discrete LEDs *(red, green, amber)*.
Annunciator	Audio tone, 2500 Hz
Setup Memory	EEPROM, all parameters
Memory Retention	10 years without power
Operating Range	0 - 50E C.
Storage Range	-40 - 60E C.
Construction	Enclosure - Kydex, Face - Lexan, back printed
Size	8.25" H x 3"W x 6"D (210 mm x 152 mm x 152 mm*)*
Weight	# 3 lbs. (*1.4 kg)*
Connection	Rear, screw type, 3/8 inch centers
Output	Relay, form "C" contacts (*N/O - C - N/C*), 5 amps, 24 VAC
Power	7 VA, 120 VAC ∀ 10%, 50 / 60 Hz

Exhaust System

Most Bold Technologies' process stations are equipped with adjustable vent slots in the back wall of the deck. Adjustments to exhaust flow can be easily made by loosening the screw knobs and repositioning the panel's slots for desired flow. Many stations include an exhaust pressure switch/gage. The exhaust pressure switch/gage provides high and low pressure limit switches. The limit switches provide a safety interlock should exhaust pressure exceed the set limits.

Emergency Power-Off (*EPO) System

All process stations requiring a means for emergency power shutdown are equipped with an Emergency Power-Off *(EPO)* system. Red colored buttons activate the EPO circuit and are provided wherever they are needed and most accessible. The EPO system disconnects power to the station at the main breaker. Some EPO systems employ under-voltage trip breakers thus meeting the fail safe requirements of SEMI S2-93A, 12.2. EPO systems provide battery-backed power to operate audible and visual alarms whenever statioB Vn power is *off. (See section entitled "Servicing I Safety Interlocks" for instructions on restoring station power after an EPO circuit trip.)*

** EPO is equivalent to EMO (Emergency Machine Off)*

Casehead Power Breaker and Reset

Most Bold Technologies' stations provide an independent power branch for casehead components. The casehead power circuit provides a breaker and reset button and is usually rated at 5 amps. Current rating for this circuit may be higher depending on the total requirements of the casehead components. The Plug Strip Breaker indicator lights up if the circuit breaker is tripped. If the indicator lights up, reset the casehead power circuit by pressing the Reset switch.

Blocked Main Drain Indicator

Most Bold Technologies' process stations provide a blocked main drain indicator. The blocked main drain indicator lights whenever level sensors in the plenum are switched on due to a blockage in the main drain. To restore operation, clear the blockage. Once the plenum level is normal, the blocked main drain indicator turns off.

SERVICING

Facilities Installation Checklist

The following items may be helpful in determining the causes of installation problems:

1. Verify exhaust damper is properly connected to facilities exhaust duct.

2. Verify all electrical wiring was installed properly according to local requirements and the National Electrical Code.

3. Verify tubing from regulated nitrogen line to wet station tube fittings are properly connected and properly pressurized *(typically 15 PSIg.)*

4. Verify tubing from regulated CDA line to wet station tube fittings are properly connected and properly pressurized *(typically 60 PSIg.)*

5. Verify DI water is properly connected to inlet manifold *(typically 1" NPT PVDF*) and, where applicable, outlet is connected to DI water return and properly pressurized *(typically 60-70 PSIg.)*

Safety Interlocks

Bold designs two station types: *"standard"*, using dedicated special controllers and *"automated"*, using PC-based distributed control. Both include integrated safety interlocks, some of which may be specially ordered. The following table outlines events that occur when a safety interlock condition begins and describes how to restore normal operation.

EVENT TRIGGERING SAFETY INTERLOCK	STANDARD STATION (Dedicated Controllers)	
	What happens:	How to restore:
EPO button pressed	1. EPO circuit trips Main Contactor breaker 2. All electrically operated equipment is disabled except battery powered alarms and indicators 3. Alarm silence button remains lit until power is restored (or battery runs low)	1. Pull all EPO buttons to OUT position 2. Reset under-voltage or Main Contactor Relay breaker then turn ON 3. Manually turn power ON to each controller
Low or no exhaust pressure	1. Exhaust pressure circuit trips Main Contactor breaker 2. All electrically operated equipment is disabled except for battery powered alarms and indicators 3. Alarm silence button remains lit until power is restored (or battery runs too low)	1. Verify adequate exhaust pressure has been restored 2. Verify all EPO buttons are to the OUT position 3. Reset under-voltage or Main Contactor breaker then turn ON 4. Manually turn power ON to each controller
Loss of house A.C. line power	1. Main power is lost at the Main Contactor breaker 2. All electrically operated equipment is disabled except for battery powered alarms and indicators 3. Alarm silence button remains lit until power is restored (or until battery runs too low)	1. Restore house A.C. line 2. Verify all EPO buttons are in the OUT position 3. Verify under-voltage or Main Contactor Relay breaker is in ON position, if not, reset and turn ON 4. Manually turn power ON to each controller
Rear access doors opened during process run	1. Stops all process pumps, heaters and transfer systems 2. Operator Interface's Alarm Screen displays "Back Doors Are Open"	1. Close doors 2. Manually restart pumps, heaters
Door to A.C. power distribution on Computer Control Cabinet opened during run	N/A	N/A
Auto-Window obstructed	N/A	N/A
Main drain is blocked	1. Detects high liquid level in drain and lights indicator 2. (Special orders) Triggers automatic valve shutoff	Clear blocked main drain
Emergency DI Water Shutdown (special orders only)	1. Manual switch activated shutoff valve 2. DI water stops flowing	Correct cause of emergency shutdown and reset valve
Emergency CDA or N_2 shutdown (special orders only)	Pneumatic devices shut down (pumps, cylinders, valves, liquid level detectors, N_2 purge, submergible heaters)	(Provided by customer's facilities) Restore CDA or N_2

Lockout/Tagout, Electrical Safe Work Practices

(a) Complex process equipment which is scheduled for servicing/maintenance operations is generally identified by plant supervision. Plant supervision would issue specific work orders regarding the operations to be performed.

(b) In most instances where complex process equipment is to be serviced or maintained, the service technician can be expected to conduct the shutdown procedure. This is generally due to their in-depth knowledge of the equipment and the need to conduct the shut-down procedure in a safe, economic and specific sequence.

(c) The Service technician will normally prepare the equipment for lockout/tagout as they proceed and will identify the locations for blanks, blocks, etc., by placing "operations locks and/or tags" on the equipment. The Service technician can be expected to isolate the hazardous energy, and drain and flush fluids from the process equipment following a standard procedure or a specific work permit procedure.

(d) Upon completion of shutdown, the Service technician would review the intended job with full comprehension of the energy controls necessary to conduct the servicing or maintenance safely. During or immediately after the review of the job, the servicing and maintenance crews would install locks, tags and/or special isolating devices at previously identified equipment locations following the specified work permit procedure.

(e) Line openings necessary for the isolation of the equipment would normally be permitted only by special work permits issued by operations personnel. (According to customers rules and regulations.)

(f) All of the previous steps should have been documented by a master system of accountability and retained at the primary equipment control station for the duration of the job. The master system of accountability may manifest itself as a Master Tag which is subsequently signed by all of the maintenance/servicing workers if they fully comprehend the details of the job and the energy isolation devices actuated or put in place. This signing by the respective workers further verifies that energy isolation training relative to this operation has been conducted.

(g) After the system has been rendered safe, the authorized employees verify energy controls according to the customers rules and regulations.

(h) Each day each authorized employee assigned must sign in on the work permit at the time of arrival to the job and sign out at departure. Signature, date, and time for sign-in and sign-out would be recorded and retained by the applicable crew supervisor who upon completion of the permit requirements would return the permit to the operations supervisor. Work permits could extend beyond a single shift and may subsequently be the responsibility of several supervisors.

(i) Upon completion of the tasks required by the work permit, the authorized employees' names can be signed off the Master Tag by their supervisor once all employees have signed off the work permit. The work permit is then attached to the Master Tag. (Accountability of exposed workers is maintained.)

(j) As the work is completed by the various crews, the work permits and the accountability of personnel are reconciled jointly by the primary authorized employee and the operations supervisor.

(k) During the progress of the work, inspection audits are conducted.

(l) Upon completion of all work, the equipment is returned to the operations personnel after the maintenance and servicing crews have removed their locks, tags, and/or special isolating devices following the company procedure.

(m) At this time all authorized employees who were assigned to the tasks are again accounted for and verified to be clear from the equipment area.

(n) After the completion of the servicing/ maintenance work, operations personnel remove the tags originally placed to identify energy isolation.

(o) Operations personnel then begin check-out, verification and testing of the equipment prior to being returned to production service.
It should be noted that the purpose of the lockout/tagout standard is to reduce the likelihood of worker injuries and fatalities during servicing/maintenance operations. Therefore, when compliance officers inspect workplaces, they should evaluate the potential for employee exposure to the unexpected release of hazardous energy during servicing/maintenance operations. When a hazard is noted, the various requirements of the standard should be applied in a manner which will result in abatement of the hazardous circumstance.

Never bypass or remove a lock or tag!

Preventive Maintenance

Bold designs a wide variety of *customer-specified* equipment. The most common equipment and components failures are listed below.

Please note: Some of these items may not be included in this specific system configuration.

Process Tanks

Should it be necessary to remove a process tank for repair or replacement, thoroughly

rinse with DI water to remove all chemicals. Remove all bezels. Remove all tubing and wiring attached to the process tank including N2 bubbler, high and low level sense tubing, thermocouples, heater, and chem fill, and place them securely out of the way before attempting to remove the process tank. To remove the tank, raise the tank above deck level and disconnect the drain valve.

To re-install the process tank, reconnect drain valve, lower the process tank back into place and replace all tubing and wiring.

NOTE: If the process tank ***does not*** employ a heater it does not require a 625C or 625S controller. Therefore, draining a process tank is done by switching the switch located in the casehead panel marked “Drain”.

Cascade Rinser

Should it become necessary to remove the Cascade Rinser drain the Rinser thoroughly and remove all bezels. Lift inner Rinse tank above deck level. Disconnect bottom fill lines. Raise tank completely out of station.

To reinstall the rinse tank connect the DI water bottom fill lines. Lower the inner tank into place.

EPO Button

Using the EPO *(emergency power-off)* button once a year to power down the sink will insure the EPO is working properly in case of emergency.

Low Exhaust Alarm

Exhaust pressure switch/gage *(Photohelic®, Magnehelic® or Minihelic®)* should be checked once a year in order to insure proper operation of the low exhaust alarm system.

Low Liquid Level

Liquid level sensing is accomplished in different ways according to the type of process system and controls used. The following is a description of location and condition.

When using a static unheated chemical tank a Low Liquid Level sensor system is not

required but can be supplied if so desired.

When using a heated static chemical tank with a 625C Temperature Controller the Low Liquid Level sensor tube should be located 2 to 3 inches above the heater element to insure the liquid does not boil away, or reach flashpoint Should the liquid fall below this level an alarm will sound, the 625C Temperature Controller display will alternately flash "LL" and the temperature, and the system will shut down. In the event this occurs the liquid level must be restored, and the system must be manually reset in order to continue process.

When using a heated chemical tank with a pump and a 625CP Temperature Controller the Low Liquid Level sensor tube should be located in the outer tank approximately 1 inch above the dispersion plate to prevent pump cavitation. Should the liquid fall below this level an alarm will sound, the 625CP Temperature Controller display will alternately flash "LL" and the temperature, and the system will shut down. In the event this occurs the liquid level must be restored, and the system must be manually reset in order to continue process.

When using a quartz heated bath with a 625C or 625CP Temperature Controller the Low Liquid Level sensor tube should be located 2 to 3 inches above the bottom of the vessel to insure the liquid does not boil away, or reach flashpoint. Should the liquid fall below this level an alarm will sound, the 625C or 625CP Temperature Controller display will alternately flash "LL" and the temperature, and the system will shut down. In the event this occurs the liquid level must be restored, and the system must be manually reset in order to continue process

When using a Heater/Chiller Module with a 625S Temperature Controller the Low Liquid Level sensor tube should be located 2 to 3 inches above the dispersion plate to insure the liquid does not boil away, or reach flashpoint. Should the liquid fall below this level an alarm will sound, the 625S Temperature Controller display will alternately flash "LL" and the temperature, for a low liquid level condition the chemical tank. For a low liquid level condition in the Heater/Chiller Module recirculating tank, the controller display will flash "REC" In the event this occurs the system will shut down and the alarm will continue until silenced. The liquid level must be restored, and the system must be manually reset in order to continue process.

Liquid Level Sensors

N2 Back pressure liquid level sensors should be tested quarterly to ensure proper function.

Thermocouples

Thermocouples should be independently verified quarterly to check proper function and ensure longer life of the equipment.

Warranties, Repairs, & Returns

Product Warranty & Exclusions

Bold Technologies guarantees that all products described in the invoice, excluding OEM components contained therein, were designed in accordance with information and specifications provided by the customer and is warranted against defects in workmanship, parts and materials, when used under normal operating conditions for a period of one (1) year commencing from the date of receipt of the equipment.

This warranty does not extend to components manufactured by others that are incorporated into the equipment by Bold Technologies. Buyer shall agree to contact manufacturer of other such components in the event of defects.

Return and Repair Policy

This product was carefully and properly packaged at our facility and received by the carrier in good condition. We fully expect this product to arrive in equal condition.

Upon receipt by the carrier, the product becomes your property. It is important that you document any damage, whether obvious or hidden, and report the same to the carrier within five (5) days of receipt to avoid forfeiting claims for damage.

Damaged Shipment Procedure

Should you find any dents or external cosmetic defects on these items, please follow these instructions for filing a damage claim.

NOTE: It is the customer's responsibility to comply with the following instructions so that the shipment carrier will honor damage claims.

- Leave the equipment items and packaging materials as they were found.

- Preserve shipping containers and contact the carrier's local office and ask for immediate inspection of packaging materials and contents. You may be asked to photograph the equipment to document your claim.

- After carrier has performed the inspection and you have received written acknowledgment of the damages, contact Bold Technologies Service Department at 801-568-7337 for a Return Materials Authorization *(RMA)* number. If you are requesting a Return Authorization number by postal or electronic mail,

indicate your purchase order number.

- If you have a defective component part, get an RMA number following the previous instructions. Indicate the part and serial numbers of any items you are returning. A purchase order is required for all repairs.

- Items returned for warranty repair or exchange must be freight prepaid and insured for the proper amount of shipment value. Warranty claims are processed on the condition that prompt notification of a defect is given within the warranty period.

- Freight charges for items shipped to and from Bold Technologies are the customer's responsibility.

- To expedite warranty repairs on all quartz heated vessels, they should be shipped directly to the manufacturer. This will assure faster service and reduce the chance of breakage during shipment. Bold Technologies will assist you in handling your claim with the manufacturer if desired.

NOTE: It is the customer's responsibility to comply with the following instructions so that the shipment carrier will honor damage claims.

In order to safely and efficiently expedite repairs of wet process equipment, it is important that these guidelines be followed:

1. Obtain a Return Material Authorization *(RMA)* number from Bold's Customer Service by calling:
    1. Customer Service: 801-568-7337
    2. Main Number: 801-568-7300

2. Products **should not** be returned to the factory without an RMA number in order to avoid possible losses or misunderstandings.

3. No credit allowances or adjustments shall be made until reported defects are confirmed by Bold Technologies.

4. Time spent by Bold Technologies to checking equipment that is found to have no fault may be chargeable, warranty status notwithstanding.

5. Products returned to Bold Technologies shall be shipped with transportation prepaid

by the buyer. Bold Technologies will ship repaired systems back to the buyer, freight collect.

6. Units must be rinsed free of all chemicals. They should be set in a proper drain sink and allowed to fully drain prior to packaging. Units not properly rinsed, drained and packaged will be refused and returned to the buyer at the buyer's expense.

7. Wrap the unit in a heavy plastic bag *(min.* 6 mil.) and secure it tightly. If not properly secured, a package can leak through the shipping container and can be declared non-deliverable by the carrier. If the solution is determined to be hazardous, YOU MAY BE LIABLE FOR DAMAGES. Bagged units should be packaged securely in a cardboard box with plenty of packing material such as bubble pack.

8. Place fragile stickers on all sides, top and bottom, to reduce rough handling and to decrease the chance of further damage to the unit.

9. Write the RMA number on the box in two locations. Units without RMA numbers are subject to refusal.

10. A notation inside the box or on the packing slip explaining the type of chemical in use at the time of failure must be included. Units sent without this notation will be subject to refusal and may be returned to the buyer at buyer's expense.

11. We recommend that all shipments be insured for the full value of the unit before shipment.

12. We suggest that you ship via the carrier that best meets your company’s standards.

13. All units received at Bold Technologies will be subject to a minimum charge for inspection (except units in for warranty repair). Units accepted that have not been properly drained, rinsed or packaged will be subject to an additional handling charge. The inspection charge, only, will be to the rebuild/repair charge. If buyer elects to not issue an order for rebuild/repair (or replacement with a Bold Technologies unit) the inspection charge will apply.

14. Units containing phenol based solvents WILL NOT be accepted.

If these guidelines are followed, your shipment to us should arrive in the same condition that they were in when they left your establishment. This helps us to make repairs as quickly as possible.

EQUIPMENT DATA

Suggested Spare Parts List

Station #1974

Bold P/N	Description	Manufacturer	Manufacturers P/N	Sugg. QOH
35-2000	DI Gun	Entegris	421-32-11	1
35-2001	DI Gun Fitting	Entegris	215-98	1
35-2002	DI Gun Tee assembly	Entegris	221-05	1
35-2003	DI Gun Tube	Entegris	221-02	1
35-4002	N2 Gun	Entegris	421-42-21	1
38-5431	Valve, Diaphragm 1/4" Orifice	Entegris	202-68-01	1
38-5420	Valve, Diaphragm 1/2" Orifice	Parker	PV-11-05	1
38-5423	Valve, Diaphragm 3/4" Adj. Bypass N/C	Entegris	202-149-01	1
35-3000	Dispenser, PVDF Specify orientation	Orion	5502.300	
65-4106	Switch, Push/Pull EPO Red	IDEC	HW1B-V4F01-R	1
65-4910	Switch, On / Off	Alcoswitch	164TL522	1
38-1460	Aspirator Block - liquid	Dytec	ASL-0206PTFEV	1
65-4710	Switch, Momentary	Alcoswitch	164TL11	1
65-4100	Cover, Splash	Fuji Electric	668'	2
65-3728	Bulb, 28V	General Electric	387	3
65-4522	Sensor, Liquid Level	World Magnetics	PSF103A20	2
31-3252	Regulator, 1/4" NPT	SMC	AR25N02H-Z	1
32-4115	Gauge, 0-15 PSI 1/8" NPT	McMaster-Carr	3847K51	1
65-5301	Solenoid, 24VDC N/C	SMC	SY114-5MOZ	2
62-2460	Cable, for 24V Solenoids	SMC	SY100-30-4A-15	2
65-4420	Switch, Magnetic Actuator	Hamlin Electronics	57135-000	4
65-4419	Sensor, Magnetic Proximity	Hamlin Electronics	57135-010	4
66-3114	Sensor, Glove Wash	Carlo Gavazzi	EC3025PPAPL	1
65-8300	Sonalert 24V	Floyd Bell	XCV09330Q	1
75-3004	Gauge, Photohelic 24V Tamper Proof	Dwyer Instrument	3002MR-TAMP	1
63-7001	Fuse, 1 AMP	Gould	GGM-1	5
63-7037	Fuse, 4 AMP	Gould	GGM-4	5
66-2310	Relay, 24VDC 10AMP	IDEC	RH2BULDC24V	1
66-2311	Relay, 24VDC 10amp 4-Pole	IDEC	RH4BULDC24V	1
66-2603	Relay, solid state 90AMP 24V	Crydom	D2490	1
66-1200	Contactor, Relay 50 AMP 24VAC	ABB	A30-30-10-81	1
64-2030	Supply, Power 30W 24VDC	Carlo Gavazzi	SPD 24 30 1	1
64-2100	Supply, Power 100W 24 VDC	Carlo Gavazzi	SPD 24 120 1	1
61-1152	Breaker, 15 AMP	Square D	QO115	1
61-1120	Breaker, 20 AMP GFI	Square D	QO120GFI	1
65-6320	Timer, 24V	IDEC	RTE P2AD24	1
70-1000	Controller, Temperature OMRON 0-400C	Omron	E5C2R20J0400C32752F	1
70-1003	Cover, Temperature Controller OMRON	Omron	Y92A48B	1
30-3001	Orifice, .005 1/4" Lime Green	Air Logic	F215050B85	5

Bold P/N	Description	Manufacturer	Manufacturers P/N	Sugg. QOH
66-3200	Thermocouple, Type J	Bold Technologies	66-3200	2
70-2024	Controller, 625C-582	Bold Technologies	625C-582	1
71-1582	Controller, 625TM-582/RS232	Bold Technologies	625TM-582/RS232	1
68-0863	Heater, Submergible PTFE 8X6X3	Heateflex	656320-80	
193-0071	Stir Motor	Cole Parmer	K-04634-00	
39-1430	Tubing PFA 1/4" OD	Ryan Herco	0317.043'	50'
39-1426	Tubing PFA 1/2" OD	Ryan Herco	0367.407'	50'
39-1460	Tubing PFA 3/8" OD	Ryan Herco	0367.371'	50'

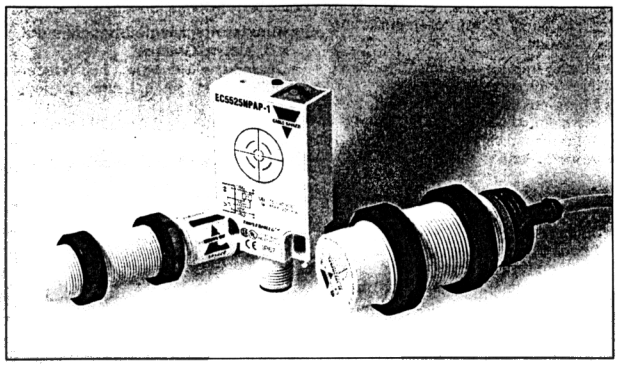
OEM Equipment Data List

Station #1974

The following pages contain helpful information provided by third party vendors and are organized in alphabetical order.

MANUFACTURERS	COMPONENT DESCRIPTIONS	MODEL
CARLO GAVAZZI	GLOVE WASH SENSOR	EC3016PPAPL
CRYDOM	90 AMP SS RELAY	D2490
DWYER	FLOWMETER 0-20 SCFH & 0-300 cc/min AIR	RMA6SSV
DWYER	PHOTOHELIC	A3002
ENTEGRIS	VALVES	202-57 202-149
ENTEGRIS (FLUOROWARE)	DI GUN	421-32-11
ICD/HEATEFLEX	SUBMERGIBLE HEATER PTFE 8X6X3	656320-80
IDEC	12V RELAY	RY2SU12
IDEC	24V DC 10A 4POL RELAY 24V DC 10A RELAY	RH4BULDC24V RH2BUDC24
IDEC	POWER SUPPLY POWER SUPPLY	PS300W48 PS5RC24
IDEC	TIMER	RTE P2AD24
OMRON	BACKUP TEMPERATURE CONTROLLER	E5C2R2OJ0400C
PARKER	TEFLON PNEUMATIC VALVES	PV-11-005
SMC	REGULATOR	AR25N02H-Z
SMC	REGULATOR & FILTER	AW20-NO2H-CZ
SMC	SOLENOID	SY114-5MOZ
SQUARE D	BREAKERS FA, FC, FH, SFH	FA, FC, FH, SFH
SQUARE D	DOUBLE POLE BREAKERS	QO, QOB
SQUARE D	SINGLE POLE BREAKERS	QO, QOB

Capacitive Sensors / Kapazitive Sensoren
Installation and Adjustment Guide / Installations- und Einstellhinweise



CARLO GAVAZZI

English

Capacitive sensors have the unique ability to detect almost all materials, either in liquid or solid form. Capacitive sensors can detect metallic as well as non-metallic objects, however, their traditional use is for non-metallic materials such as:

- **Plastic Industry:** resins, regrinds or moulded products.
- **Chemical Industry:** cleansers, fertilisers, liquid soaps, corrosives and petrochemicals.
- **Wood Industry:** saw dust, paper products, door and window frames.
- **Ceramic & Glass Industry:** raw material, clay or finished product, bottles.
- **Packaging Industry:** package inspection for level or contents, dry goods, fruits and vegetables, dairy products.

Materials are detected due to their dielectric constant. The bigger the size of an object, the higher the density of material, the better or easier it is to detect the object. Nominal sensing distance for a capacitive sensor is referenced to a grounded metal plate (ST37). For additional information regarding dielectric ratings of materials please refer to our catalogue: "SENSORS".

Deutsch

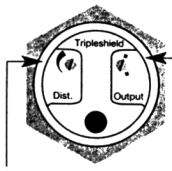
Kapazitive Sensoren eignen sich zum Erfassen von Materialien in fester oder flüssiger Form. Dazu gehören alle Metalle und nicht-metallischen Stoffe. Einsatzmöglichkeiten ergeben sich in:

- **Kunststoffspritzgießmaschinen:** z.B. Kleber, Granulat.
- **Chemische Industrie:** z.B. Wasseraufbereitung, Säure, Lauge, Lösungsmittel.
- **Holzindustrie:** z.B. Holz, Sägespäne, Papier.
- **Keramik- und Glasindustrie:** z.B. Quarzsand, Flaschenerfassung.
- **Verpackungsindustrie:** z.B. Verpackungen, Füllmengenerfassung, Futtermittel, Molkereiprodukte, Früchte und Gemüse.

Die Erfassung von Materialien durch kapazitive Sensoren hängt von der Dichte und den elektrischen Eigenschaften des Objektes ab. Der angegebene Schaltabstand für kapazitive Sensoren bezieht sich auf eine genormte Messplatte aus Stahl (ST37). Weitere Informationen über Reduktionsfaktoren von Materialien finden Sie in unserem Katalog "SENSOREN".

EC3016TBAPL(-6)
EC3025TBAPL(-6)

Programmable NO or NC by rotary switch.
2-wire device rear view.
Programmierbar NO oder NC. Drehschalter auf Gehäuserückseite. 2-Leiter Typ Rückseite

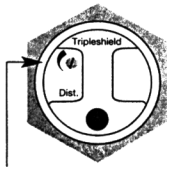


Sensitivity adjustment
Einstellung Schaltabstand

EC55.....

Sensitivity adjustment Flatpack (top view)
Einstellung Schaltabstand (Geräteoberseite)

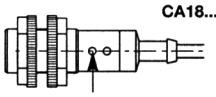
EC3016xPAPL(-1)
EC3025xPAPL(-1)



Sensitivity adjustment
4-wire device rear view
Einstellung Schaltabstand
Geräterückseite 4-Leiter Typ

Sensitivity
Schaltabstand

CA18...



Sensitivity adjustment
Einstellung Schaltabstand

English

The environments in which capacitive sensors are installed can often be unstable regarding temperature, humidity, object distance and industrial (noise) interference. Because of this, Carlo Gavazzi offers as standard features in all *TRIPLESHIELD*™ capacitive sensors a user-friendly sensitivity adjustment instead of having a fixed sensing range, extended sensing range to accommodate mechanically demanding areas, temperature stability to ensure minimum need for adjusting sensitivity if temperature varies and high immunity to electromagnetic interference (EMI).

Note:
Sensors are factory set (default) to maximum rated sensing range.

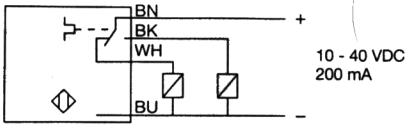
Deutsch

Hinsichtlich der Umgebungsbedingungen von EMV Störungen, Feuchtigkeit und Umgebungstemperatur arbeiten kapazitive Sensoren oft im kritischen Bereich. *TRIPLESHIELD*™ Sensoren von Carlo Gavazzi bietet ein hohes Maß an Störsicherheit und Temperaturstabilität sowie eine bedienerfreundliche Einstellung des Schaltabstandes. Der große Schaltabstand bei vergleichsweise geringen Gehäuseabmessungen schützt den Sensor auch vor mechanischer Beschädigung. Die vollvergossenen Sensoren widerstehen auch starken Vibrationen und entsprechen der Schutzart IP 67.

Bemerkung:
Die kapazitiven Sensoren sind werkseitig auf den maximalen Schaltabstand eingestellt.

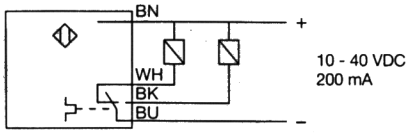
Wiring Diagrams/Schaltbilder

EC30xxPPAxL(-1), EC5525PPAP(-1), CA18CLxxxPA(M1)
PNP, NO and/*und* NC



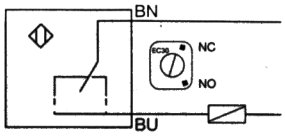
10 - 40 VDC
200 mA

EC30xxNPAxL(-1), EC5525NPAP(-1), CA18CLxxxNA(M1)
NPN, NO and/*und* NC



10 - 40 VDC
200 mA

EC30xxTBAxL(-6), CA18CLxxxTx(M6). SCR, NO or/*oder* NC
EC30: (programmable, factory default NO / *programmierbar, Werkseinstellung NO*)



20 - 250 VAC
10 - 500 mA

These products feature
TRIPLESHIELD™
Sensor Technology

Highest Standard of Immunity:
- Electrostatic Discharges
- Communication Interference (GSM)
- Transient (burst) Interference
- Wire-conducted Interference

CE conformity

Diese Produkte sind mit
TRIPLESHIELD™
Sensortechnologie ausgerüstet

3-fache Störfestigkeit:
- Elektrostatische Entladungen
- Elektromagnetische Störeinflüsse
- Störstoßspannungen (Burst)
- Leitungsgebundene Störungen

CE zugelassen

CARLO GAVAZZI INDUSTRI A/S
Over Hadstenvej 40, DK-8370 Hadsten

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Internet: http://www.carlogavazzi.com

CARLO GAVAZZI

MAN CAP ENG/GER 18 01.03
Printed in Denmark by Vitten Bogtryk A/S
15-029-47

crydom™

Series 1

10-90Amp • 120/240 Vac - AC OUTPUT

- **Zero Voltage and Random Turn-On Switching**
- **Panel Mount**
- **600V Transient Capability**
- **Internal Snubber**
- **110 & 125A Models Available**
- **Integrated Overvoltage Protection by Automatic Self Turn-On (Suffix P)**

Featuring state-of-the-art Surface Mount Technology, these SPST-NO relays deliver proven reliability in the most demanding applications. Output consists of an SCR AC switch and is available in zero-cross, random turn-on (phase controllable) and normally closed (Form B) versions with either AC or DC input (coil) control. Manufactured in Crydom's ISO 9001 Certified facility for optimum product performance and reliability.

MODEL NUMBERS	AC CONTROL	A1210	A1225	A1240	A2410	A2425	A2450	A2475	A2490
	DC CONTROL	D1210	D1225	D1240	D2410	D2425	D2450	D2475	D2490
OUTPUT SPECIFICATIONS ①									
Operating Voltage (47-63 Hz) [Vrms]		24-140	24-140	24-140	24-280	24-280	24-280	24-280	24-280
Max. Load Current ③ [Arms]		10	25	40	10	25	50	75	90
Min. Load Current, [mArms]		40	40	40	40	40	40	40	40
Transient Overvoltage [Vpk]		400	400	400	600	600	600	600	600
Max. Surge Current, (16.6ms) [Apk]		120	250	625	120	250	625	1000	1200
Max. On-State Voltage Drop @ Rated Current [Vpk]		1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Thermal Resistance Junction to Case ($R_{\theta JC}$) [°C/W]		1.48	1.02	0.63	1.48	1.02	0.63	0.31	0.28
Maximum I^2t for Fusing, (8.3 msec.) [A^2sec]		60	260	1620	60	260	1620	4150	6000
Max. Off-State Leakage Current @ Rated Voltage [mArms]		8	8	8	10	10	10	10	10
Min. Off-State dv/dt @ Max. Rated Voltage [V/µsec] ②		500	500	500	500	500	500	500	500
Max. Turn-On Time ④		1/2 Cycle (DC Control), 10.0 msec (AC Control)							
Max. Turn-Off Time		1/2 Cycle (DC Control), 40.0 msec(AC Control)							
Power Factor (Min.) with Max. Load		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

INPUT SPECIFICATIONS ①	DC CONTROL	AC CONTROL	24V AC/DC CONTROL (E SUFFIX)
Control Voltage Range	3-32 Vdc	90-280 Vrms (60Hz)	18-36 Vrms/Vdc
Max. Reverse Voltage	-32 Vdc	—	—
Max. Turn-On Voltage	3.0 Vdc	90 Vrms	18 Vrms/Vdc
Min. Turn-Off Voltage	1.0 Vdc	10 Vrms	4.0 Vrms/Vdc
Nominal Input Impedance	1500 Ohms	60K Ohms	9.0K Ohms
Typical Input Current	3.4mA @ 5 Vdc, 20mA @ 28Vdc	2mA @ 120 Vrms, 4mA @ 240 Vrms	3mA @ 24 V

GENERAL NOTES

① All parameters at 25° C unless otherwise specified.
② Off-State dv/dt test method per EIA/NARM standard RS-443, paragraph 13.11.1
③ Heat sinking required, for derating curves see page 3.
④ Turn-on time for random turn-on versions is 0.02 msec (DC Control Models).

For recommended applications and more information contact:
USA: Sales Support (877) 502-5500 **Tech Support** (877) 702-7700 **FAX** (619) 710-8540
Crydom Corp, 2320 Paseo de las Americas, Ste. 201, San Diego, CA 92154
Email: sales@crydom.com **WEB SITE:** http://www.crydom.com
UK: +44 (0)1202 365070 • **FAX** +44 (0)1202 365090 Crydom International Ltd., 7 Cobham Road, Ferndown Industrial Estate, Ferndown, Dorset BH21 7PE, Email: intsales@crydom.com.
GERMANY: +49 (0)180 3000 506

ISO 9001 CERTIFIED

GENERAL SPECIFICATIONS

Dielectric Strength 50/60Hz Input/Output/Base	4000 Vrms
Insulation Resistance (Min.) @ 500 Vdc	10^9 Ohm
Max. Capacitance Input/Output	8 pF
Ambient Operating Temperature Range	-40 to 80°C
Ambient Storage Temperature Range	-40 to 125°C

MECHANICAL SPECIFICATIONS

Weight: (typical)	3.0 oz. (86.5g)
Encapsulation:	Thermally Conductive Epoxy
Terminals:	Screws and Saddle Clamps Furnished, Unmounted

AVAILABLE OPTIONS

-B Normally Closed (Form B)
Example: **D2450-B, A2450-B**

E 24V AC/DC Input
Example: **A2450E**

F Faston Terminals (Up to 50A Models)
Example: **D1225F**

G Input Status LED.
Agencies Approval Pending
Example: **D2450G**
Note: Control Voltage Range 4.5-32Vdc
for DC Control Models.

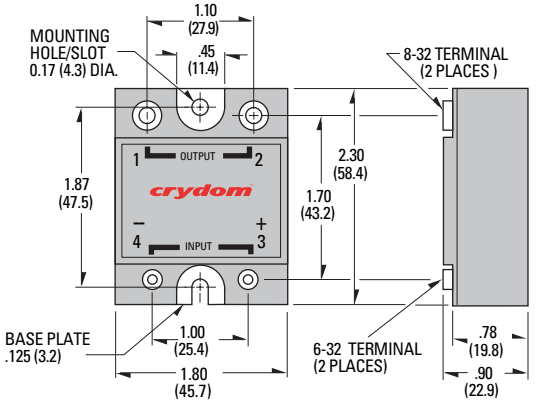
P Internal Overvoltage Protection.
Relay Will Self Trigger Between
450-600 Vpk. Not Suitable For Capacitive Loads.
Not Available with -B Option
Agencies Approval Pending.
Example: **D2425P**

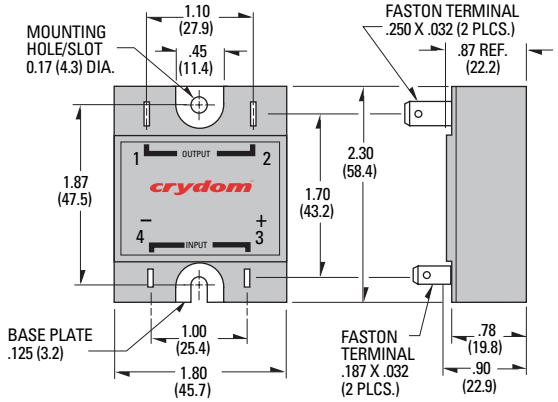
4D 400 Hz Operation
10-50 Amp Models Only
Zero Cross Switching Only
Example: **4D2450**

-10 Random Turn-On (AC & DC Control)
Phase Controllable (DC Control)
Example: **D2450-10**

H Heat Transfer Pad (Attached)
Example: **D2450H**

Ordering System: Combination of the suffixes should be made in the following order: **EFPG-10**.
Example: **A2450EFPG-10**





Screw Torque Requirements:
6-32 Screws - 10 in. lbs.,
8-32 and 10-32 Screws - 20in. lbs.
(Screws dry without grease.)

Fastons:
Single pair (up to 25A)
Double pair* (up to 50A).
***Caution: User must connect to both pairs**

Crydom Heat Sinks offer excellent thermal management and are perfectly matched to the load current ratings of Crydom panel mount relays. Request Crydom's Heat Sink specification sheet for all the details.

All dimensions are in inches (millimeters)

APPROVALS

UL	E116949	CE
CSA	LR81689	
VDE	10143 UG	(Not Applicable: -B and 4D)

For recommended applications and more information contact:
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Crydom Corp, 2320 Paseo de las Americas, Ste. 201, San Diego, CA 92154
Email: sales@crydom.com **WEB SITE**: http://www.crydom.com
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GERMANY: +49 (0)180 3000 506

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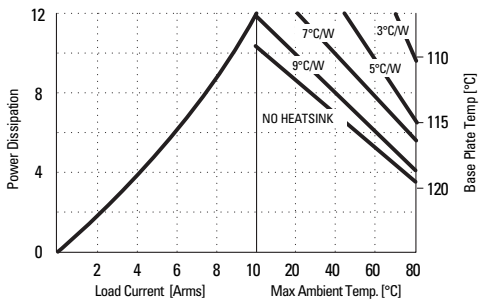
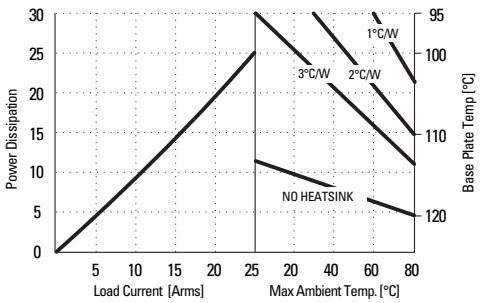
CURRENT DERATING CURVES

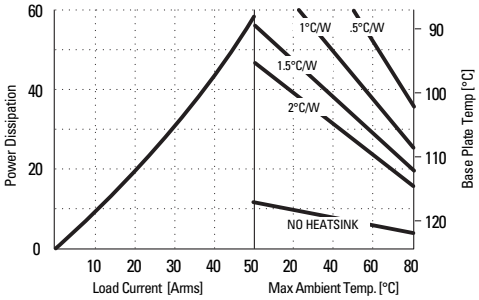
10A



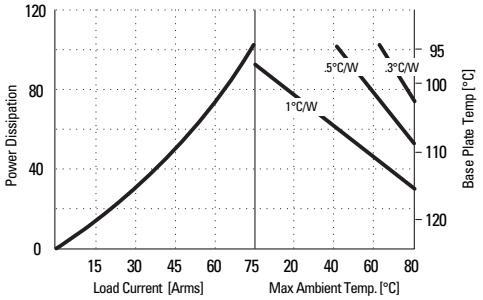
25A



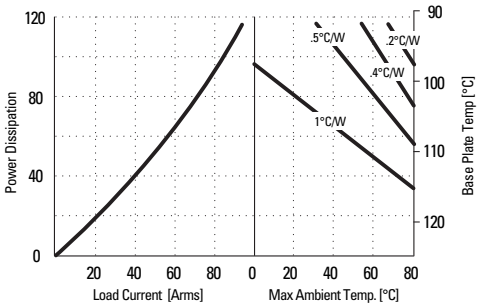
50A



75A



90A



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GERMANY: +49 (0)180 3000 506

ISO 9001 CERTIFIED

Series RM Rate-Master® Flowmeters

Specifications - Installation and Operating Instructions

Fig. 1

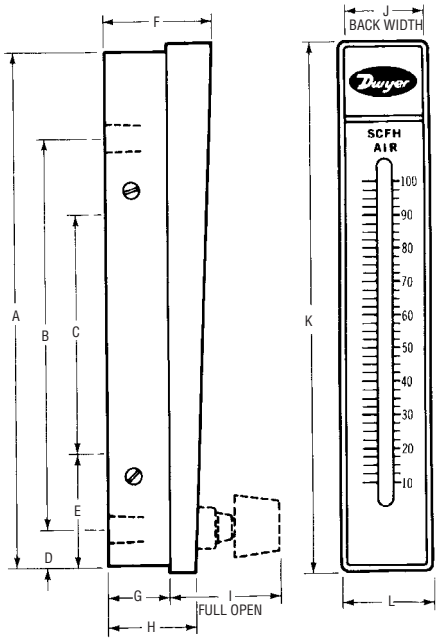

Fig. 2

Dimensions in Inches (Centimeters)			
	Model RMA	**Model RMB**	**Model RMC**
A	4 -9/16 (11.59)	8-1/2 (21.59)	15 -1/8 (38.42)
B	3 (7.62) 1/8 NPT CONN.	6-7/16 (16.35) 1/4 NPT CONN.	12 -1/4 (31.12) 1/2 NPT CONN.
C	1-5/8 (3.17) 10 - 32 Thds.	3-15/16 (8.56) 1/4 - 20 Thds.	8-3/4 (10.72) 10 - 32 Thds.
D	3/8 (.95)	5/8 (1.59)	1 (2.54)
E	1-1/16 (2.60)	1-7/8 (3.42)	2-3/4 (5.83)
F	1-3/16 (2.73)	1-3/4 (3.29)	2-1/4 (5.33)
G	3/4 (1.91)	1 (2.54)	1-7/16 (2.98)
H	1 (2.54)	1-7/16 (2.98)	1-31/32 (3.51)
I (OPEN)	1-3/8 (3.49)	1-13/16 (4.60)	2-1/2 (6.35)
J	3/4 (1.91)	1-1/4 (3.18)	2 (5.08)
K	4-13/16 (12.22)	8-3/4 (22.23)	15-3/8 (39.05)
L	1 (2.54)	1-1/2 (3.81)	2-1/4 (5.72)

PANEL CUTOUT FOR FLUSH MOUNTING			
HIGH	4-5/8 (11.75)	8-9/16 (21.75)	15 -3/16 (38.58)
WIDE	7/8 (2.22)	1-5/16 (3.33)	2-1/16 (5.24)
PANEL HOLE SIZES FOR SURFACE MOUNTING			
PIPE	7/16 (1.11)	5/8 (1.59)	15/16 (2.38)
BOLT	1/4 (0.64)	9/32 (0.71)	13/32 (1.03)

Dwyer Series RM Rate-Master® Flowmeters are furnished in three models (see Fig. 2), each available in a broad array of flow ranges with direct reading scales for air, gas or water. Installation, operation and maintenance are very simple. Only a few common-sense precautions must be observed to assure long, trouble-free service.

CAUTION: Dwyer Rate-Master® Flowmeters are designed to provide satisfactory long-term service when used with air, water or other compatible media. Refer to factory for information on questionable gases or liquids. Avoid solutions of acids, bases or salts having a pH below 5.0 or above 8.5. Caustic solutions, antifreeze (ethylene glycol) and aromatic solvents should definitely not be used.

Calibration
Each Rate-Master® Flowmeter is calibrated at the factory. If at any time during the meter's life, you wish to re-check its calibration, do so only with devices of certified accuracy. DO NOT attempt to check a Rate-Master® Flowmeter with a similar flowmeter, as seemingly unimportant variations in piping and back pressure may cause noticeable differences in the indicated reading. If in doubt, return your Dwyer Rate-Master® Flowmeter to the factory. Its calibration will be checked for you at no charge. Before proceeding with installation, check to be sure you have the Rate-Master model and flow range you require.

LOCATION: Temperature, Pressure, Atmosphere and Vibration: Dwyer Rate-Master® Flowmeters are exceptionally tough and strong. They are designed for use at pressures up to 100 psi (6.89 bar) and temperatures up to 130°F (54°C).

DO NOT EXCEED THESE LIMITS! The installation should not be exposed to strong chlorine atmospheres or solvents such as benzene, acetone, carbon tetrachloride, etc. The mounting panel should be free of excessive vibration, as it may prevent the unit from operating properly.

Inlet Piping Run: It is good practice to approach the flowmeter inlet with as few elbows and restrictions as possible. In every case, the inlet piping should be at least as large as the connection to the flowmeter; i.e.,1/8″ Iron Pipe Size for RMA models 1/4″ IPS for RMB models,1/2″ IPS for RMC models. Length of inlet piping makes little difference for normal pressure-fed flowmeters.

For flowmeters on vacuum air service, the inlet piping should be as short and open as possible. This will allow operation near atmospheric pressure and thereby insure the accuracy of the device. (**Note:** for vacuum air service, the flow control valve, if any, should be on the discharge side of the flowmeter. Either the TMV unit or a separate in-line valve may be applied.).

Discharge Piping: As on the inlet, discharge piping should be at least as large as the flowmeter connection. Also, for pressure-fed flowmeters on air or gas service, the discharge piping should be as short and open as possible. This will allow operation of the flow tube at near atmospheric pressure and insure the accuracy of the device. This is of less importance on water or liquid flowmeters, as the flowing medium is generally incompressible and moderate back pressure will not affect the accuracy of the instrument as calibrated.

POSITIONING AND MOUNTING
All Rate-Master® Flowmeters must be mounted in a vertical position with inlet connection at the bottom rear and outlet at the top rear.

Bezel or Through-Panel Mounting: Make panel cutout using appropriate dimensions from Fig. 2. Flowmeter must fit into panel freely without forcing or squeezing. Insert the flowmeter from the front of the panel and install the mounting clamps from the rear. Insert and tighten the clamp bolts in the locations shown in Fig. 3. Do not exceed 5 in./lbs. Make connections to inlet and outlet ports using small amount of RTV sealant or Teflon® thread tape to avoid leakage. Avoid excess torque, which may damage the flowmeter body.

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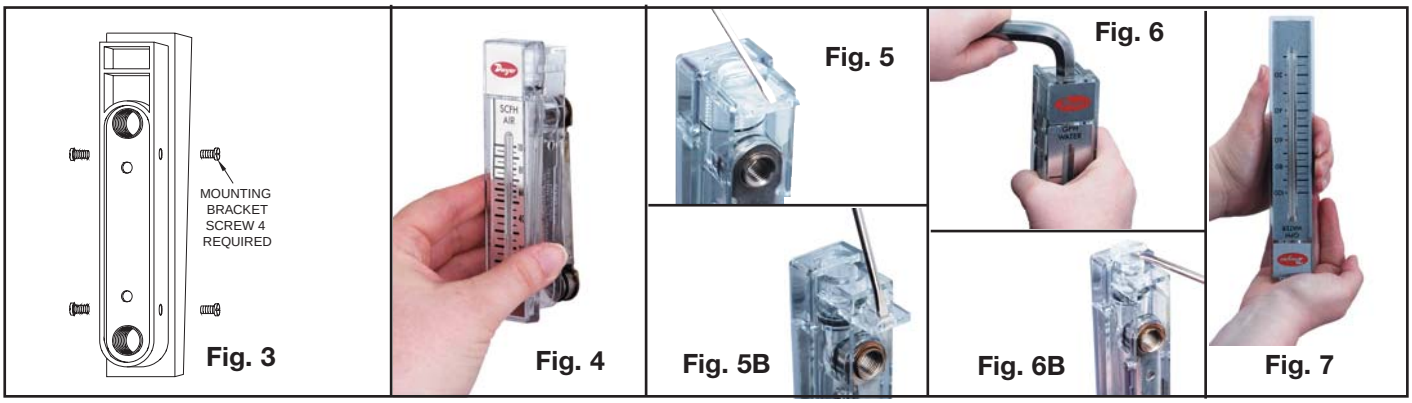


Surface Mounting: Drill appropriate holes in panel, using the dimensions shown in Fig. 2. Hold the flowmeter in position in front of the panel and install the clamp bolts from the rear. (The mounting clamps may be used as washers, if desired, by installing them backwards or straightening them out.) Pipe up inlet and discharge following the directions in the previous sections.

Surface Mounting on Piping Only: An alternate method of surface mounting, omitting the clamp bolts and supporting the flowmeter solely on the connecting piping, is possible. For this method, extra-long or straight pipe threads should be used so that nuts may be run onto the pipe and later tightened against the back of the panel to retain the unit in proper position. Use appropriate hole layout in formation from Fig. 2, but omit the small holes.

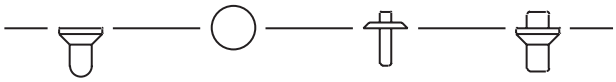
Surface Mounting on Piping Only Without Panel: For a temporary or laboratory type installation, the panel may be omitted altogether and the flowmeter installed directly in rigid piping. Its light weight permits this without difficulty.

OPERATION

To start system, open valve slowly to avoid possible damage. Control valves on BV and SSV models are turned clockwise to reduce flow, counter-clockwise to increase flow. A nylon insert is provided in the threaded section of the valve stem to give a firm touch to valve and to prevent change of setting due to vibration.

The performance of low range units used in air or gas applications may be affected by static electricity. Excessive static charge may cause the ball float to behave erratically or provide a false reading. To ensure the proper function of the unit, the application should be designed to minimize or dispel static electricity.

The standard technique for reading a Variable Area Flowmeter is to locate the highest point of greatest diameter on the float, and then align that with the theoretical center of the scale graduation. In the event that the float is not aligned with a grad, an extrapolation of the float location must be made by the operator as to its location between the two closest grads. The following are some sample floats shown with reference to the proper location to read the float.



Variable Area Flowmeters used for gases are typically labeled with the prefix "S" or "N", which represents "Standard" for English units or "Normal" for metric units. Use of this prefix designates that the flowmeter is calibrated to operate at a specific set of conditions, and deviation from those standard conditions will require correction for the calibration to be valid. In practice, the reading taken from the flowmeter scale must be corrected back to standard conditions to be used with the scale units. The correct location to measure the actual pressure and temperature is at the exit of the flowmeter, except when using the Top Mounted Valve under vacuum applications, where they should be measured at the flowmeter inlet. The equation to correct for nonstandard operating conditions is as follows:

$$Q_2 = Q_1 \times \sqrt{\frac{P_1 \times T_2}{P_2 \times T_1}}$$

Where: Q_1 = Actual or Observed Flowmeter Reading
Q_2 = Standard Flow Corrected for Pressure and Temperature
P_1 = Actual Pressure (14.7 psia + Gage Pressure)
P_2 = Standard Pressure (14.7 psia, which is 0 psig)
T_1 = Actual Temperature (460 R + Temp °F)
T_2 = Standard Temperature (530 R, which is 70°F)

Example: A flowmeter with a scale of 10-100 SCFH Air. The float is sitting at the 60 grad on the flowmeter scale. Actual Pressure is measured at the exit of the meter as 5 psig. Actual Temperature is measured at the exit of the meter as 85°F.

$$Q_2 = 60.0 \times \sqrt{\frac{(14.7 + 5) \times 530}{14.7 \times (460 + 85)}}$$

Q_2 = 68.5 SCFH Air

CAUTION: Do not completely unscrew valve stem unless the flowmeter is unpressurized and drained of any liquid. Removal while in service will allow gas or liquid to flow out the front of the valve body and could result in serious personal injury. For applications involving high pressure and/or toxic gases or fluids, special non-removable valves are available on special order. Please contact factory for details.

MAINTENANCE

The only maintenance normally required is occasional cleaning to assure reliable operation and good float visibility.

Disassembly: The flowmeter can be disassembled for cleaning simply as follows:

1. Remove valve knob from RMB or RMC -BV or -SSV units by pulling the knob forward. It is retained by spring pressure on the stem half-shaft so that a gentle pull will remove it. On RMA-BV or -SSV models, turn the valve knob counter-clockwise until the threads are disengaged. Then withdraw the stem from the valve by gently pulling on the knob.

2. Remove the four mounting bracket screws located in the sides of the flowmeter. See Fig. 3. Pull the flowmeter body gently forward away from the back plate to avoid undue strain on the body. Leave the piping connections intact. There is no need to disturb them. See Fig. 4.

3. Threaded body style flowmeters - Remove the slip cap with a push on a screwdriver as shown in Fig. 5. Remove the plug ball stop as shown in Fig. 6 using allen wrench sizes as follows: Model RMA - 1/4″, Model RMB - 1/2″ and Model RMC - 3/4″ Threadless body style flowmeters - Release the plastic retaining clip with a screw driver (Figure 5B), it will unclip from the valve body (TMV Option) or the plug ball stop, slide the clip back until the valve body or ball stop can be removed. The clip will remain in the body for convenience. Using a screwdriver gently lift up on the plug in the groove as shown in Figure 6B until the o-ring seal is released and remove the plug. For the TMV option gently pull up on the valve knob to release the valve body seals and remove the valve.

4. Take out the ball or float by inverting the body and allowing the float to fall into your hand, as shown in Fig. 7. (Note: It is best to cover the discharge port to avoid losing the float through that opening.)

Cleaning: The flow tube and flowmeter body can best be cleaned with a little pure soap and water. Use of a bottle brush or other soft brush will aid the cleaning. Avoid benzene, acetone, carbon tetrachloride, alkaline detergents, caustic soda, liquid soaps (which may contain chlorinated solvents), etc. Also, avoid prolonged immersion, which may harm or loosen the scale.

Reassembly: Simply reverse steps 1 through 4 and place the flowmeter back in service. A little stopcock grease or petroleum jelly on the "O" rings will help maintain a good seal as well as facilitate assembly. No other special care is required.

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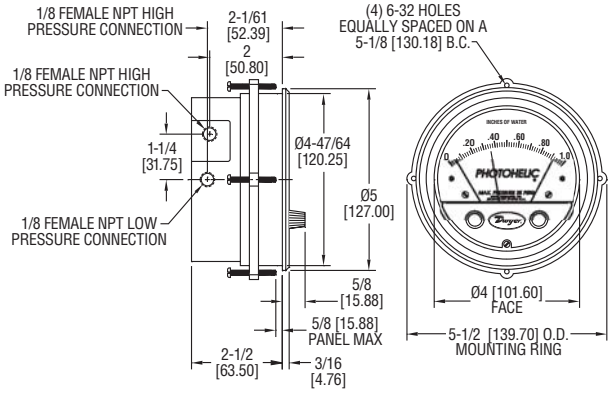
Series 3000MR Photohelic® Differential Pressure Switch/Gage

Specifications — Installation and Operating Instructions



Using solid state technology, the Series 3000MR Photohelic® switch/gage combines the functions of a precise, highly repeatable differential pressure switch with a large easy-to-read analog pressure gage employing the durable, time-proven Magnehelic® design. Switch setting is easy to adjust with large external knobs on the gage face. Gage reading is unaffected by switch operation — will indicate accurately even if power is interrupted. Solid state design now results in greatly reduced size and weight. Units can be flush mounted in 4 13/16″ (122 mm) hole or surface mounted with hardware supplied. 3000MR models employ versatile electromechanical relays with gold over silver contacts — ideal for dry circuits. All models provide both low and high limit control and include 18-inch (45 cm) cable assemblies for electrical connections.

Gage accuracy is ±2% of full scale and switch repeatability is ±1%. Switch deadband is one pointer width — less than 1% of full scale. Compatible with air and other non-combustible, non-corrosive gases, they can be used in systems with pressures to 25 psig (1.725 bar). Optional construction is available for use to either 35 psig (2.42 bar) or 80 psig (5.51 bar).

Accessories

Mounting ring, snap ring
18″ (45 cm) cable assembly
(2) 3/16″ tubing to 1/8″ NPT adapters
(2) 1/8″ NPT pipe plugs
(4) 6-32 x 1 1/4″ RH machine screws (panel mounting)
(3) 6-32 x 5/16″ RH machine screws (surface mounting)

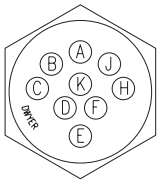
SPECIFICATIONS

GAGE SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult Factory.
Accuracy: ±2% of full scale (3000-0 ±3% of full scale).
Pressure Limit: -20″ Hg. to 25 psig (-0.677 bar to 1.72 bar). MP option; 35 psig (2.41 bar), HP option; 80 psig (5.52 bar).
Temperature Limits: 20 to 120°F. (-6.67 to 48.9°C).
Process Connections: 1/8 female NPT (duplicated side and back).
Size: 4″ (101.6 mm) dial face, 5″ (127 mm) O.D. x 3-1/8″ (79.38 mm).
Weight: 1.8 lb., (816 g).

SWITCH SPECIFICATIONS 3000MR

Switch Type: Each setpoint has 1 Form C relay (SPDT).
Relay Contacts: (resistive load) 1 Form C rated 1.0 amp @ 30 VDC, 0.3 amp @ 110 VDC or 0.5 amp @ 125 VAC. Gold over clad silver - suitable for dry circuits.
Electrical Connections: 18″ (46 cm) cable assembly with 8 conductors. Optional lengths to 100′ (30.5 m).
Power Requirements: 24 VDC, regulated ± 10%.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Set Point Adjustment: Adjustable knobs on face.



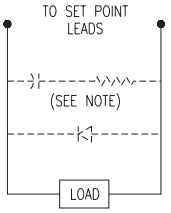
		LETTER	COLOR
Power Supply	+	A	Red
	-	E	Black
Low Set Point	COM	C	Brown
	NC	B	Violet
	NO	D	Blue
High Set Point	COM	H	Green
	NC	J	White
	NO	F	Orange

ELECTRICAL CONNECTIONS

CAUTION: Do not exceed specified electrical ratings. Permanent damage not covered by warranty will result. This unit is not designed for AC line voltage operation.

Electrical connections are made by means of the cable assembly supplied which has a multi-pin female plug installed on one end which mates with the male connector on the rear of the gage. Wire leads on the opposite end of the assembly are connected in accordance with the drawing and chart to the right.

Note: An R/C (resistor/capicitator) snubber is required when switching inductive loads such as a solenoid or contactor. specify Dwyer part number A-600. For DC circuits, also include a 1N4005 diode.



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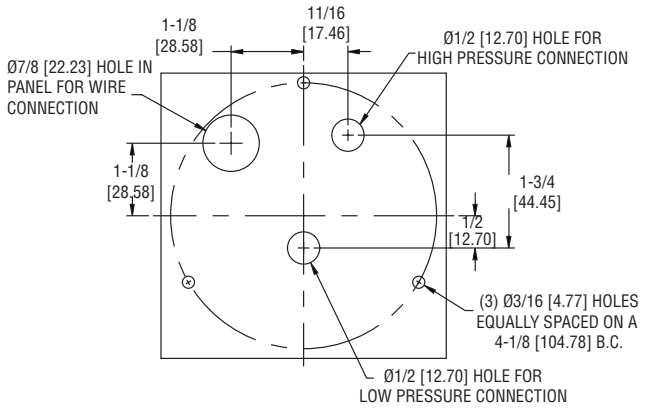
INSTALLATION

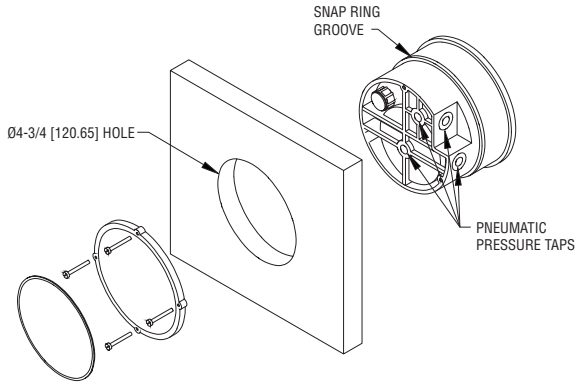
1. **LOCATION:** Select a location where the temperature of the unit will be between 20°F and 120°F (-6.67 to 48.9°C). The tubing feeding pressure to the instrument can be run practically any length required but long lengths will increase response time slightly. Avoid surfaces with excessive vibration.

2. **POSITION:** All standard models are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If your application requires mounting in other than a vertical position, be sure to specify this when ordering.

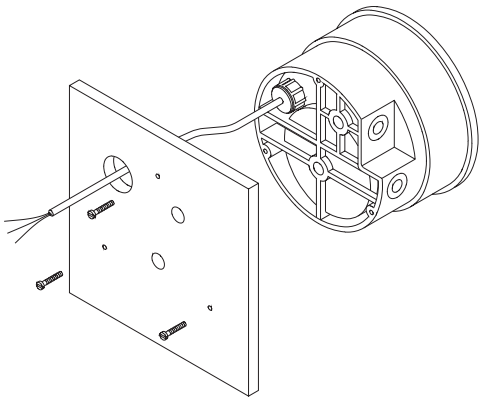
3. **PRESSURE CONNECTIONS:** For convenience, two sets of 1/8˝ female NPT ports are available. Plug the unused set with pipe plugs provided. Attach tubing from positive pressure source to port marked "HI" or from negative (Vacuum) source to port marked "LOW". In either case, opposite port must be vented to atmosphere. In dusty environments, we recommend use of an A-331 Filter Vent Plug to keep interior of instrument clean. For differential pressures the higher source is connected to the "HI" port and lower to the "LOW" port.



4. **MOUNTING:** The Photohelic® Switch/Gage may be either panel mounted or surface mounted.



A. PANEL MOUNTING: Cut a 4-3/4˝ or 120mm dia. hole in panel and insert the complete unit from the front. Slip on the mounting ring and install the split snap ring in the groove on the bezel. Seat the mounting ring against the snap ring and thread the four screws through the tapped holes. Tighten screws against rear of panel.



B. SURFACE MOUNTING: Drill (3) 3/16˝ dia. holes for mounting screws and (1) 7/8˝ dia. hole for wire assembly as shown in hole location drawing. Insert screws from rear of panel and thread into tapped holes on back of Photohelic® case. If rear pressure connections are to be used, make 1/2˝ dia. holes located as shown in hole location drawing in left column.

Once Photohelic® unit is securely mounted, plug wire assembly into 9 pin connector on rear of unit, being careful to match pin locations.

5. **ZEROING:** Once the Photohelic® is mounted in its final position, check to be sure pointer aligns with zero on scale, when no pressure is applied and both low and high pressure ports are vented to atmosphere. To adjust, turn small slotted screw at center-bottom of gage face.

MAINTENANCE

Dwyer Photohelic® Switch/Gages are precision instruments, expertly assembled and calibrated at the factory. They require no lubrication or periodic servicing. If the interior is protected from dust, dirt corrosive gases and fluids, years of trouble-free service may be expected. Zero adjustment should be checked and reset occasionally to maintain accuracy. Any repairs necessary to either the Dwyer Photohelic® gage or the electronic components should be performed by a trained instrument mechanic. In most cases, this is best accomplished by returning the complete Photohelic® Switch/Gage to the Dwyer factory.

The Series 3000MR Photohelic® Differential Pressure Switch/Gage is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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Entegris

INTEGRA® PNEUMATICALLY AND MANUALLY OPERATED DIAPHRAGM VALVES SPECIFICATION SHEET

½" orifice, 2-way designs

SPECIFICATIONS FOR MODELS

Pneumatic, normally closed: 202-57-01, 202-58-01, 202-59-01, 202-60-01, 202-66-01, 202-60-SI-01, 202-60-SO-01, 202-66-SI-01, 202-66-SO-01

Pneumatic, normally open: 202-61-01, 202-62-01, 202-63-01, 202-64-01, 202-67-01, 202-64-SI-01, 202-64-SO-01, 202-67-SI-01, 202-67-SO-01

Manual, ¼-turn: 201-33-01, 201-34-01, 201-35-01, 201-36-01, 201-37-01, 201-36-SI-01, 201-36-SO-01, 201-37-SI-01, 201-37-SO-01

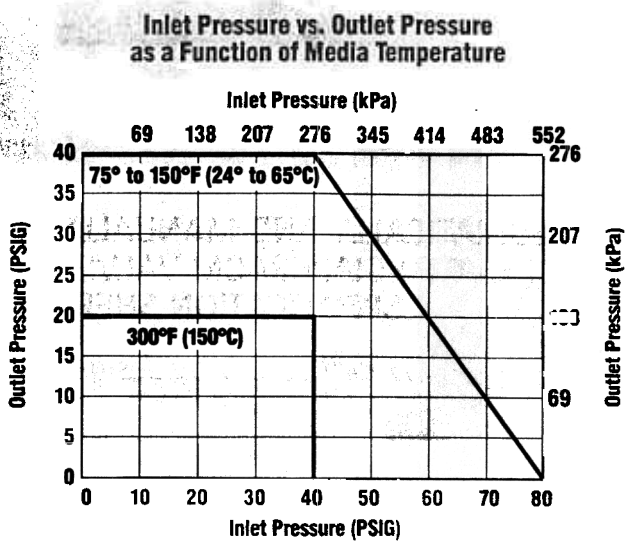
Manual, multi-turn: 201-38-01, 201-39-01, 201-40-01, 201-41-01, 201-42-01, 201-41-SI-01, 201-41-SI-01, 201-42-SI-01, 201-42-SI-01

*Includes all derivatives such as valves with PFA and CPFA Flaretek® nuts, FlareLock® II nuts and other special configurations.

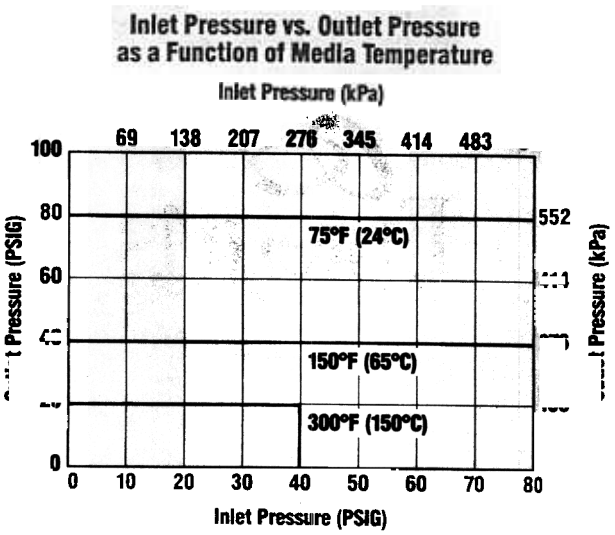
SPECIFICATIONS

Pressure range:	29" Hg vacuum (980 mbar) to 80 PSIG (551.6 kPa) Refer to Inlet vs. Outlet Pressure Charts
Temperature range	75° to 150°F (24° to 65°C), ambient 75° to 150°F (24° to 65°C), fluid, normally open 75° to 300°F (24° to 150°C), fluid, normally closed 75° to 300°F (24° to 150°C), fluid, manual
Pneumatic supply pressure:	Normally closed valves: 35 PSIG (241.3 kPa) minimum to 70 PSIG (482.6 kPa) maximum Normally open valves: 40 PSIG (275.8 kPa) minimum to 70 PSIG (482.6 kPa) maximum
Pneumatic supply port	⅛" FNPT
Materials:	All wetted parts are PFA. Exterior actuator parts are PVDF. Interior actuator parts are PVDF, stainless steel, Viton®
Typical flow factor	3.0 C_V (42.8 K_V)

½" Pneumatic Valves

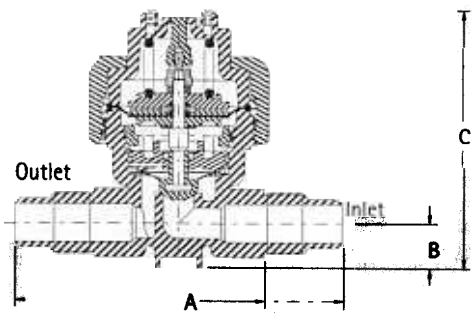


½" Manual Valves



DIMENSIONS

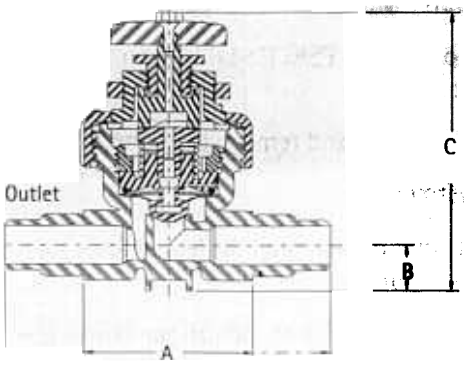
Pneumatic Valves



ORDERING INFORMATION

Order Number	Dimensions A	B	C
Pneumatic Normally Closed Valves			
202-57-01	2.75" (69,85 mm)	.73" (18,54 mm)	4.22" (107,19 mm)
202-58-01	5.75" (146,05 mm)	.73" (18,54 mm)	4.22" (107,19 mm)
202-59-01	5.75" (146,05 mm)	.73" (18,54 mm)	4.22" (107,19 mm)
202-66-01	4.40" (111,76 mm)	.57" (14,47 mm)	4.06" (103,12 mm)
202-60-01	5.27" (133,86 mm)	.73" (18,54 mm)	4.22" (107,19 mm)
202-66-SI-01	4.64" (117,86 mm)	.57" (14,47 mm)	4.06" (103,12 mm)
202-66-SO-01	4.64" (117,86 mm)	.57" (14,47 mm)	4.06" (103,12 mm)
202-60-SI-01	5.54" (140,72 mm)	.73" (18,54 mm)	4.22" (107,19 mm)
202-60-SO-01	5.54" (140,72 mm)	.73" (18,54 mm)	4.22" (107,19 mm)
Pneumatic Normally Open Valves			
202-61-01	2.75" (69,85 mm)	.73" ,54 mm)	3.89" (98,81 mm)
202-62-01	5.75" (146,05 mm)	.73" ,54 mm)	3.89" (98,81 mm)
202-63-01	5.75" (146,05 mm)	.73" ,54 mm)	3.89" (98,81 mm)
202-67-01	4.40" (111,76 mm)	.57" ,47 mm)	3.72" (94,49 mm)
202-64-01	5.27" (133,86 mm)	.73" ,54 mm)	3.89" (98,81 mm)
202-67-SI-01	4.64" (117,86 mm)	.57" ,47 mm)	3.72" (94,49 mm)
202-67-SO-01	4.64" (117,86 mm)	.57" ,47 mm)	3.72" (94,49 mm)
202-64-SI-01	5.54" (140,72 mm)	.73" ,54 mm)	3.89" (98,81 mm)
202-64-SO-01	5.54" (140,72 mm)	.73" ,54 mm)	3.89" (98,81 mm)

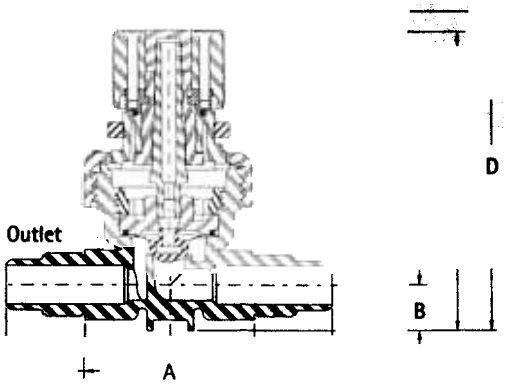
Manual ¼-turn Valves



ORDERING INFORMATION

Order Number	Dimensions A	B	C
201-33-01	2.75" (69,85 mm)	.73" (18,54 mm)	4.45" (113,03 mm)
201-34-01	5.75" (146,05 mm)	.73" (18,54 mm)	4.45" (113,03 mm)
201-35-01	5.75" (146,05 mm)	.73" (18,54 mm)	4.45" (113,03 mm)
201-36-01	5.27" (133,86 mm)	.73" (18,54 mm)	4.45" (113,03 mm)
201-37-01	4.40" (111,54 mm)	.57" (14,48 mm)	4.29" (108,97 mm)
201-36-SI-01	5.54" (140,72 mm)	.73" (18,54 mm)	4.45" (113,03 mm)
201-36-SO-01	5.54" (140,72 mm)	.73" (18,54 mm)	4.45" (113,03 mm)
201-37-SI-01	4.64" (117,86 mm)	.57" (14,48 mm)	4.29" (108,97 mm)
201-37-SO-01	4.64" (117,86 mm)	.57" (14,48 mm)	4.29" (108,97 mm)

Manual Multi-turn Valves



ORDERING INFORMATION

Order Number	Dimensions A	B	Closed Position C	Open Position D
201-38-01	2.75" (69,85 mm)	.73" (18,54 mm)	4.90" (124,46 mm)	5.22" (132,59 mm)
201-39-01	5.75" (146,05 mm)	.73" (18,54 mm)	4.90" (124,46 mm)	5.22" (132,59 mm)
201-40-01	5.75" (146,05 mm)	.73" (18,54 mm)	4.90" (124,46 mm)	5.22" (132,59 mm)
201-41-01	5.27" (133,86 mm)	.73" (18,54 mm)	4.90" (124,46 mm)	5.22" (132,59 mm)
201-42-01	4.40" (111,76 mm)	.57" (14,48 mm)	4.70" (119,38 mm)	5.02" (127,51 mm)
201-41-SI-01	5.54" (140,72 mm)	.73" (18,54 mm)	4.90" (124,46 mm)	5.22" (132,59 mm)
201-41-SO-01	5.54" (140,72 mm)	.73" (18,54 mm)	4.90" (124,46 mm)	5.22" (132,59 mm)
201-42-SI-01	4.64" (117,86 mm)	.57" (14,48 mm)	4.70" (119,38 mm)	5.02" (127,51 mm)
201-42-SO-01	4.64" (117,86 mm)	.57" (14,48 mm)	4.70" (119,38 mm)	5.02" (127,51 mm)

SERIAL NUMBER IDENTIFICATION

Each valve is marked with a model number and serial number on the PVDF outer cap. Each valve body has a molded Part Identification Number (PIN) between the inlet and outlet ports.

ORDERING INFORMATION

Repair Kits

	Description
202-116	½" pneumatic valves, normally open
202-152	½" pneumatic valves, normally closed
201-73	½" manual, ¼-turn
201-74	½" manual, multi-turn
213-103-01	Tool kit

DO NOT move the adjustment nut on the manual valves, the adjustment is set at the factory. To set the adjustment nut if altered in the field, use the following procedure:

Adjustment Nut Procedure, ¼-turn Manual Valves

1. Close the valve and connect 80 PSIG (551.6 kPa) air pressure to the outlet port.
2. Turn the adjustment nut clockwise until leakage stops from the inlet port.
3. Turn the adjustment nut an additional 1/8 turn.

Adjustment Nut Procedure, Multi-turn Manual Valves

1. Close the valve and connect 80 PSIG (551.6 kPa) air pressure to the outlet port.
2. Remove the two white screws and remove the handle.
3. Back off the red adjustment nut.
4. Put the handle back on and tighten until the leak stops. Tighten an additional ¼-turn.
5. Remove the handle taking care not to disturb the red indicator position.
6. Thread red adjustment nut until it stops, then back off the red adjustment nut to match hexes. Replace the handle.
7. Replace the two screws.

ENTEGRIS, INC.
Corporate Headquarters

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Chaska, Minnesota 55318 USA

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Customer Service Fax 612-556-8022
www.entegris.com

P/N 01-001844 (Rev. B 11/99)

FLUOROWARE

Spray Gun Specification Sheet

DI water, nitrogen

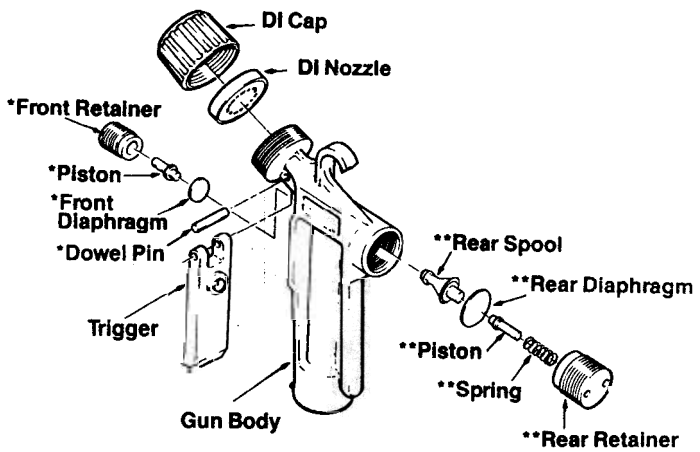
SPECIFICATIONS FOR MODELS

DI water spray gun: 421-22-11, 421-22-21, 421-22-31, 421-32-11, 421-32-21, 421-32-31, 421-111-1, 421-121-1

Nitrogen gun: 421-42-11, 421-42-21, 421-42-31, 421-112-1, 421-122-1

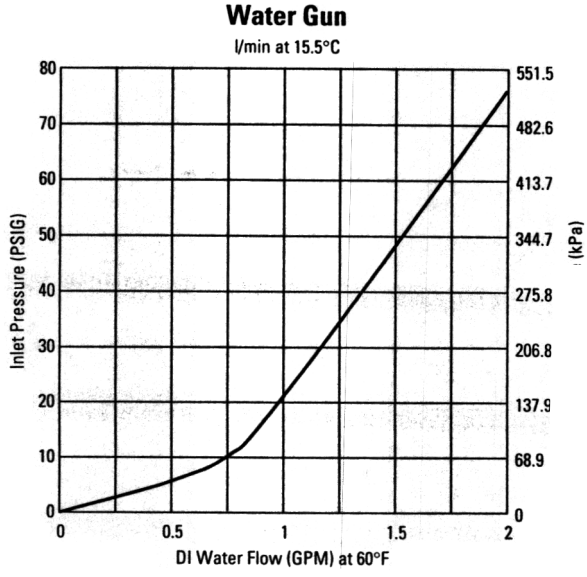
SPECIFICATIONS

DI Water Spray Gun

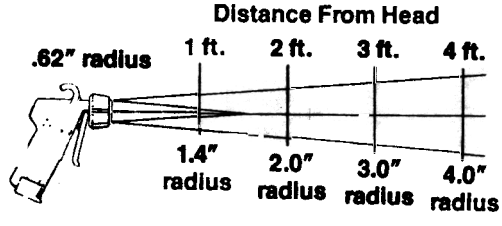


*repairable with front tool **repairable with rear tool

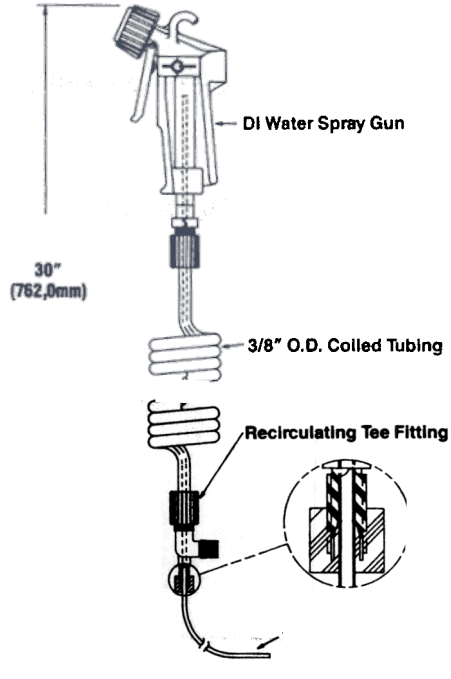
Maximum Pressure:	80 PSIG (552 kPa)
Orifice:	3/16" (4,76 mm)
Connection:	¼" or ½" female NPT, ⅜" Flaretek® tube fitting, ½" PVC hose fitting
Materials:	All wetted parts are PFA, PTFE and ETFE

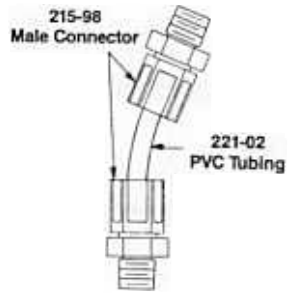


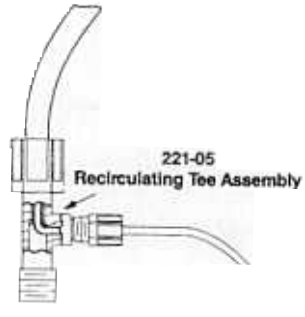
Spray Pattern



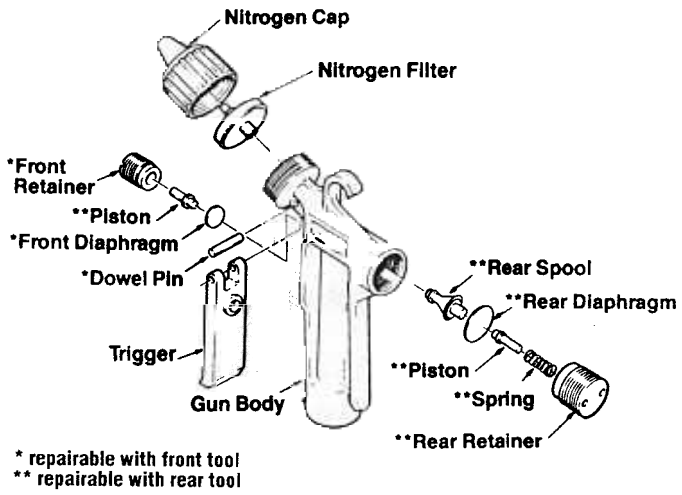
Connection Options





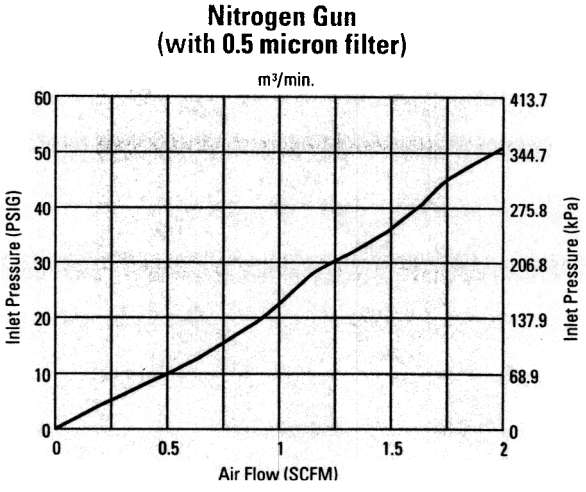


Nitrogen Gun



Maximum Pressure:	75 PSIG (517 kPa)
Orifice:	3/16" (4,76 mm)
Connection:	1/4" female NPT
Filter:	5 micron PTFE membrane
Materials:	All wetted parts are PFA, PTFE, ETFE and polyethylene Nitrogen cap/nozzle prevents pressure build up if outlet is blocked

Flow vs. Inlet Pressure



Fluoroware manufactures a complete line of critical fluid management products including valves, tubing, fittings, fusible piping products, sensing products and chemical containers. For information, or the name of your local stocking distributor, contact Fluoroware, Inc.

WARRANTY: Fluoroware, Inc. warrants each new Fluoroware® critical fluid management product against defects in materials or workmanship for a period of one (1) year from the date of shipment and, upon confirmation of defects, agrees as its exclusive remedy to repair defective product without charge.

Fluoroware, Inc. is not responsible for product damage resulting from accident, misuse or abuse, or lack of reasonable care.

IMPORTANT: No other warranty, written or oral, is authorized by Fluoroware, Inc. No responsibility is assumed for any special, incidental, or consequential damages. Implied warranties of merchantability and fitness for particular purpose are specifically disclaimed.

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612.448.8196 Customer Service Telephone 612.368.8022 Customer Service Fax
http://www.fluoroware.com

 P/N 01-003411 (Rev. A 05/98)

Heateflex Corporation
405 E. Santa Clara St., Arcadia, CA 91006-7218 • Tel: (626) 599-8566• Fax: (626) 599-9567

RECEIVING INSPECTION PROCEDURE

This shipment was carefully inspected, checked, and properly packaged at our company and delivered to the carrier in good condition. We fully expect your merchandise to arrive in your hands in good condition.

ALL PRODUCTS ARE SHIPPED F.O.B. FACTORY; THEREFORE, WHEN IT IS DELIVERED TO THE CARRIER, IT BECOMES YOUR PROPERTY. THUS, IT IS IMPORTANT THAT YOU TAKE NOTE OF ANY DAMAGE, WHETHER OBVIOUS OR HIDDEN, AND REPORT SAME TO THE TRANSPORTATION COMPANY WITHIN FIVE (5) DAYS OF RECEIPT OF THE SHIPMENT AT YOUR PREMISE TO AVOID FORFEITING CLAIMS FOR DAMAGE.

Here is what to do if your shipment is damaged:

Leave the items, packing material, and carton “as is”. Notify your carrier’s local office and ask for immediate inspection of the carton and contents.

After inspection has been made by the carrier, and you have received acknowledgment in writing as to the damage, please contact our Customer Service Department at (626) 599-8566 for return authorization. If writing for return authorization, please indicate your purchase order number.

We will either repair or replace the merchandise depending upon the extent of the damage.

It is your responsibility to follow the above instructions, or the carrier will not honor any claims for damage. If there are any shortages or questions regarding this shipment, please notify us within ten (10) days.

Heateflex Corporation
405 E. Santa Clara St., Arcadia, CA 91006-7218 • Tel: (626) 599-8566• Fax: (626) 599-9567

HEATER HANDLING GUIDELINE

The possibility of heater damage during installation has prompted Heateflex Corporation to develop handling guidelines on Teflon® products for the OEM and end user market.

The heater is shipped inside of a sealed plastic bag, wrapped in bubble wrap and placed inside of a box. It is our intent that you do not open the sealed plastic bag until your tank has been cleaned for testing with the heater. This will provide some protection against physical damage to the element before it is installed in the tank. Drills, Scrapers, screwdrivers and metal shavings are common equipment at the OEM fabricator, and are all potential hazards to Teflon® products. Sharp objects in the tank are a serious risk to the heater. It is advisable that Teflon® heaters not be issued to the shop floor for installation until the work surface is cleaned and the testing of the bath requires the heater to be installed.

During the installation of the heater, the Teflon® wire may be pulled through holes, fittings, cracks and gaps. Some of these may be metal with sharp edges that can cut and expose the conductor. Caution in this area is necessary with all wires.

Like fine China, our product is durable and long lasting, but exposed to the tools of the fabrication process, the possibility of damage is greatly increased. Awareness is your best protection.

!!! WARNING !!!

ELECTRIC IMMERSION HEATERS WILL IGNITE MANY PLASTIC TANKS SUCH AS POLYPROPYLENE AND POLYETHYLENE AND SUBJECT PERSONNEL TO SHOCK HAZARD IF NOT PROPERLY INSTALLED AND MAINTAINED.

Heateflex Corporation
405 E. Santa Clara St., Arcadia, CA 91006-7218 • Tel: (626) 599-8566• Fax: (626) 599-9567

HEATER HI-LIMIT SAFETY SETTING PROCEDURE

Your Heateflex is an immersion heater. It should always be under liquid when operating. Operating heater in air or in a Crystalline or Precipitate solution that may coat the heater, may result in damage to the heater and cause severe damage to your equipment. Non compliance to the following procedure will void warranty.

1. Connecting the Thermocouple on heater element to Hi-limit controller.

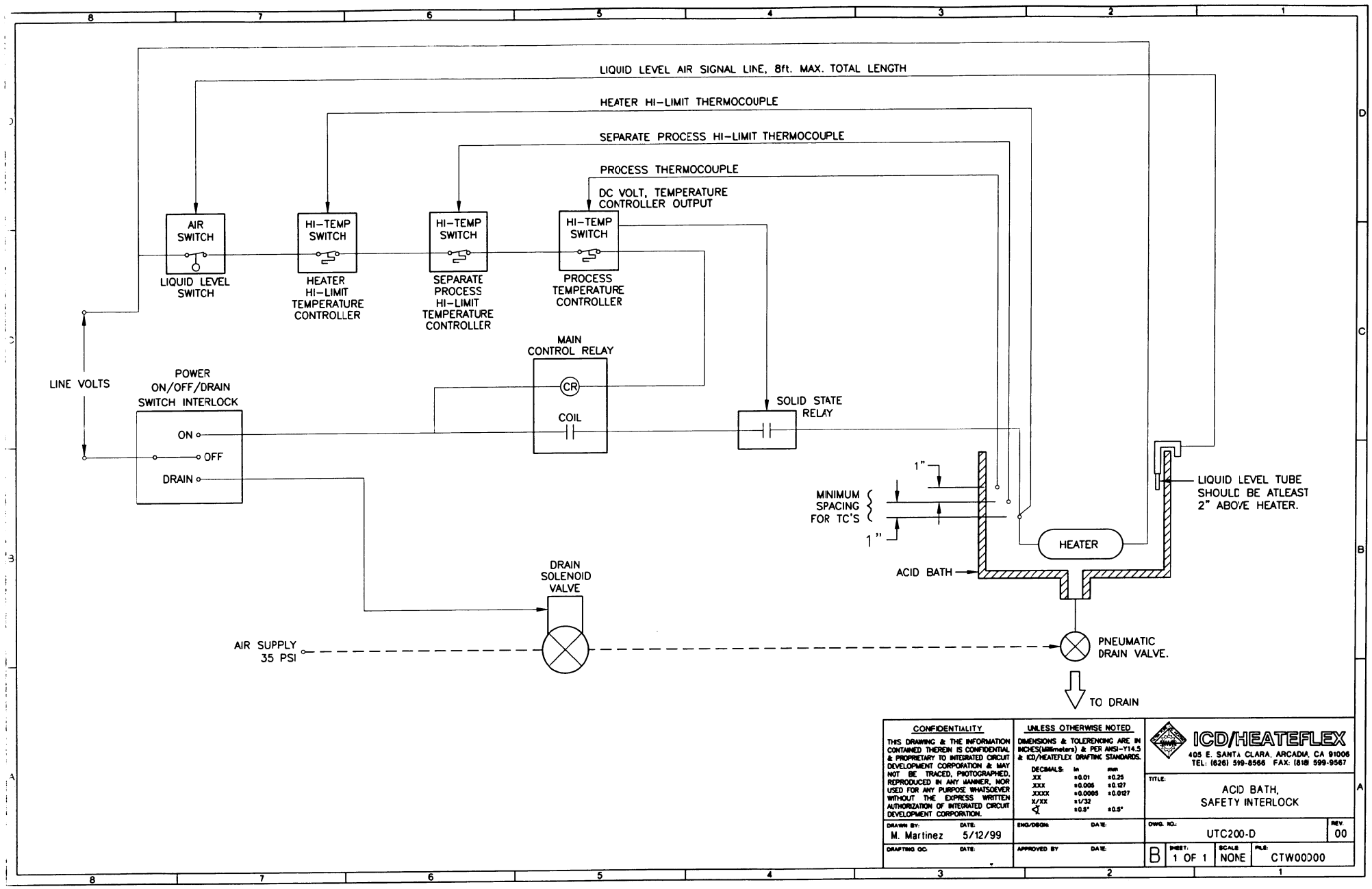
2. Setting the process temperature controller to desired operating temperature. Example: setpoint = 100 degree C.

3. Temporarily set the Hi-limit controller at 150 degree.

4. When the process temperature reaches about 80 % of process setpoint (80 degree C), bring down the Hi-limit temperature until the control relay trips the Heater. At this point add 5 to 10 degree C to the Hi-limit temperature controller. This is the Hi-limit safety setpoint for the Heater.

5. The process T/C position should be placed at approximate 1" above the Heater.

6. The process Alarm setpoint should be set at 5 degree C above process setpoint.



CONFIDENTIALITY

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UNLESS OTHERWISE NOTED

DIMENSIONS & TOLERENCING ARE IN INCHES(Millimeters) & PER ANSI-Y14.5 & ICD/HEATEFLEX DRAFTING STANDARDS.

DECIMALS:	in	mm
XX	±0.01	±0.25
XXX	±0.005	±0.127
XXXX	±0.0005	±0.0127
X/XX	±1/32	
∠	±0.5°	±0.5°

ICD/HEATEFLEX
405 E. SANTA CLARA, ARCADIA, CA 91006
TEL: (626) 599-8566 FAX: (818) 599-9567

TITLE: ACID BATH, SAFETY INTERLOCK

DRAWN BY: M. Martinez	DATE: 5/12/99	DWG. NO.: UTC200-D	REV.: 00
ENG/DSGN:	DATE:		
DRAFTING QC:	DATE:	SHEET: 1 OF 1	SCALE: NONE
APPROVED BY	DATE:	B	FILE: CTW00000

Heateflex Corporation
405 E. Santa Clara St., Arcadia, CA 91006-7218 • Tel: (626) 599-8566• Fax: (626) 599-9567

January 03, 2000

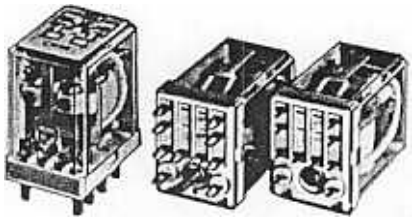
HEATEFLEX CORPORATION'S MATERIAL WARRANTY

Heateflex Corporation warranties the equipment offered to be free from defects in material and workmanship, under normal handling and proper usage, for a period of one year from the date of shipment. All products purchased from manufacturers by Heateflex Corporation will carry that manufacturer's warranty period. This expressed warranty is in lieu of, and excludes all other representations made by advertisements or by agents. There are no implied warranties for the equipment.

Heateflex Corporation agrees to correct any defect in workmanship or material which may develop under normal handling and proper usage during a period of one year from the date of shipment or, by its option, to repair or replace the defective equipment F.O.B. Arcadia, California, USA. Purchaser's remedies shall be limited exclusively to the right of repair or replacement. Heateflex Corporation shall not be liable for any expenses incurred by the purchaser or any other person by reason of the use, misuse, sale, or fabrication of the equipment regardless of whether the equipment conforms to the specifications.

Items returned for warranty repair must be prepaid and insured for shipment. Warranty claims are processed on the condition that prompt notification of a defect is given within the warranty period. Heateflex Corporation shall have the sole right to determine whether, in fact, a warranty situation exists.

Magnetic Latching Relays
Miniature Size, 3A Contact Rating
2 Form C Contacts



Features

- Standard "Ice Cube", 14-pin solder lug termination
- Operates by pulse input and maintains condition even during power failure
- Excellent self-holding performance
- Built-in operation indicator to show set/reset condition
- DIN rail, surface, and panel mount sockets available for a wide range of mounting applications
- UL recognized and CSA certified

UL Recognized File No. E55996

CSA Certified File No.LR35144

RY2L Series Part List

Termination	Contact Configuration	Basic Part No.
S: Solder/Plug-in	DPDT	RY2LS-U
V: PCB - 0.032" (0.8mm) wide	DPDT	RY2LV-U

Ordering Information

Ordering standard voltages results in quickest delivery
Allow extra delivery time for non-standard voltages.

Basic Part No.		Coil Voltage
RY2LS-U	—	AC120V

Coil Ratings

Rated Voltage		Set Coil			Reset Coil		
		Rated Current ±15% @20°C		Coil Resistance ±10% @20°C	Rated Current ±15% @20°C		Coil Resistance ±10% @20°C
		60Hz	50Hz		60Hz	50Hz	
AC	6V	120mA	127mA	14.3Ω	61mA	61.8mA	7.8Ω
	12V	60mA	64mA	64.6Ω	30.5mA	31.1mA	34.1Ω
	24V	30mA	32mA	282Ω	14.2mA	14.4mA	127Ω
	120V	6mA	6.3mA	7480Ω	2.8mA	2.8mA	3380Ω
DC	6V	200mA		30Ω	100mA		60Ω
	12V	100mA		120Ω	51mA		235Ω
	24V	51mA		470Ω	25.5mA		940Ω
	48V	25.5mA		1880Ω	12.8mA		3760Ω

D2

Operational Characteristics

Maximum continuous applied voltage (AC/DC) @ 20°C	110% of rated voltage
Set & Reset (AC/DC) voltages @20°C	80% of rated voltage

Contact Ratings

Voltage	Resistive			Inductive		
	Nom.	UL	CSA	Nom.	UL	CSA
30V DC	3A	3A	3A	1.5A	—	1.5A
100V DC	—	—	—	—	—	0.2A
120V AC	3A	3A	3A	1.5A	1.5A	1.5A
240V AC	3A	3A	3A	0.8A		

Note: Inductive load cos ø = 0.3, L/R = 7 msec.

Sockets

Relay	Sockets				Spring (Optional)
	DIN Rail Mount		Panel Mount	PC Mount	
	Standard	Fingersafe			
RY2LS	SY4S-05	SY4S-05C	SY4S-51	SY4S-61 SY4S-62	SFA-101 SFA-202 SFA-301 SFA-302 SY4S-51F1

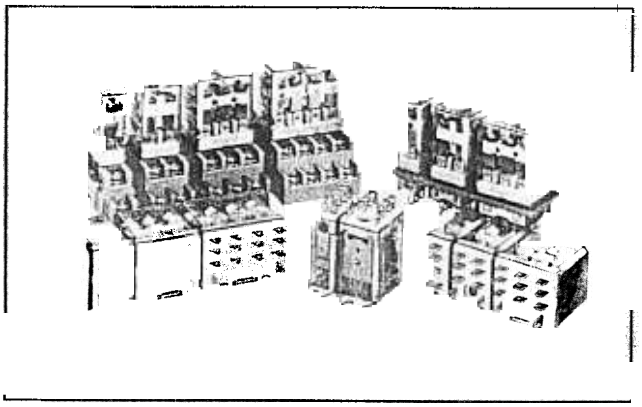
Note: See sect. F for sockets. All DIN rail mnt. sockets shown

Specifications

Contact Material	Silver, Gold-Plated
Contact Resistance	50mΩ or less (initial value)
Minimum Applicable Load	5V DC, 100mA
Operating Time	30ms or less (AC); 20ms or less (DC)
Release Time	30ms or less (AC); 20ms or less (DC)
Power Consumption	Set Coil: DC: Approx. 1.2W AC: Approx 0.75VA (50Hz); 0.7VA (60Hz) Reset Coil: DC: Approx. 0.60W AC: Approx 0.35VA
Insulation Resistance	100MΩ minimum
Dielectric Strength	Betw. live and dead parts: 1500VAC, 1 min Betw. contact circuit and operating coil: 1000VAC, 1 min Betw. contact circuits: 1000VAC, 1 min Betw. contacts of same pole: 700VAC, 1 min
Response Frequency	1800 operations/hr
Vibration Resistance	60N (0 - 6G); Max. frequency 55Hz
Shock Resistance	100N or more (10G or more)
Life Expectancy	Electrical: 200,000 operations Mechanical: 10,000,000 operations
Operating Temperature	-30°C to +70°C
Weight	34g (approx.)

Note: See page D2-17 for dimensions. See page D2-13 for electrical life curves and internal circuit drawings.

General Purpose "Midget" Relays
10A Contact Rating
1, 2, 3, & 4 Form C Contacts



Features

- Compact "Midget" size package saves space
- Large switching capacity, (10A)
- High dielectric strength, up to 2000V
- Choice of blade or PCB style terminals
- Relay options include indicator light, check button and top mounting bracket
- DIN rail, surface, panel and PCB type sockets available for flexible mounting applications
- UL recognized and CSA certified

UL Recognized
File No.E67770
E59804
E64245

CSA Certified
File No. LR35144

RH Series Type List

Termination	Contact Configuration	Basic Part No.	Basic Part No. w/Indicator Light	Basic Part No. w/Check Button	Basic Part No. w/Indicator Light & Check Button	Basic Part No. w/Top Bracket
B (Blade)	SPDT	RH1B-U			—	RH1B-UT
	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-ULC	RH2B-UT
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	RH3B-ULC	RH3B-UT
	4PDT	RH4B-U	RH4B-UL	RH4B-UC	RH4B-ULC	RH4B-UT
V2 (PCB .078" (2mm) wide)	SPDT	RH1V2-U	—			
	DPDT	RH2V2-U	RH2V2-UL	RH2V2-UC	RH2V2-ULC	
	3PDT	RH3V2-U	RH3V2-UL	RH3V2-UC	RH3V2-ULC	
	4PDT	RH4V2-U	RH4V2-UL	RH4V2-UC	RH4V2-ULC	

Coil Ratings

Voltage (V)	Rated Current (mA) ±15% @ 20°C 60Hz SPDT	DPDT	3PDT	4PDT	50Hz SPDT	DPDT	3PDT	4PDT	Coil Resistance (Ω) ±15 @ 20°C SPDT	DPDT	3PDT	4PDT
	150	200	280	330	170	238	330	387	18.8	9.4	6.0	5.4
	75	100	140	165	86	118	165	196	76.8	39.3	25.3	21.2
	37	50	70	83	42	59.7	81	98	300	153	103	84.5
	7.5	11	14.2	16.5	8.6	12.9	16.4	19.5	7680	4170	2770	2220
*240	—	5.5	7.1	8.3		6.5	8.2	9.8	—	15210	12100	9120

		SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT
DC	6	128	150	240	250	47	40	25	24
	12	64	75	120	125	188	160	100	96
	24	32	36.9	60	62	750	650	400	388
	48	18	18.5	30	31	2600	2600	1600	1550
	*110	—	9.1	12.8	15	—	12100	8600	7340

Note: Rated voltage marked with * are not available in SPDT.
Maximum continuous applied voltage (AC/DC) @ 20°C: 110% of rated voltage.
Minimum operate voltage (AC/DC) @20°C: 80% of rated voltage.
Drop-out voltage (AC): 30% or more of the rated voltage.
Drop-out voltage (DC): 10% or more of the rated voltage.

Specifications

Contact Material	Silver cadmium oxide (Ag-CdO)
Contact Resistance	50mΩ max. (initial value)
Operate Time	SPDT(RH1), DPDT(RH2): 20 ms max., 3PDT(RH3), 4PDT(RH4): 25 ms max.
Release Time	SPDT(RH1), DPDT(RH2): 20 ms max., 3PDT(RH3), 4PDT(RH4): 25 ms max.
Power Consumption	SPDT(RH1): AC: 1.1 VA (50 Hz), 1 VA (60 Hz) DC: 0.8W DPDT(RH2): AC: 1.4 VA (50Hz), 1.2 VA (60 Hz) DC: 0.9W 3PDT(RH3): AC: 2VA(50Hz), 1.7 VA (60 Hz) DC: 1.5w 4PDT(RH4): AC: 2.5 VA (50) Hz), 2 VA (60 Hz) DC: 1.5W
Insulation Resistance	100MΩ min. (measured with a 500V DC megger)
Dielectric Strength	SPDT(RH1) Bet. live and dead parts: 2,000V AC, 1 minute Bet. contact circuit and operating coil: 2000V AC, 1 minute Bet. contacts of the same pole: 1000V AC, 1 minute
	DPDT(RH2), 3PDT(RH3), 4PDT(RH4) Bet. live and non-live parts: 2000V AC, 1 minute Bet. contact circuit and operating coil: 2000V AC, 1 minute Bet. contact circuits: 2000V AC, 1 minute Bet. contacts of the same pole: 1000V AC, 1 minute
Response Frequency	1800 operations/hour
Temperature Rise	Coil: 85 deg. max., Contact: 65 deg. max.
Vibration Resistance	0 to 6g (55 Hz max.)
Shock Resistance	SPDT(RH1), DPDT(RH2): 20g 3PDT(RH3), 4PDT(RH4): 10g
Life Expectancy	Electrical: over 500,000 operations at 120V AC, 10A* Mechanical: over 50,000,000 operations

Note: *Electrical life expectancy: over 200,000 operations or more at 120V AC, 10A for the SPDT (RH1), 3PDT (RH3), and 4PDT (RH4).

Contact Ratings

UL Ratings

Voltage (V)	Resistive (A)				General Use(A)			
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT
240 AC	10	10	–	7.5	7	7	*	5
120 AC	10	10	10	10	7.5	–	–	7.5
30 DC	10	10	10	–	7	7	–	–
28 DC	10	10	10	10	7.5	–	–	7.5

Note: *6.5A/Pole, 20A Total

CSA Ratings

Voltage (V)	Resistive (A)				General Use (A)			
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3DPT	4PDT
240 AC	10	10	–	7.5	7	7	7	5
120 AC	10	10	10	10	7.5	7.5	–	7.5
30 DC	10	10	10	10	7	7.5	–	–

Nominal Ratings

Voltage (V)	Resistive (A)				Inductive (A)			
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT
220 AC	7	7.5	7.5	4.5	5	5	5	5
110 AC	10	10	10	10	7	7.5	7.5	7.5
30 DC	10	10	10	10	7	7.5	7.5	7.5

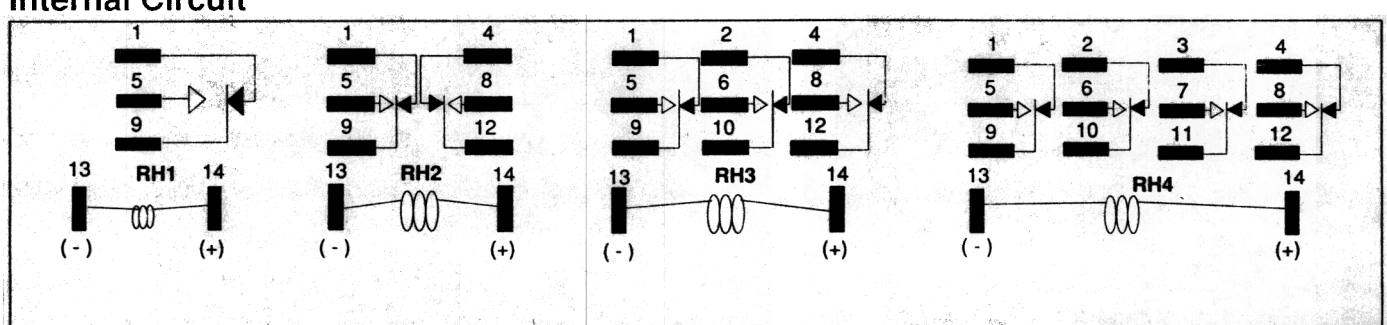
Note: Inductive load cos φ = 0.3, L/R = 7msec

UL & CSA Horsepower Ratings

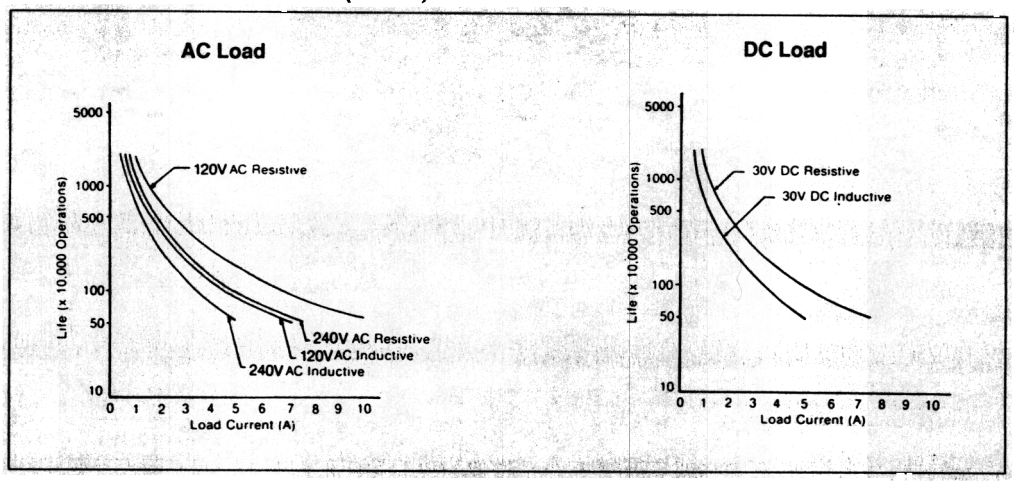
Motor Load	SPDT, DPDT	3PDT
240V AC	1/3 HP	1/3 HP
120V AC	1/6 HP	1/6 HP

D

Internal Circuit



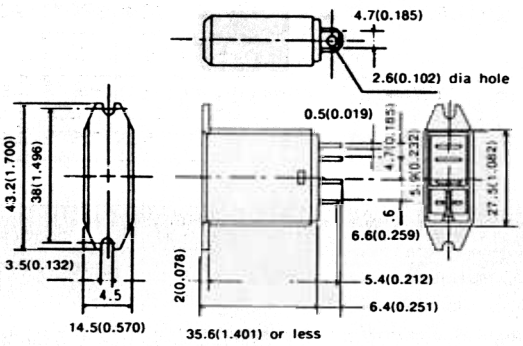
Electrical Life Curve (RH2)



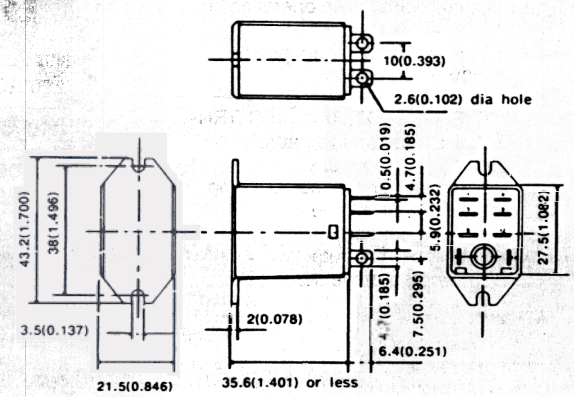
Dimensions

Dimensions in inches (mm).

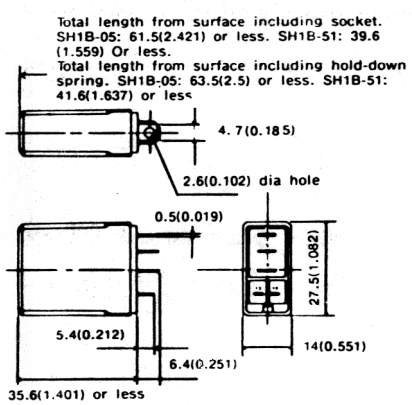
Top Bracket Mounting Type (Blade Terminal)
RH1B-UT



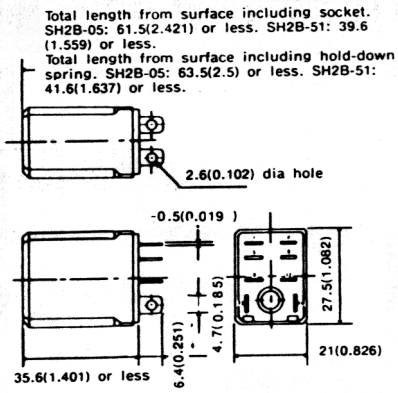
RH2B-UT



Plug-in Type (Blade Terminal)
RH1B



RH2B

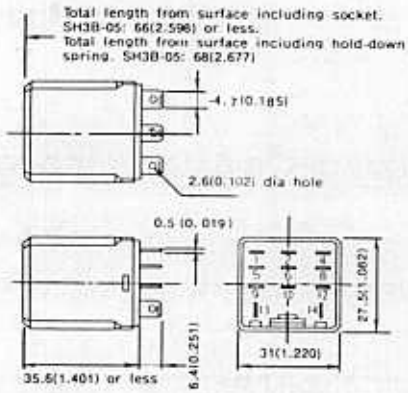


Dimensions

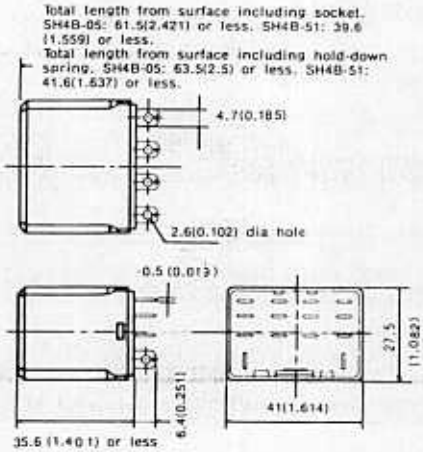
Dimensions in inches (mm).

Blade Terminal (Plug-In)

RH3B

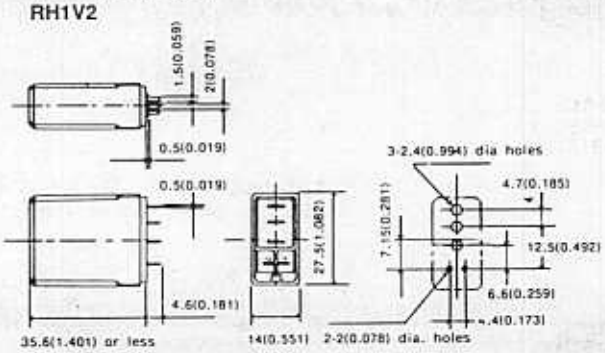


RH4B

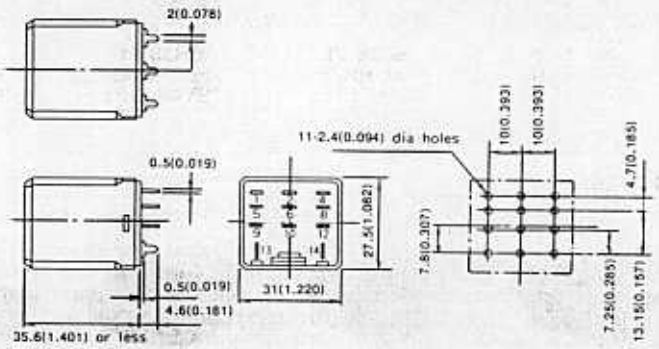


PC Board Terminal

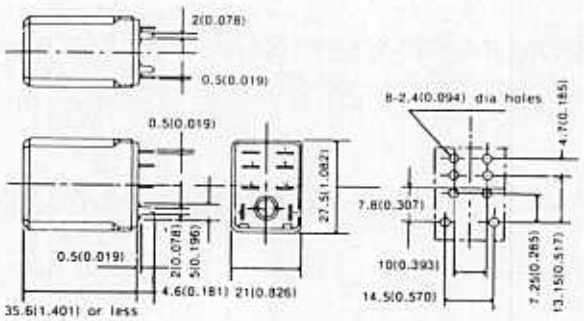
RH1V2



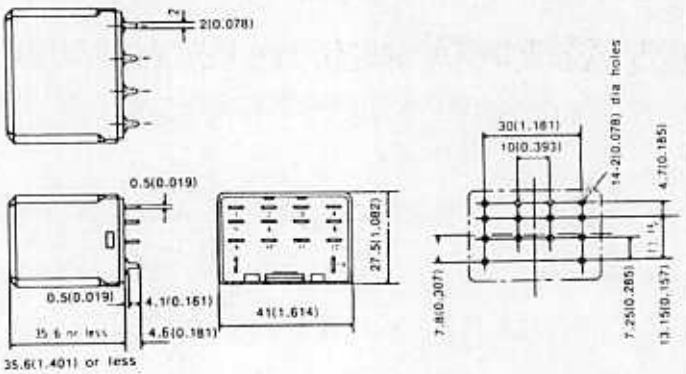
RH3V2



RH2V2



RH4V2



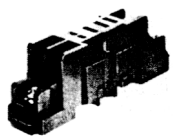
D

Sockets

For more details on socket accessories, see Section F, Sockets, pages F11 and F15

UL Recognized, File No. E64245
CSA Certified, File No. LR53144

Snap-Mount (DIN Rail)

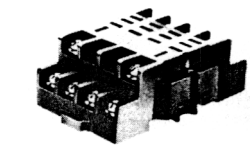


SH1B-05
•SH1B-05C
For: RH1B
*SY2S-02F1
*SFA-101
*SFA-202

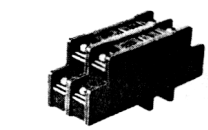
SH2B-05
•SH2B-05C
For: RH2B
*SY4S-02F1
*SFA-101
*SFA-202

SH3B-05
•SH3B-05C
For: RH3B
*SH3B-05F1
*SFA-101

Surface Mount



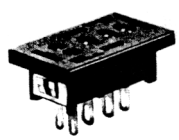
SH4B-05
•SH4B-05C
For: RH4B
*SH4B-02F1
*SFA-101



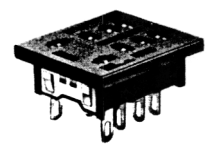
SH2B-02
For: RH2B
*SY4S-02F1

Note: •New finger-safe DIN rail mount socket, see SECTION F, SOCKETS on pages F5 and F6 for more details.

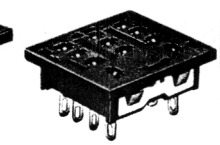
Panel Mount



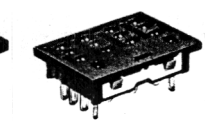
SH1B-51
For: RH1B
*SY4S-51F1
*SFA-302
*SFA-301



SH2B-51
For: RH2B
*SY4S-51F1
*SFA-302
*SFA-301

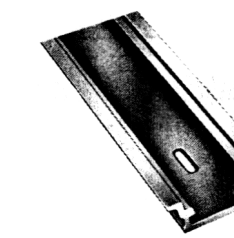


SH3B-51
For: RH3B
*SY4S-51F1



SH4B-51
For: RH4B
*SY4S-51F1

DIN Rail



BND-1000
DIN/Screw Mount

PC Mount

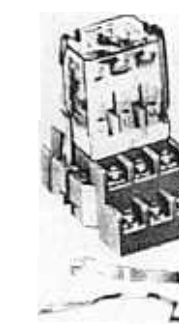
SH1B-62
For: RH1B
*SY4S-51F1
*SFA-302
*SFA-301

SH2B-62
For: RH2B
*SY4S-51F1

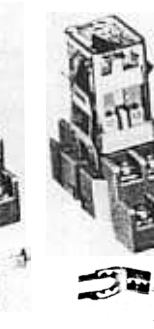
SH3B-62
For: RH3B
*SY4S-51F1

SH4B-62
For: RH4B
*SY4S-51F1

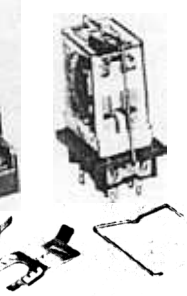
Note: *Indicates hold-down spring/clip.



SFA-101



SFA-202



SY4S-F1

Hold-Down Springs/Clips

SY4S-02F1

SY4S-51F1

SH4B-02F1

SFA-101

SFA-202

SFA-301

SFA-302

Ordering Information

When ordering RH Series relays, specify Basic Part No. and Coil Voltage.

RH2B-U - AC120V

Basic Part No.

Coil Voltage

PS5R Standard Series — Switching Power Supplies

Key features of the PS5R standard series include:

- Wide Power Range: 7.5W-240W
- Universal Input:
  7.5W-75W:85-264V AC/105-370V DC
  100W:100-120V AC/200-240V AC
  (Selectable) 240-370V DC
  120W-240W:85-264V AC/105-370V AC
- Fused Input
- Overcurrent/Overvoltage Protection
- Power Factor Correction (75W, 120W, 240W models)
  EN61000-3-3
  EN61000-3-2
- Voltage adjustment + 10%
- Spring-up Screw Terminal, IP20 (finger-safe)
- DIN rail or Panel Surface Mount
- Approvals:
  CE marked
  UL 508 Listed
  UL, c-UL
  TÜV approved
  EMC Directives: EN50081-2
  EN50082-2
  EN61000-6-2
  LVD EN60950:2000

UL 508 Listed
File # E177168

Cert. No.
BL980213332392

Part Numbers

Part Number	Item	Watts	Rated Voltage	Rated Current
PS5R-A05		7.5	5V DC	1.5A
PS5R-A12			12V DC	0.6A
PS5R-A24			24V DC	0.3A
PS5R-B05		15	5V DC	2.5A
PS5R-B12			12V DC	1.2A
PS5R-B24			24V DC	0.6A
PS5R-C12		30	12V DC	2.5A
PS5R-C24			24V DC	1.3A
PS5R-D24		50	24V DC	2.1A
PS5R-Q24		75	24V DC	3.1A
PS5R-E24		100	24V DC	4.2A
PS5R-F24		120	24V DC	5A
PS5R-G24		240	24V DC	10A

L

Power Supplies

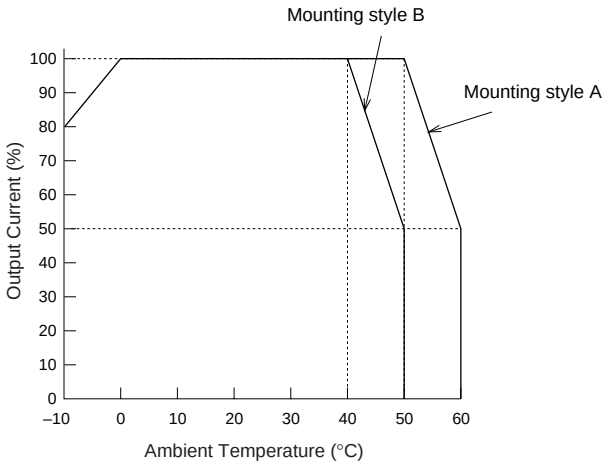
Specifications

Specifications	Part Numbers	5VDC output	PS5R-A05	PS5R-B05*	—	—		—		—
		12VDC output	PS5R-A12	PS5R-B12	PS5R-C12	—		—		—
		24VDC output	PS5R-A24	PS5R-B24	PS5R-C24	PS5R-D24	PS5R-Q24	PS5R-E24	PS5R-F24	PS5R-G24
	Output Capacity		7.5W	15W	30W	50W	75W	100W	120W	240W
	Input	Input Voltage (single-phase, 2-wire)	100 to 240VAC nominal (85 to 264V AC), 50/60Hz (47 to 63Hz) 110 to 340VDC nominal (105 to 370VDC)					100 to 120VAC, 50/60Hz 200 to 240VAC, 50/60Hz (jumper select-able) 240 to 370VDC	100 to 240VAC, 50/60Hz, 110 to 340VDC	
		Input Current (typical)	0.17A at 100VAC	0.3A at 100VAC	0.68A at 100VAC	1.15A at 100VAC	1.1A	2.5A at 100VAC 1.5A at 200VAC	1.8A	4A at 100VAC
		Internal Fuse Rating	2A	2A	3.15A	3.15A	3.15A	4A	4A	6.3A
		Inrush Current	50A maximum (at cold start at 200V AC)				70A maximum (at cold start at 230V AC)	50A maximum (at cold start at 200V AC)	70A maximum (at cold start at 230V AC)	
		Leakage Current (at no load)	0.75mA maximum (60Hz, measured in conformance with UL, CSA, VDE)							
		Typical Efficiency	69% at 5V 73% at 12V 75% at 24V	69% at 5V 75% at 12V 79% at 24V	75% at 12V 75% at 24V	79% at 24V	83% at 24V DC	85% at 24V	83% at 24V DC	83% at 24V
		Overvoltage Protection	Outputs turns off at 105% (typical)							
	Output	Voltage and Current Ratings	5V, 1.5A 12V, 0.6A 24V, 0.3A	5V, 2.5A 12V, 1.2A 24V, 0.6A	12V, 2.5A 24V, 1.3A	24V, 2.1A	24V, 3.1A	24V, 4.2A	24V, 5A	24V, 10A
		Voltage Adjustments	±10% (V.ADJ screw on top)							
		Output Holding Time	20ms minimum (at full rated input and output)							
		Rise Time	200ms maximum (at full rated input and output)							150ms max.
		Line Regulation	0.4% maximum							
		Load Regulation	1.5% maximum							
		Fluctuation due to Ambient Temperature Change	0.05% maximum							
		Ripple Voltage	2% peak to peak maximum (including noise)							
		Overload Protection	120% typical (Zener-limiting)		120% typical, auto reset					
	Operation Indicator		LED							
	Parallel Operation		PS5R-A	PS5R-B	PS5R-C	PS5R-D	PS5R-Q	PS5R-E	PS5R-F	PS5R-G
			No				Yes	No	Yes	
	Dielectric Strength		Between input and output terminals: 3,000V AC, 1 minute Between input terminals and housing: 2,000V AC, 1 minute Between output terminal and housing: 500V AC, 1 minute							
	Insulation Resistance		Between input and output terminals/input terminals and housing: 100MΩ minimum (500V DC megger)							
	Operating Temperature		–10 to +60°C (14° to 140°F) (see derating curves)							
	Storage Temperature		–30 to +85°C (-22° to 185°F)							
	Operating Humidity		20 to 90% relative humidity (no condensation)							
	Vibration Resistance		45m/s^2, 10 to 55Hz, 2 hours on each of 3 axes				10 to 50Hz, 0.75mm p-p, 2 hrs on each of 3 axes			
	Shock Resistance		300m/s^2(30G), 3 shocks in each of 6 directions							
	Approvals		Conforms to EMC Directives EN50081-2 & EN50082-2. LVD Directive EN60529 — Certified to EN60950. UL508 listed. UL, c-UL, TUV approved. CE marked. EN61000-3-2							
	Weight		150g	170g	360g	390g	800g	600g	1200g	2000g
	Termination		Spring-up, fingersafe terminals with captive M3.5 screws							
	IP protection		IP20 (finger safe)							
	Dimensions H x W x D (mm)		75 x 45 x 70	75 x 45 x95	75 x 90 x 95	75 x 90 x 95	120 x 85 x 140	75 x 145 x 95	120 x 115 x140	120 x 200x 140
	Dimensions H x W x D (inches)		2.95 x 1.77 x 2.76	2.95 x 1.77 x 3.74	2.95 x 3.54 x 3.74	2.95 x 3.54 x 3.74	4.72 x 3.35 x 5.52″	2.95 x 5.71 x 3.74"	4.72 x 4.53 x 5.52	4.72 x 7.87 x 5.51

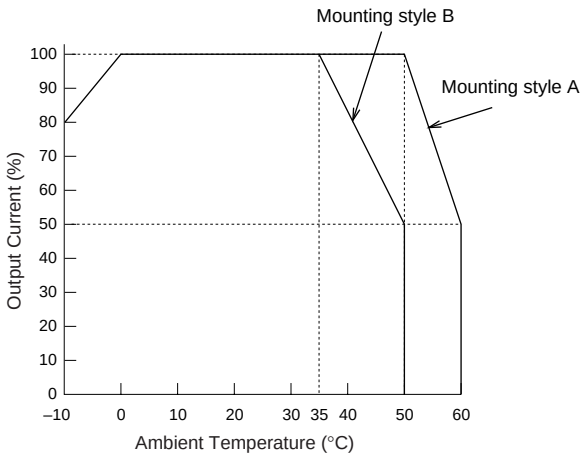
1. For dimensional drawings, see page L-12.
2. For usage instructions, see page L-11.
*3. *12.5W for 5VDC model.*

Temperature Derating Curves

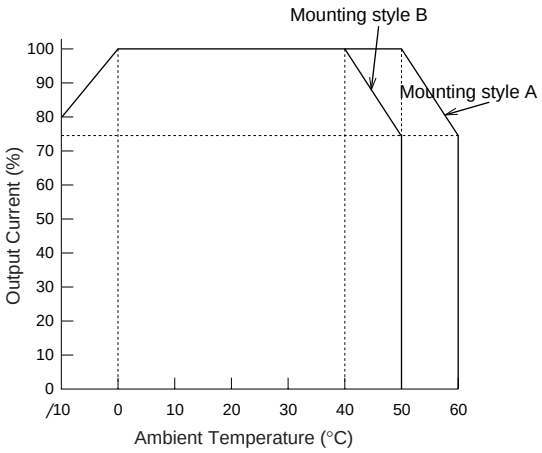
PS5R-A/B



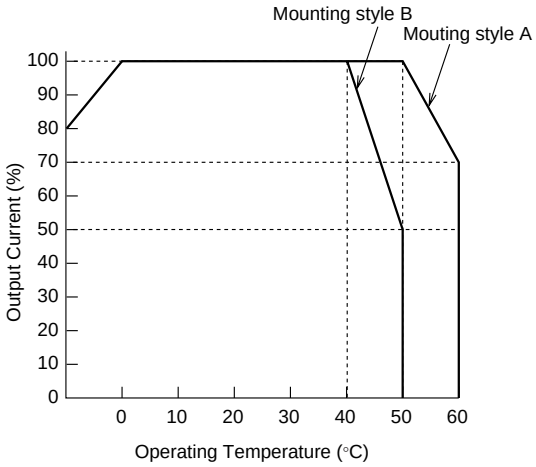
PS5R-C/D



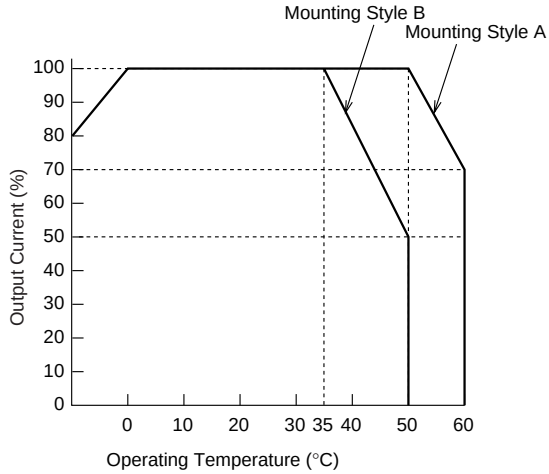
PS5R-E



PS5R-Q

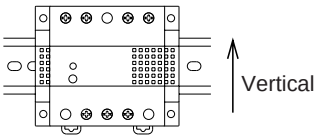


PS5R-F/G



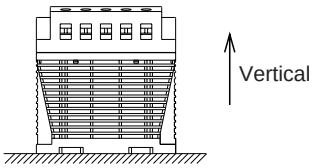
A Mounting

Mounting Style A
(standard)



B Mounting

Mounting Style B
(Facing upward)



L

Power Supplies

Accessories

Part Numbers: PS5R Accessories

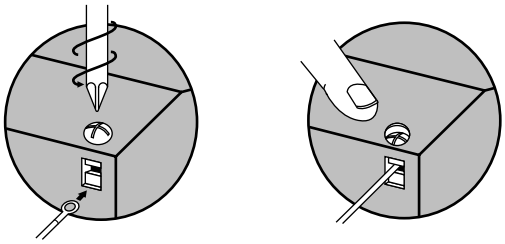
Appearance	Description	Part Number
	DIN rail (1000mm)	BNDN1000
	DIN rail end clip	BNL5

Installation Instructions

Time-Saving Spring-up Terminals

The innovative terminals on the PS5R series use a special, spring-loaded screw. This makes installation as easy as pushing down and turning with a screwdriver. Installation time is cut in half since the screws do not need to be backed out to install wiring. The screws are held captive once installed and are 100% finger-safe. Screw terminals accept bare wire or ring or fork connectors.

1. Insert the wire connector into the slot on the side of the power supply.
2. Using a Phillips screwdriver, push down and turn the screw.

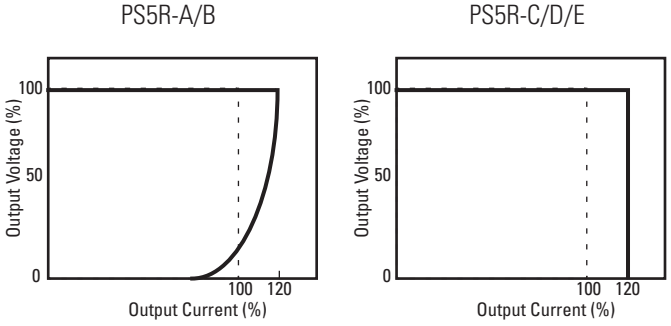


The wire is now connected, and the screw terminal is finger-safe!

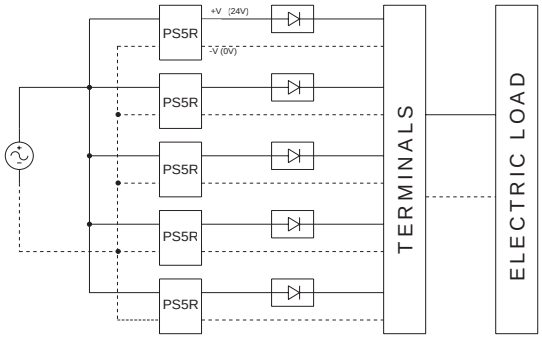
Front Panel (terminals)

Terminal	Name	Description
V. ADJ	Voltage adjustment	Adjusts within ±10%; turn clockwise to increase output voltage
DC ON	Operation indicator	Green LED is lit when output voltage is on
+V, –V	DC output terminals	+V: Positive output terminal –V: Negative output terminal
⏚	Frame ground	Ground this terminal to reduce high-frequency currents caused by switching
L, N	Input terminals	Accept a wide range of voltages and frequencies (no polarity at DC input)
NC	No connection	Do *not* insert wires here, as this may damage the power supply

Overcurrent Protection Characteristics



Parallel Operation



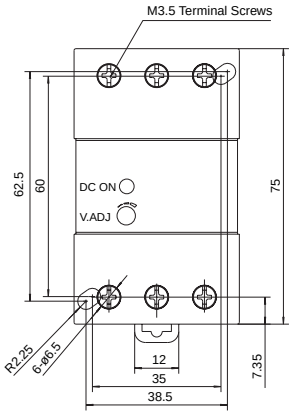
Parallel operation only recommended for PS5R-Q24, PS5R-F24 and PS5R-G24.

L

Power Supplies

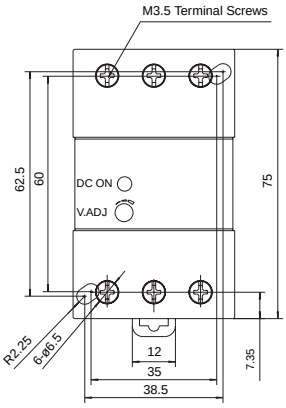
Dimensions

PS5R-A (7.5W)



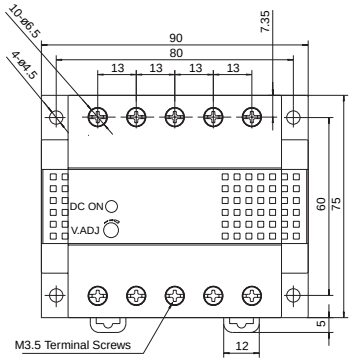
Height 75.0 mm
Width 45.0 mm
Depth 70.0 mm

PS5R-B (15W)



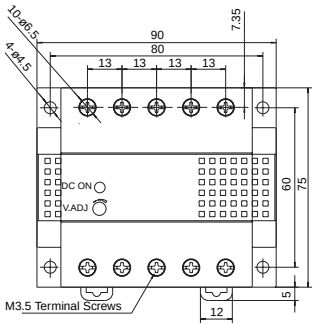
Height 75.0 mm
Width 45.0 mm
Depth 95.0 mm

PS5R-C (30W)



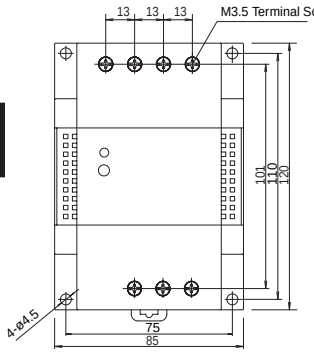
Height 75.0 mm
Width 90.0 mm
Depth 95.0 mm

PS5R-D (50W)



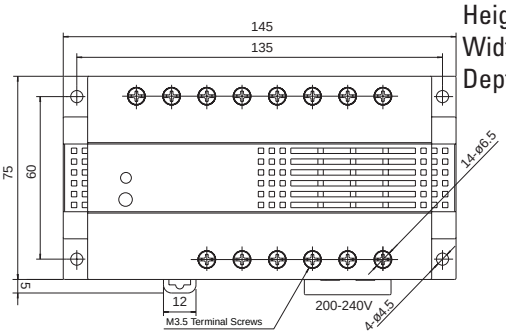
Height 75.0mm
Width 90.0mm
Depth 95.0mm

PS5R-Q (75W)



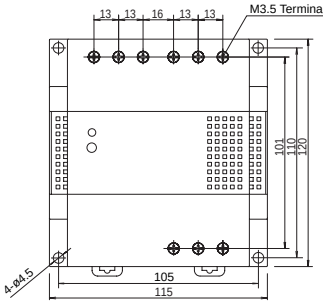
Height 120.0 mm
Width 85.0 mm
Depth 140.0 mm

PS5R-E (100W)



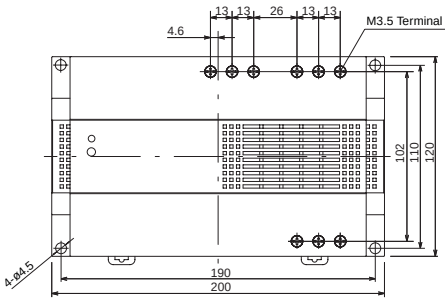
Height 75.0 mm
Width 145.0 mm
Depth 95.0 mm

PS5R-F (120W)



Height 120.0 mm
Width 115.0 mm
Depth 140.0 mm

PS5R-G (240W)



Height 120.0mm
Width 200.0mm
Depth 140.0mm

L

Power Supplies

RTE Series — Analog Timers

NEW DESIGN!

Key features of the RTE series include:

- **20 time ranges and 10 timing functions**
- **Time delays up to 600 hours**
- **Space-saving package**
- **High repeat accuracy of ± 0.2%**
- **ON and timing OUT LED indicators**
- **Standard 8- or 11-pin and 11-blade termination**
- **2 form C delayed output contacts**
- **10A Contact Rating**

TÜV PRODUCT SERVICE Cert. No. E9950913332316 (EMC, RTE)
cert. No. BL960813332355 (LVD, RTE)

c UL us UL Listed
File No. E66043

CE

General Specifications

Operation System		Solid state CMOS Circuit	
Operation Type		Multi-Mode	
Time Range		0.1sec to 600hours	
Pollution Degree		2 (IE60664-1)	
Over voltage category		III (IE60664-1)	
Rated Operational Voltage	AF20	100-240V AC(50/60Hz)	
	AD24	24V AC(50/60Hz)/24V DC	
	D12	12V DC	
Voltage Tolerance	AF20	85-264V AC(50/60Hz)	
	AD24	20.4-26.4V AC(50/60Hz)/21.6-26.4V DC	
	D12	10.8-13.2V DC	
Input off Voltage		Rated Voltage x10% minimum	
Ambient Operating Temperature		-20 to +65ºC (without freezing)	
Ambient Storage and Transport Temperature		-30 to +75ºC (without freezing)	
Relative Humidity		35 to 85%RH (without condensation)	
Atmospheric Pressure		80kPa to 110kPa (Operating), 70kPa to 110kPa (Transport)	
Reset Time		100msec maximum	
Repeat Error		±0.2%, ±20msec*	
Voltage Error		±0.2%, ±20msec*	
Temperature Error		±0.5%, ±20msec*	
Setting Error		±10% maximum	
Insulation Resistance		100MΩ minimum (500V DC)	
Dielectric Strength		Between power and output terminals: 2000V AC, 1 minute Between contacts of different poles: 2000V AC, 1 minute Between contacts of the same pole:1000V AC, 1 minute	
Vibration Resistance		10 to 55Hz amplitude 0.5mm2 hours in each of 3 axes	
Shock Resistance		Operating extremes: 98m/sec^2 (10G) Damage limits: 490m/sec^2 (50G) 3 times in each of 3 axes	
Degree of Protection		IP40 (enclosure) (IEC60529)	
Power Consumption (Approx.) TYPE		RTE-P1, -B1	RTE-P2, -B2
AF20	120V AC/60Hz	6.5VA	6.6VA
	240V AC/60Hz	11.6VA	11.6VA
24V AC 60Hz/DC		3.4VA/1.7W	3.5VA/1.7W
D12		1.6W	1.6W
Mounting Position		Free	
Dimensions	RTE-P1, P2	40Hx 36W x 77.9D mm	
	RTE-B1, B2	40Hx 36W x 74.9D mm	
Weight (Approx.)		RTE-P1: 87g	RTE-P2: 89g; RTE-B1, -B2: 85g

**For the value of the error against a preset time, whichever the largest.*

Contact Ratings

Contact Configuration		2 Form C, DPDT (Delay output)
Allowable Voltage / Allowable Current		240V AC, 30V DC / 10A
Maximum Permissible Operating Frequency		1800 cycles per hour
Rated Load	Resistive	10A 240V AC, 30V DC
	Inductive	7A 240V AC, 30V DC
	Horse Power Rating	1/6 HP 120V AC, 1/3 HP 240V AC
Life	Electrical	500,000 op. minimum (Resistive)
	Mechanical	50,000,000 op. minimum

RTE Table of Contents

Part Numbering Guide

RTE series part numbers are composed of 4 part number codes. When ordering a RTE series part, select one code from each category.
Example: RTE-P1AF20

RTE	—	P	1	—	AF20
① Series		② Terminal Style	③ Function Group		④ Input Voltage

Part Numbers: RTE Series

	Description	Part Number Code	Remarks
① **Series**	RTE series	RTE	For internal circuits, see next page.
② **Terminal Style**	Pin	P	Select one only.
	Blade	B	
③ **Function Group**	ON-delay, interval, cycle OFF, cycle ON	1	Each function group has different timing functions. See page G-4.
	ON-delay, cycle OFF, cycle ON, signal ON/OFF delay, OFF-delay, one-shot	2	
④ **Input Voltage**	100 to 240V AC(50/60Hz)	AF20	
	24V AC(50/60Hz)/24V DC	AD24	
	12V DC	D12	

Part Number List

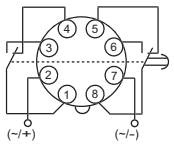
Part Numbers

New Part Number	Voltage	Terminals	Obsolete Part Number
RTE-B1AD24	24V AC/DC	Blade	RTE-B11-24V
			RTE-B12-24V
RTE-B1AF20	100 - 240V AC	Blade	RTE-B11-AC120V
			RTE-B12-AC120V
RTE-B1D12	12V DC	Blade	RTE-B11-12V
			RTE-B12-12V
RTE-B2AD24	24V AC/DC	Blade	RTE-B21-24V
			RTE-B22-24V
RTE-B2AF20	100 - 240V AC	Blade	RTE-B21-AC120V
			RTE-B22-AC120V
RTE-B2D12	12V DC	Blade	RTE-B21-12V
			RTE-B22-12V
RTE-P1AD24	24V AC/DC	8 Pin	RTE-P11-24V
			RTE-P12-24V
RTE-P1AF20	100 - 240V AC	8 Pin	RTE-P11-AC120V
			RTE-P12-AC120V
RTE-P1D12	12V DC	8 Pin	RTE-P11-12V
			RTE-P12-12V
RTE-P2AD24	24V AC/DC	11 Pin	RTE-P21-24V
			RTE-P22-24V
RTE-P2AF20	100 - 240V AC	11 Pin	RTE-P21-AC120V
			RTE-P22-AC120V
RTE-P2D12	12V DC	11 Pin	RTE-P21-12V
			RTE-P22-12V

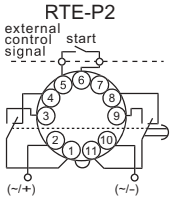
1. *For schematics, see page G-10.*
2. *For timing diagrams, see page G-10.*
3. *All timers have multiple time ranges. For a list of ranges, see page G-13.*
4. *For socket and accessory information, see page G-11.*

Timing Diagrams

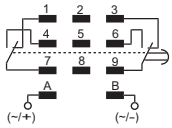
RTE-P1



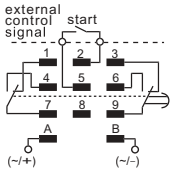
RTE-P2



RTE-B1



RTE-B2

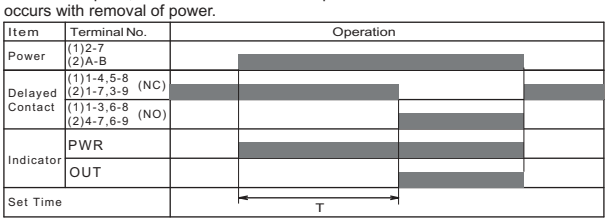


1. RTE-P2: Do not apply voltage to terminals #5, #6 & #7.
2. RTE-B1, -B2: Do not apply voltage to terminals #2, #5 & #8.
3. IDEC sockets are as follows: RTE-P1: SR2P-06 pin type socket, RTE-P2: SR3P-05* pin type socket, RTE-B1, -B2: SR3B-05* blade type socket, (*-may be followed by suffix letter A,B,C or U).*

RTE-P1, -B1

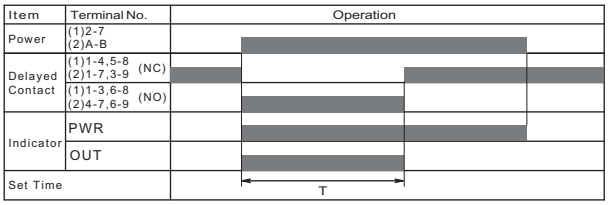
A: ON-Delay 1 (power start)

Set timer for desired delay, apply power to coil. Contacts transfer after preset time has elapsed, and remain in transferred position until timer is reset. Reset occurs with removal of power.



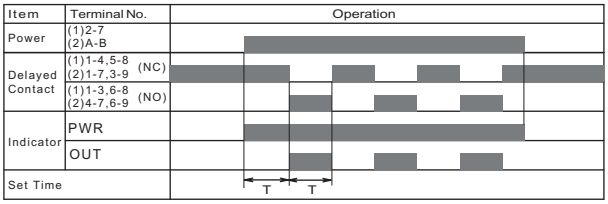
B: Interval (power start)

Set timer for desired delay, apply power to coil. Contacts transfer immediately, and return to original position after preset time has elapsed. Reset occurs with removal of power.



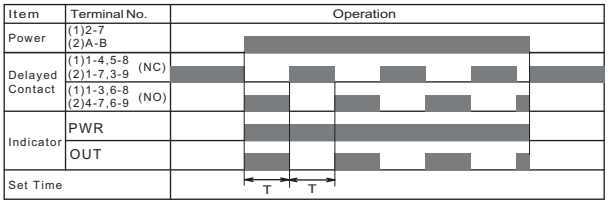
C: Cycle 1 (power start, OFF first)

Set timer for desired delay, apply power to coil. First transfer of contacts occurs after preset delay has elapsed, after the next elapse of preset delay contacts return to original position. The timer now cycles between on and off as long as power is applied (duty ratio 1:1).



D: Cycle 3 (power start, ON first)

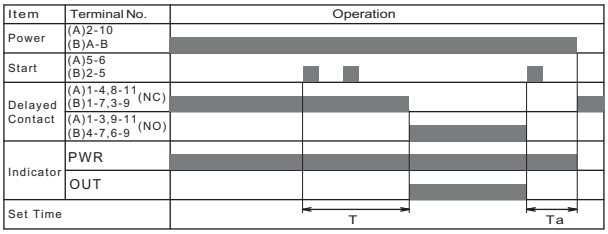
Functions in same manner as Mode C, with the exception that first transfer of contacts occurs as soon as power is applied. The ratio is 1:1. Time On = Time Off



RTE-P2, -B2

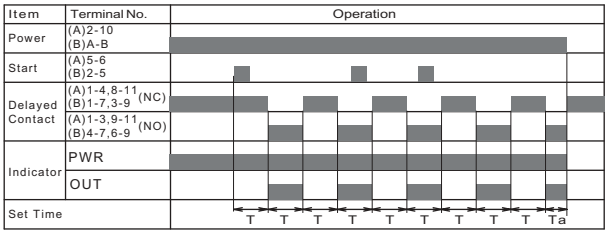
A: ON-Delay 2 (signal start)

When a preset time has elapsed after the start input turned on while power is on, the NO output contact goes on.



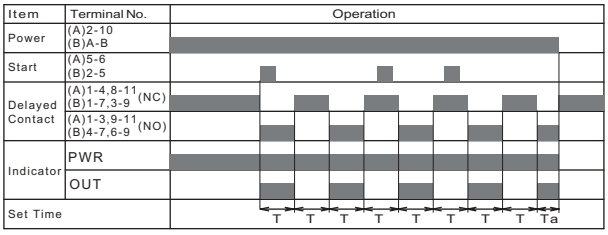
B: Cycle 2 (signal start, OFF first)

When the start input turns on while power is on, the output oscillates at a preset cycle (duty ratio 1:1), starting while the NO contact off.



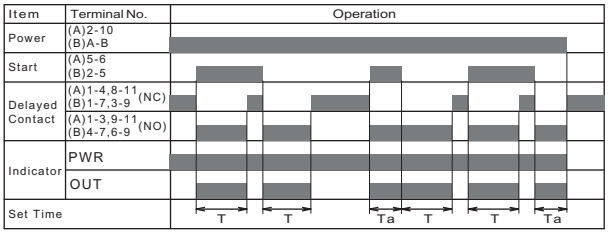
C: Cycle 4 (signal start, ON first)

When the start input turns on while power is on, the NO contact goes on. The output oscillates at a preset cycle (duty ratio 1:1).



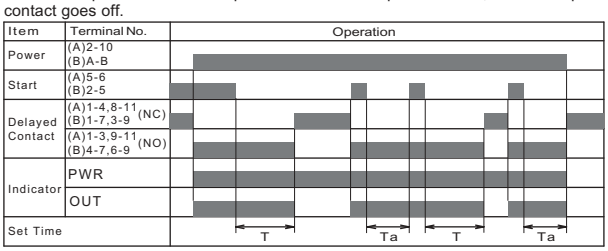
D: Signal ON/OFF-Delay

When the start input turns on while power is on, the NO output contact goes on. When a preset time has elapsed while the start input remains on, the output contact goes off. When the start input turns off, the NO contact goes on again. When a preset time has elapsed after the start input turned off, the NO contact goes off.



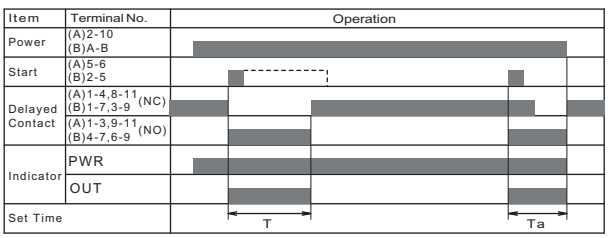
E: Signal OFF-Delay

When power is turned on while the start input is on, the NO output contact goes on. When a preset time has elapsed after the start input turned off, the NO output contact goes off.



F: One-Shot (signal start)

When the start input turns on while power is on, the NO output contact goes on. When a preset time has elapsed, the NO output contact goes off.



Note : T=Set Time, Ta=Shorter than set time, (1): RTE-P1, (2): RTE-B1, (A): RTE-P2, (B): RTE-B2

G Timers

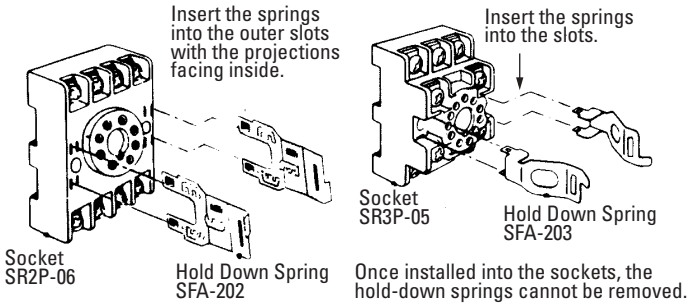
DIN Rail Mounting Accessories

Part Numbers: DIN Rail/Surface Mount Sockets and Hold-Down Springs

DIN Rail Mount Socket				Applicable Hold-Down Springs	
Style	Appearance	Use with Timers	Part No.	Appearance	Part No.
11-Pin Screw Terminal (dual tier)		RTE-P2	SR3P-05		SFA-203
11-Pin FingerSafe Socket		RTE-P2	SR3P-05C		
8-Pin Screw Terminal		RTE-P1	SR2P-06		SFA-202
11-Blade Screw Terminal		RTE-B1 RTE-B2	SR3B-05		
DIN Mounting Rail Length 1000mm		—	BNDN1000		

Installation of Hold-Down Springs

DIN Rail Mount Socket



G Timers

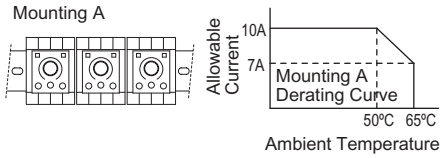
Panel Mounting Accessories

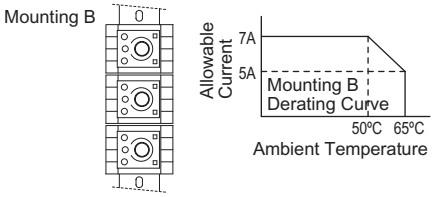
Part Numbers: Flush Panel Mount Adapter and Sockets that use an Adapter

Accessory	Description	Appearance	Use with	Part No.
Panel Mount Adapter	Adaptor for flush panel mounting RTE timers		All RTE timers	RTB-G01
Sockets for use with Panel Mount Adapter	8-pin screw terminal	 (Shown: SR6P-M08G for Wiring Socket Adapter)	RTE-P1	SR6P-M08G
	11-pin screw terminal		RTE-P2	SR6P-M11G
	8-pin solder terminal		RTE-P1	SR6P-S08
	11-pin solder terminal		RTE-P2	SR6P-S11

No hold down clips are available for flush panel mounting applications.

Temperature Derating Curves





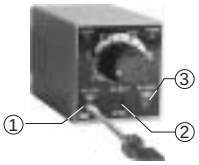
Instructions

Types

RTE-P1AF20

- Power Voltage: AF20: 100 to 240V AC(50/60Hz); AD24: 24V AC(50/60Hz)/24V DC; D12: 12V DC
- Connection type: P: Pin; B: Blade
- Operation Mode
  - 1: No Control Signal: A: ON-Delay 1; B: Interval; C: Cycle 1; D: Cycle 3
  - 2: Control Signal: A: ON-Delay 2; B: Cycle 2; C: Cycle 4; D: Signal ON/OFF-Delay; E: Signal OFF-Delay; F: One-Shot

Switch Settings



① Operation Mode Selector
② Scale Selector
③ Time Range Selector

1. Turn the selectors securely using a flat screwdriver 4mm wide (maximum). Note that incorrect setting may cause malfunction. Do not turn the selectors beyond their limits.
2. Since changing the setting during timer operation may cause malfunction, turn power off before changing.

G Timers

Safety Precautions

Special expertise is required to use Electronic Timers.

- All Electronic Timers are manufactured under IDEC's rigorous quality control system, but users must add a backup or fail safe provision to the control system when using the Electronic Timer in applications where heavy damage or personal injury may occur should the Electronic Timer fail.
- Install the Electronic Timer according to instructions described in this catalog.
- Make sure that the operating conditions are as described in the specifications. If you are uncertain about the specifications, contact IDEC in advance.
- In these directions, safety precautions are categorized in order of importance under Warning and Caution.

Warnings

Warning notices are used to emphasize that improper operation may cause severe personal injury or death.

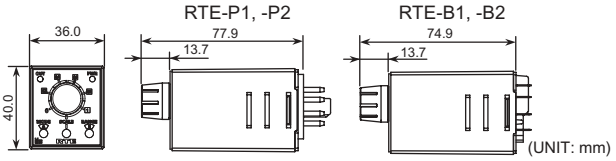
- Turn power off to the Electronic timer before starting installation, removal, wiring, maintenance, and inspection on the Electronic Timer.
- Failure to turn power off may cause electrical shocks or fire hazard.
- Do not use the Electronic Timer for an **emergency stop circuit** or **interlocking circuit**. If the Electronic Timer should fail, a machine malfunction, breakdown, or accident may occur.

Caution

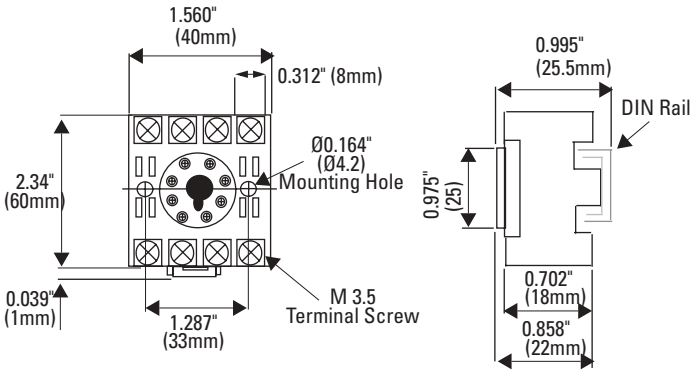
Caution notices are used where inattention might cause personal injury or damage to equipment.

- The Electronic Timer is designed for installation in equipment. Do not install the Electronic Timer outside equipment.
- Install the Electronic Timer in environments described in the specifications. If the Electronic Timer is used in places where it will be subjected to high-temperature, high-humidity, condensation, corrosive gases, excessive vibrations, or excessive shocks, then electrical shocks, fire hazard, or malfunction could result.
- Use an IEC60127-approved fuse and circuit breaker on the power and output line outside the Electronic Timer.
- Do not disassemble, repair, or modify the Electronic Timer.
- When disposing of the Electronic Timer, do so as industrial waste.

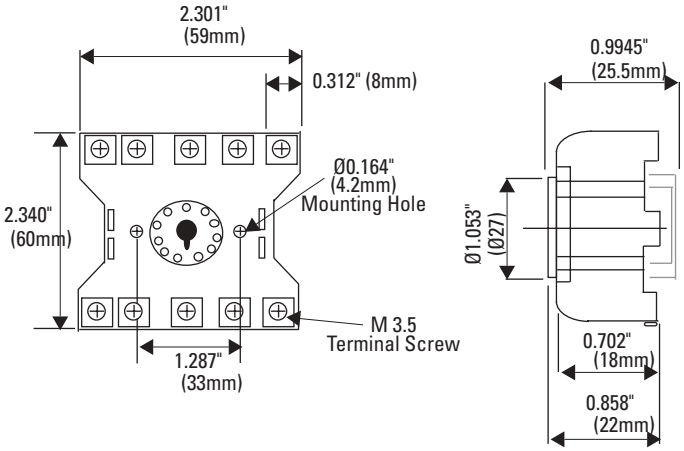
Dimensions



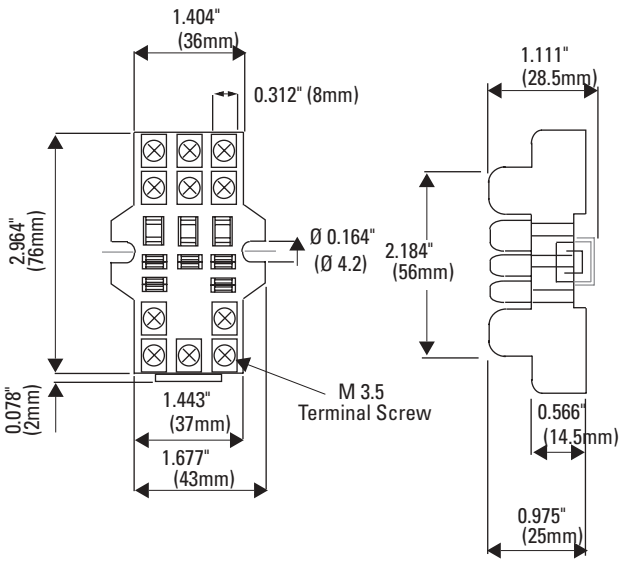
SR2P-06 Socket



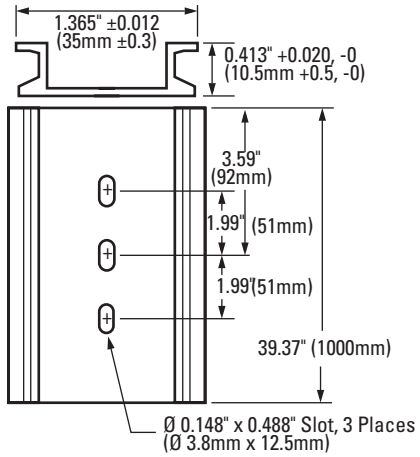
SR3P-06 Socket



SR3B-05 Socket



BNDN1000 DIN Rail



G Timers

General Instructions for All Timer Series

Load Current
With inductive, capacitive, and incandescent lamp loads, inrush current more than 10 times the rated current may cause welded contacts and other undesired effects. The inrush current and steady-state current must be taken into consideration when specifying a timer.

Contact Protection
Switching an inductive load generates a counter-electromotive force (back EMF) in the coil. The back EMF will cause arcing, which may shorten the contact life and cause imperfect contact. Application of a protection circuit is recommended to safeguard the contacts.

Temperature and Humidity
Use the timer within the operating temperature and operating humidity ranges and prevent freezing or condensation. After the timer has been stored below its operating temperature, leave the timer at room temperature for a sufficient period of time to allow it to return to operating temperatures before use.

Environment
Avoid contact between the timer and sulfurous or ammonia gases, organic solvents (alcohol, benzine, thinner, etc.), strong alkaline substances, or strong acids. Do not use the timer in an environment where such substances are prevalent. Do not allow water to run or splash on the timer.

Vibration and Shock
Excessive vibration or shocks can cause the output contacts to bounce, the timer should be used only within the operating extremes for vibration and shock resistance. In applications with significant vibration or shock, use of hold down springs or clips is recommended to secure a timer to its socket.

Time Setting
The time range is calibrated at its maximum time scale; so it is desirable to use the timer at a setting as close to its maximum time scale as possible. For a more accurate time delay, adjust the control knob by measuring the operating time with a watch before application.

Input Contacts
Use mechanical contact switch or relay to supply power to the timer. When driving the timer with a solid-state output device (such as a two-wire proximity switch, photoelectric switch, or solid-state relay), malfunction may be caused by leakage current from the solid-state device. Since AC types comprise a capacitive load, the SSR dielectric strength should be two or more times the power voltage when switching the timer power using an SSR.

Generally, it is desirable to use mechanical contacts whenever possible to apply power to a timer or its signal inputs. When using solid state devices, be cautious of inrushes and back-EMF that may exceed the ratings on such devices. Some timers are specially designed so that signal inputs switch at a lower voltage than is used to power the timer (models designated as "B" type).

Timing Accuracy Formulas

Timing accuracies are calculated from the following formulas:

Repeat Error

$$= \pm \frac{1}{2} \times \frac{\text{Maximum Measured Value} - \text{Minimum Measured Value}}{\text{Maximum Scale Value}} \times 100\%$$

Voltage Error

$$= \pm \frac{Tv - Tr}{Tr} \times 100\%$$

T_v: Average of measured values at voltage V
T_r: Average of measured values at the rated voltage

Temperature Error

$$= \pm \frac{Tt - T20}{T20} \times 100\%$$

T_t: Average of measured values at °C
T_{20}: Average of measured values at 20°C

Setting Error

$$= \pm \frac{\text{Average of Measured Values} - \text{Set Value}}{\text{Maximum Scale Value}} \times 100\%$$

OMRON

Model E5C2|E5C3|E5C4

TEMPERATURE CONTROLLER

(UK/USA) INSTRUCTION MANUAL
(D) BEDIENUNGSANLEITUNG
(F) Manuel d'instructions

Thank you for purchasing this OMRON product. This manual primarily describes precautions reguired in installing and wiring the temperature controller. Before operating the product, read this manual throughly to acguire sufficient knowledge of the product. Keep this manual close at hand and use for reference during operation.

Vielen Dank für den kauf dieses OMRON Produktes. Bevor Sie diesen temperaturregler in Betrieb nehmen, lesen Sie bitte diese Bedienungsanleitung gründlich, damit Sie sich mit dem Produkt ausreichend vertraut machen können. Nehmen Sie diese Betriebsanleitung zur Hand, wenn Sie mit dem Gerät arbeiten.

Nous vous remercions d'avoir fait l'aguisition de ce produit OMRON.
Avant d'utiliser le produit température, veuillez lire attentivement ces instructions, afin de vous familiariser avec le produit. Garder ce manuel à portée de main lors des opérations.

Karasuma Nanajo, Shimogyo-ku, Kyoto 600-8216, Japan
OMRON Corporation
0682537-5B

(UK/USA) NOTICE

(1) Operating environment
Do not use the product in places where explosive or flammable gases may be present.
(2) Load power supply
Make sure that the load power supply is within the rating.
(3) Handling
Never disassemble, modify or repair the product.

(UK/USA) FOR CORRECT USE

(1) For correct use, do not subject the temperature controller to the following conditions.
- Places where temperature fluctuates dramatically.
- Places where humidity is high and condensation may occur.
- Places where sever vibration and shock may occur.
- Places where corrosive gas and dust may be present.
- Places where there is danger of splashing of water, oil or any chemicals.

(2) Wiring
- Avoid wiring near high voltage sources and power lines carrying large currents.
- Be sure to wire properly with correct polarity of terminals.
- Check noise influence carefully before wiring.

(3) To conform to IEC/EN standards
For the model E5C2, input and output terminals have basic insulation from power supply terminals. Connect input and output terminals to any device that has no live parts that are accessible. The connection of input and output terminals must have basic insulation for 250 VAC for any device.
(4) Cleaning
To prevent damage, the exterior of the temperature controller must not be exposed to organic (e.g. paint thinner or benzine), strong alkalies, or strong acids.

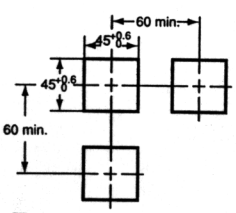
(UK/USA) Precautions in Using the Product

When the product is used under the circumstances or environment below, ensure adherence to limitations of the ratings and functions. Also take countermeasures for safety precaution such as fail-safe installations.
①Use under circumstances or environment which are not described in the instruction manual.
②Use for nuclear power control, railway, aircraft, vehicle, incinerator, medical equipment, entertainment equipment, safety device etc...
③Use for applications where death or serious property damage is possible and extensive safety precautions are required.

(UK/USA) PRODUCT CHARACTERISTIC

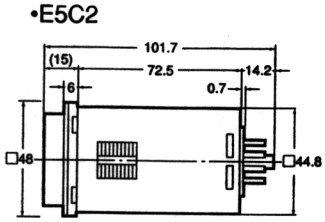
Operating power : 100/110 VAC (±10 %) 50/60 Hz
110/120 VAC (±10 %) 50/60 Hz
200/220 VAC (±10 %) 50/60 Hz
220/240 VAC (±10 %) 50/60 Hz
For the E5C2,
100/110/120 VAC(±10 %) 50/60 Hz
200/220/240 VAC(±10 %) 50/60 Hz
Power consumption : 2 VA max.
Control method : ON/OFF(-□20□), P(-□40□)
Operating ambient temperature : -10 to 55 °C
Operating ambient humidity : 45 to 85 %
Storage temperature : -25 to 65 °C
Installation category : II
Pollution degree : 2
Altitude : 2000 m max.
Recommended fuse : T1A, 250 VAC, Time-lag, Low-breaking capacity

1

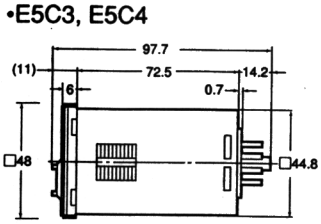


2

•E5C2



•E5C3, E5C4



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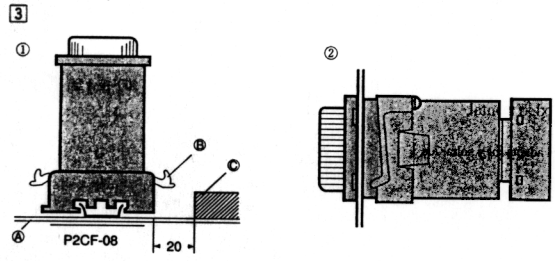

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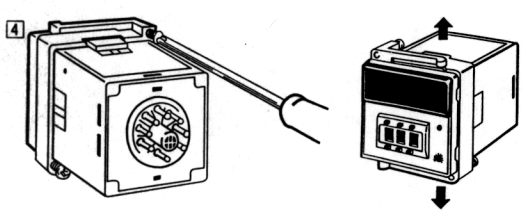


(UK/USA) INSTALLATION

1 Panel cutout

- Recommended panel thickness is 1 to 4 mm.
- Close side-by-side mounting of plural units is possible by mounting an adapter.
(One direction only)

2 Dimensions

3 Mounting

①Surface mounting
When mounting plural units in vertical arrangement, leave space of approx. 20 mm above and below the mounting socket.
②Flush mounting
Insert the unit into mounting hole on the panel and mount an adapter by pushing it forward from the back side.
Push the adapter as close as possible to the panel. Then fix the adapter with screws.
③The P3G-08 flush mounting socket can be wired in the same way as the front connecting socket.

4 Dismounting of adapter

If flush mounted, loosen the screw of adapter and disengage the hooks for dismounting.

Ⓐ Panel, Ⓑ Hook, Ⓒ Duct and etc.

UK/USA CONNECTIONS

1 Connection

●Input connection

- Use the specified compensating conductors for the connection of thermocouple.
- Use lead wires with low resistance (5 Ω or less per a line) for the connection of platinum resistance thermometer.
- When connecting Model E52-□□1D to solder terminal, take out the solderless terminal and polish the point of it enough before soldering. (The thermocouple strands are used as wires.)
- Isolate all sensor input lead wires connected to the Temperature Controller in order to prevent electrical noise induction from power for load lines.

●Output connection

- If the load circuit is a heating control system, be sure to connect the load to terminals ④ and ⑤.
  If the load circuit is a cooling control system, be sure to connect the load to terminals ④ and ⑥.
  Incorrect connection will lead abnormal temperature and a serious accident may result.
- If the E5C2 is in frequent operation, such as proportional operation, add an appropriate external relay to the E5C2 by considering the capacity of the load and the life of the relay.

●Power supply connection

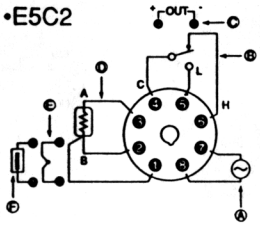
- If a single power supply is used for the E5C2 and the load, the supply voltage of the power supply may vary greatly when the load is open or closed if the capacity of the power supply is not large enough.
  Make sure that the capacity of the power supply is large enough so that the supply voltage range will be always from 90 % to 110 % of the rated supply voltage.
- The E5C2 operates at either 50 or 60 Hz.

Ⓐ Power supply 100/110, 110/120, 200/220, 220/240 VAC
Ⓑ Contact output
Ⓒ Voltage output
Ⓓ Resistance thermometer input
Ⓔ Thermocouple input
Ⓕ Thermistor input

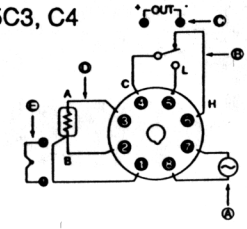
2 Connecting socket (sold separately)

1

•E5C2

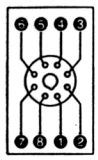


•E5C3, C4



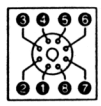
2

P2CF-08



(TOP VIEW)

P3G-08

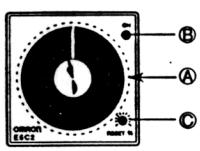


(BOTTOM VIEW)

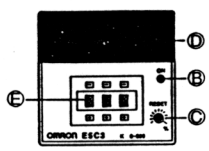
US08

(BOTTOM VIEW)

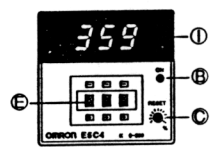
•E5C2

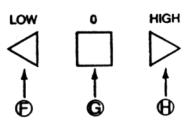


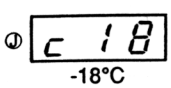
•E5C3



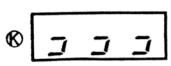
•E5C4







-18°C



Over flow

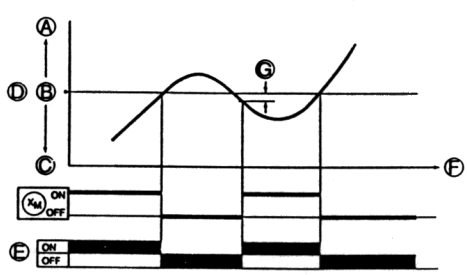
UK/USA NOMENCLATURE

Ⓐ Temperature setting knob
Ⓑ Operation indicator
Ⓒ RESET shaft

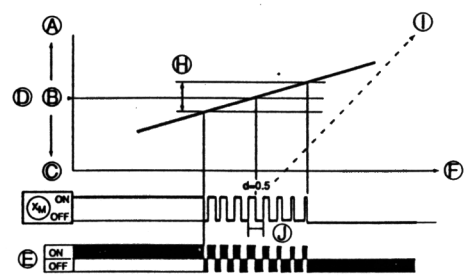
•E5C2	•E5C3/E5C4	
For OFFSET adjustment with PD control action type only	ON/OFF control action···	When there is an error between the displayed temperature and the set value, the error can be adjusted by varying operation point.
	P(proportional) action·····	Offset adjustment is available.

Ⓓ LED deviation indicator Ⓔ Thumbwheel switch for temperature setting
Ⓕ Lights when temperature is lower than the set point Ⓖ Lights when temperature is within the range of ±1% of full scale against the set point
Ⓗ Lights when temperature is higher than the set point Ⓘ Temperature indicator
Ⓙ Since this series temperature controllers are not for minus temperature range, the minus temperature displayed such as the above is not guaranteed.
Ⓚ When the temperature exceeds the set value range (except 0 to 399 °C) or when burnout circuit is operated.

•E5C2-□2□. E5C3-□2□. E5C4-□2□



•E5C2-□4□. E5C3-□4□. E5C4-□4□



UK/USA SETTING

- For the type with standard scale range of 0 to 399 °C, the digit of hundreds is changed 0, 1, 2, 3, 0, 1, 2 and 3 by push type thumbwheel switch and this cycle is repeated.
- When setting the temperature of the E5C2, avoid turning the setting knob exceeding the scale range. The knob stopper may be damaged.
- When using the temperature controller in a sequence circuit, note that is takes a few seconds to turn on the relay after power application if the detected temperature is lower than the set value.

UK/USA ADJUSTMENT MODE

1 ON-OFF control action
2 PD control action

Ⓐ High temperature
Ⓑ Set point
Ⓒ Low temperature
Ⓓ Input
Ⓔ Operation indicator
Ⓕ Time
Ⓖ Hysteresis
Ⓗ Proportional band
Ⓘ d (duty factor) = $\frac{X_M \text{ ON time}}{\text{Proportional period}}$
Ⓙ Proportional period

PV-11 1/2" Pneumatic 2 Way Valve

Product Overview

The PV-11 PFA Diaphragm Valve is designed for use in high purity semiconductor applications. It is also ideally suited for ultra-pure water and aggressive chemical or gas applications. The design utilizes a molded high purity PFA body with precision machined areas. A one piece machined modified PTFE diaphragm is also utilized for excellent flexibility and life. A full 1/2" orifice provides maximum flow capability in a compact package.

Features	Benefits
One piece precision machined diaphragm manufactured from the latest technology modified PTFE. Provides over five times the flexural life as compared to conventional PTFE. Tongue and groove seat and diaphragm for positive through flow shut off and diaphragm to body seal.	**High cycle life.**
	Lower replacement costs.
	Less downtime.
PVDF coated stainless steel spring.	**Reduces effects of corrosive environments.**
Submergible option isolates all valve components from the external environment.	**Valve remains functional while operating in wet or gaseous corrosive environments.**

Specifications

Materials of Construction

Wetted:	PFA, Modified PTFE
Non-wetted:	PFA, PVDF, Viton seals, PVDF coated SS springs

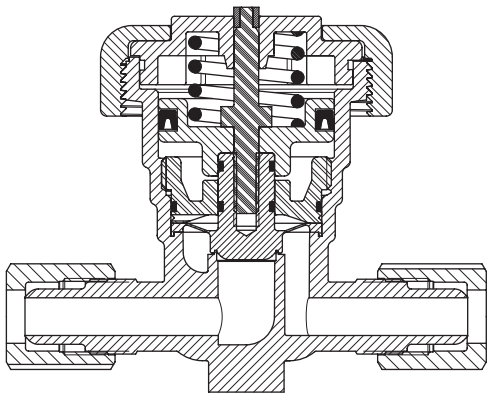
Pressure Ranges

Forward:	27" HG vacuum (913 mbar) to 100 PSIG (7 bar)
Back:	20 PSIG (1.4 bar) with100 PSIG (7 bar) inlet pressure
	50 PSIG (3.5 bar) with 50 PSIG (3.5 bar) inlet pressure
	70 PSIG (4.9 bar) with 0 PSIG (0 bar) inlet pressure
Actuator:	60 PSIG (4.2 bar) to 100 PSIG (7 bar)

Pressure ranges for operation at ambient temperatures. For use at higher temperatures consult Pressure/Temperature chart on page 3.

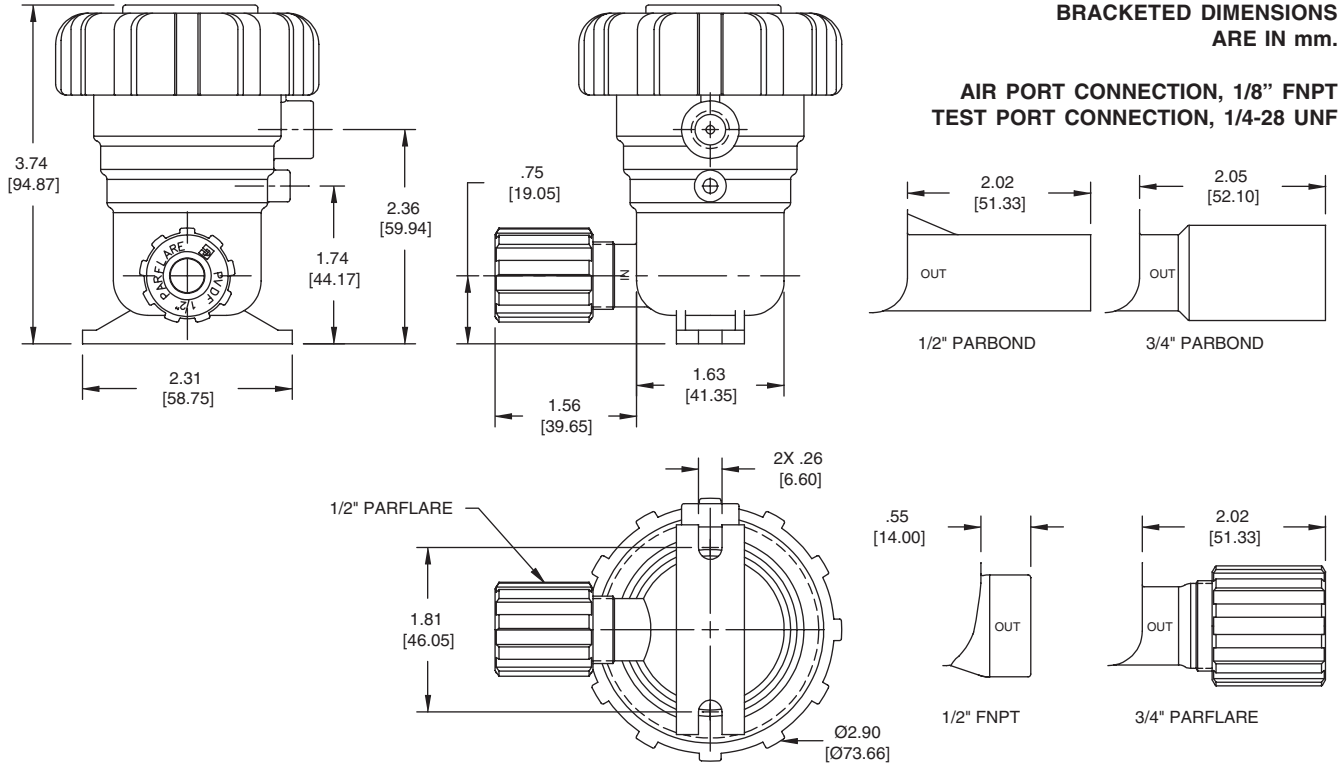
Temperature Ranges

Ambient:	0° - 150° F (-17° - 66° C)
Fluid:	0° - 266° F (-17° - 130° C)



Normally Closed Shown

Parker Hannifin Corporation
Partek Operation
Tucson, AZ



BRACKETED DIMENSIONS ARE IN mm.

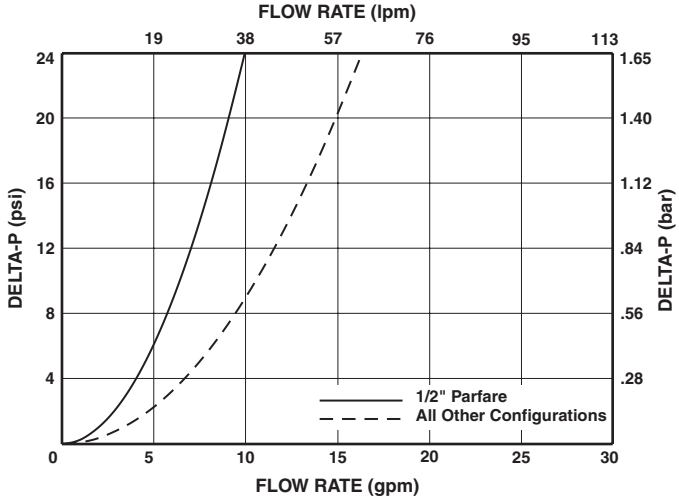
AIR PORT CONNECTION, 1/8" FNPT
TEST PORT CONNECTION, 1/4-28 UNF

Model Number	*Cv*	*Kv*	*Flow Config.*	*Port Config.*
PV-11-001	2.3	32.8	N C	1/2" Parflare
PV-11-002	3.7	52.8		3/4" Parflare
PV-11-003	3.7	52.8		1/2" Parbond
PV-11-004	3.7	52.8		3/4" Parbond
PV-11-005	3.7	52.8		1/2" FNPT

Model Number	*Cv*	*Kv*	*Flow Config.*	*Port Config.*
PV-11-011	2.3	32.8	N O	1/2" Parflare
PV-11-012	3.7	52.8		3/4" Parflare
PV-11-013	3.7	52.8		1/2" Parbond
PV-11-014	3.7	52.8		3/4" Parbond
PV-11-015	3.7	52.8		1/2" FNPT

Parflare models are supplied with PVDF nuts. For PFA nuts add -T to model number.

PRESSURE DROP VS. FLOW RATE



Parker Hannifin Corporation
Partek Operation
Tucson, AZ

AR1000 to 6000

Standard Specifications

Model	AR1000	AR2000	AR2500	AR3000	AR4000	AR4000-06	AR5000	AR6000
Port size	M5 X 0.8	1/8 1/4	1/4 3/8	1/4 3/8	1/4 3/8 1/2	3/4	3/4 1	1
Fluid	Air							
Proof pressure	1.5MPa							
Max. operating pressure	1.0MPa							
Set pressure range	0.05 to 0.7MPa	0.05 to 0.85MPa						
Pressure gauge port size	1/16	1/8	1/8	1/8	1/4	1/4	1/4	1/4
Ambient and fluid temperature	–5 to 60°C (Non-freezing)							
Construction	Relieving style							
Weight (kg)	0.08	0.27	0.27	0.41	0.84	0.94	1.19	1.55

Accessories (Options) Part No.

Description \ Model		Part No.							
		AR1000	AR2000	AR2500	AR3000	AR4000	AR4000-06	AR5000	AR6000
Bracket		B120	B220	B220	B320	B420	B420	B640A(3)	B640A(3)
Pressure gauge(1)	1.0MPa	G27-10-R1	G36-10-□01	G36-10-□01	G36-10-□01	G46-10-□02	G46-10-□02	G46-10-□02	G46-10-□02
	0.2MPa	(G27-10-R1)(2)	G36-2-□01	G36-2-□01	G36-2-□01	G46-2-□02	G46-2-□02	G46-2-□02	G46-2-□02

Note 1) In the gauge part no. (e.g. G36-10-□01)□ indicates kind of the connecting thread. Put nothing for Rc(PT) and "N" for NPT thread. Consult SMC for NPT pressure gauge.

Note 2) For 1.0MPa.

Note 3) With 2 mounting screws.

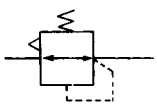
AR4000

AR3000-□□BG

AR2500

AR2000-□□BG

JIS symbol



How to Order

AR 30 00 – □ 03 BG – 1N

Regulator

Body size

10	M5
20	1/8
25	1/4
30	3/8
40	1/2
50	3/4
60	1

Thread

–	Meter thread (M5) Rc(PT)
N	NPT
F	G(PF)

Port size

M5	M5 X 0.8
01	1/8
02	1/4
03	3/8
04	1/2
06	3/4
10	1

Accessories (Options)

Symbol		Description	Applicable model
Blank		—	—
B		Bracket	AR1000 to AR6000
G	Gauge	Without limit indicator	AR1000
		With limit indicator	AR2000 to AR6000

Option

1(Note)	Set at 0.2MPa
N	Non-relieving style
R	Reverse flow

● If ordering more than one option, indicate symbols numerically then alphabetically. Ex.) 1NR

Note) Only the adjusting spring is different from the standard model.

Option/Combination Table ◎Combination available ■ Combination not available

Option	Symbol	Option			Applicable regulator			
		1	N	R	AR1000	AR2000	AR2500	AR3000 to AR6000
0.02 to 0.2MPa	–1	■	◎	◎	◎	◎	◎	◎
Non-relieving	–N	◎	■	◎	◎	◎	◎	◎
Reverse flow	–R	◎	◎	■	◎	◎	◎	◎

Order Made P.1.5-14

⚠ Precautions

Be sure to read before handling. Refer to p.0-26 and 0-27 for Safety Instructions and common precautions on the products mentioned in this catalog, and refer to p.1.0-1 and 1.0-2 for precautions on every series.

Mounting/Adjustment

⚠Warning

①The adjustment handle must be operated manually. Using a tool to turn the handle could lead to damage.

②Set up the regulator while verifying the pressure that is indicated on the primary and the secondary pressure gauges. Turning the handle excessively could damage the internal parts.

③The pressure gauge that is provided with the product for setting a pressure between 0.02 to 0.2MPa is the 0.2MPa style. To prevent damage to the pressure gauge, make sure that a pressure that exceeds 0.2MPa is not applied to it. However, for the AR1000, the gauge for setting a pressure between 0.02 to 0.2MPa is the 1.0MPa style.

⚠Caution

①Release the lock to adjust the pressure. After the adjustment, engage the lock.
Failure to observe this procedure could damage the handle or cause the secondary pressure to fluctuate.

A) On the AR1000 to AR2500 types, pull the adjustment handle to release the lock and push the adjustment handle to engage the lock. If it does not lock easily, turn the handle slightly clockwise or counterclockwise before pushing it.

B) On the AR3000 to AR5000 types, pull the adjustment handle to release the lock. (An orange colored line is provided at the bottom of the adjustment handle for visual checking.) Push the adjustment handle to engage the lock. If it does not lock easily, turn the handle slightly clockwise or counterclockwise; then, push it until the orange colored line is no longer visible.

C) On the AR6000 type, loosen the lock nut to release the lock, and tighten it to lock it.

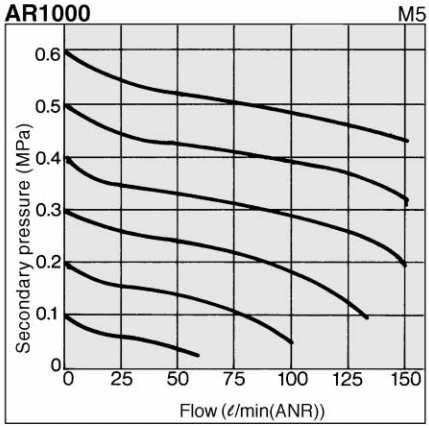
②Install the valve guide (on the opposite side of the handle) 60mm away from the ground surface to facilitate maintenance inspection.

③To use this product between the solenoid valve and the actuator, contact SMC.

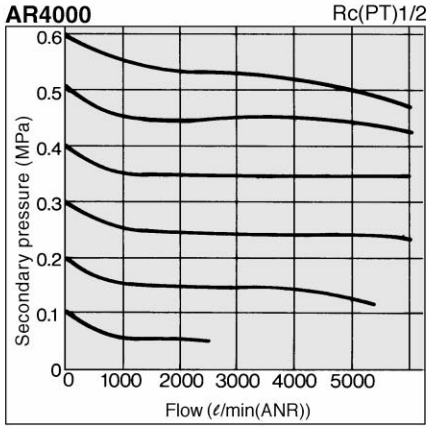
Flow Characteristics

Supply pressure: 0.7MPa

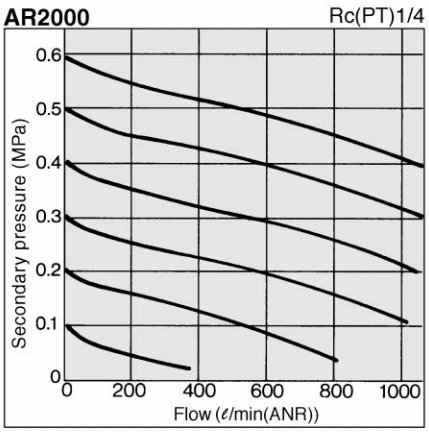
AR1000 M5



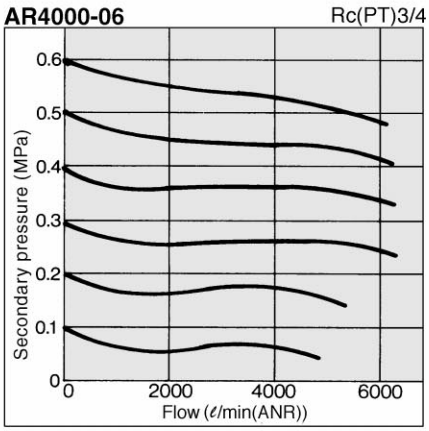
AR4000 Rc(PT)1/2



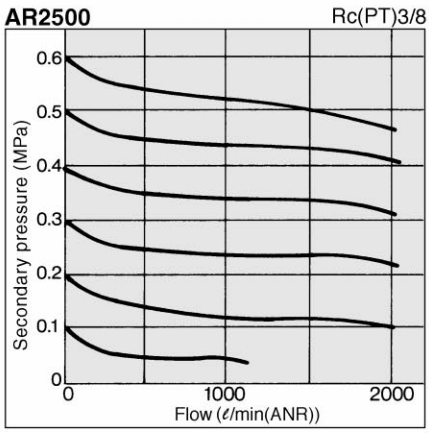
AR2000 Rc(PT)1/4



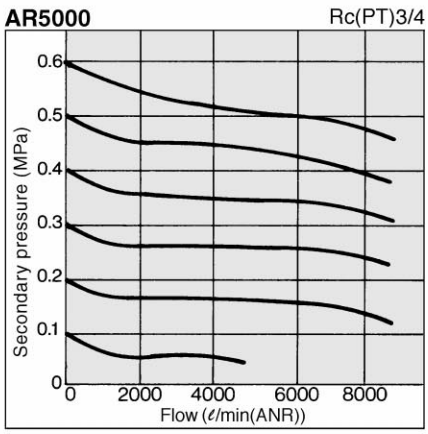
AR4000-06 Rc(PT)3/4



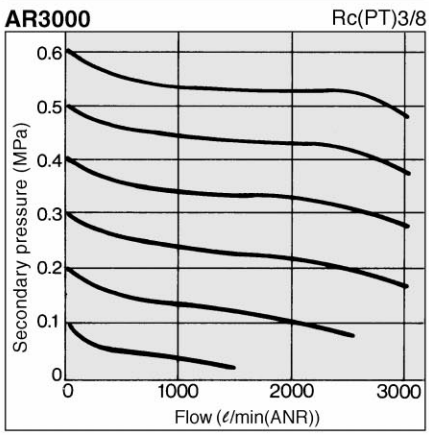
AR2500 Rc(PT)3/8



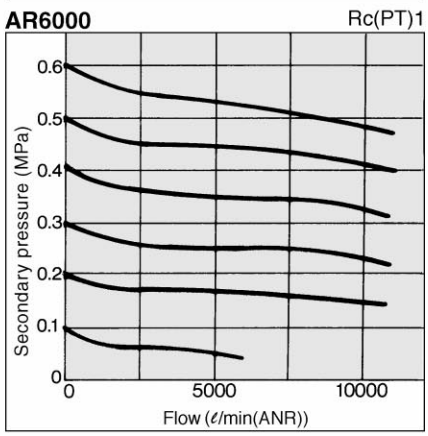
AR5000 Rc(PT)3/4



AR3000 Rc(PT)3/8



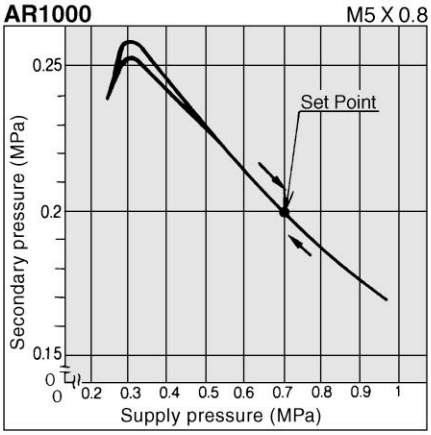
AR6000 Rc(PT)1



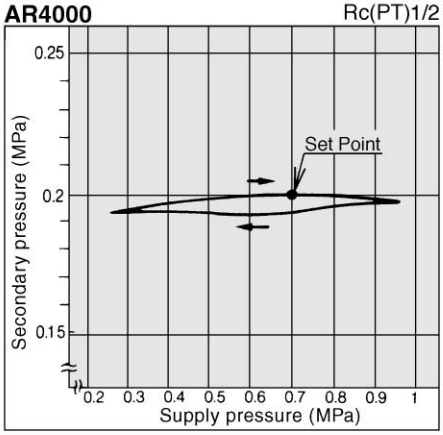
AR1000 to 6000

Pressure Characteristics
Supply pressure: 0.7MPa, Secondary pressure: 0.2MPa, Flow: 20 ℓ/min (ANR)

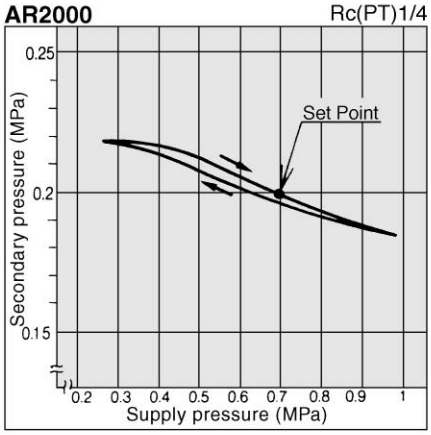
AR1000 M5 X 0.8



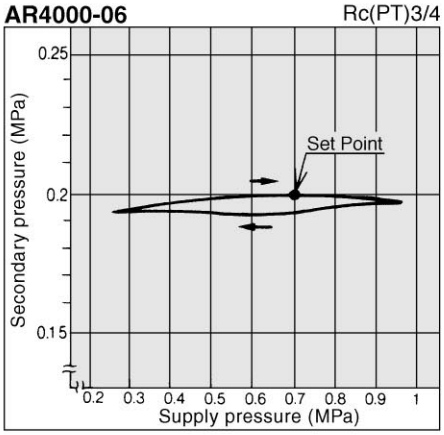
AR4000 Rc(PT)1/2



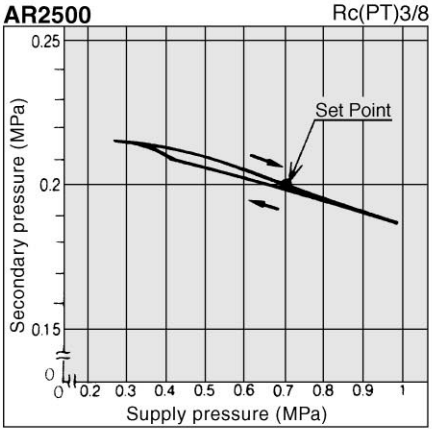
AR2000 Rc(PT)1/4



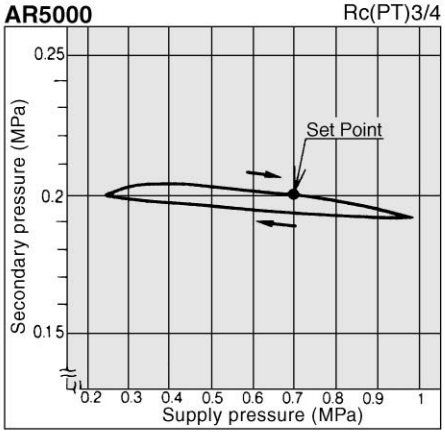
AR4000-06 Rc(PT)3/4



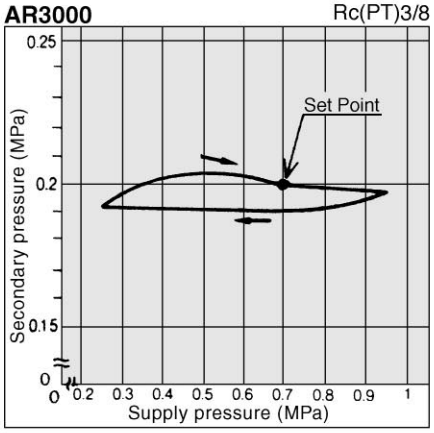
AR2500 Rc(PT)3/8



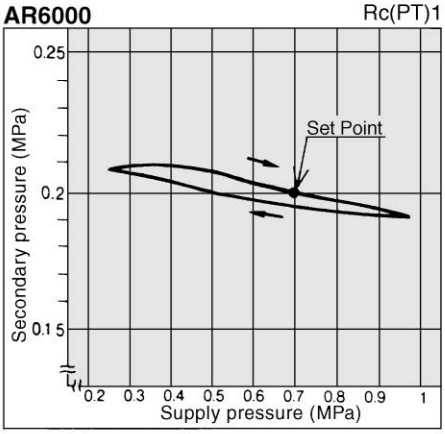
AR5000 Rc(PT)3/4



AR3000 Rc(PT)3/8



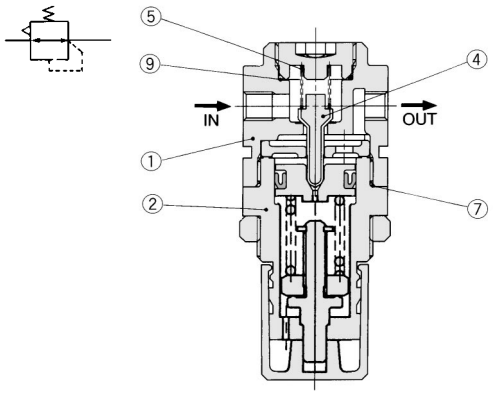
AR6000 Rc(PT)1



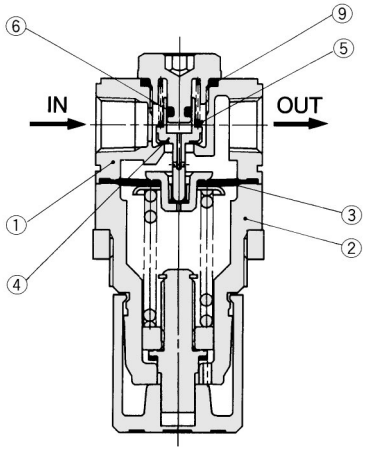
Construction

AR1000

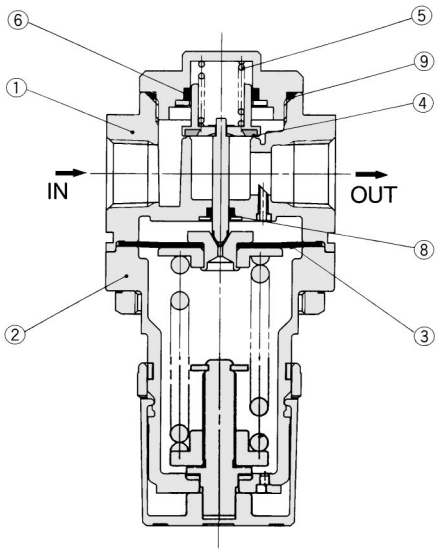
JIS symbol



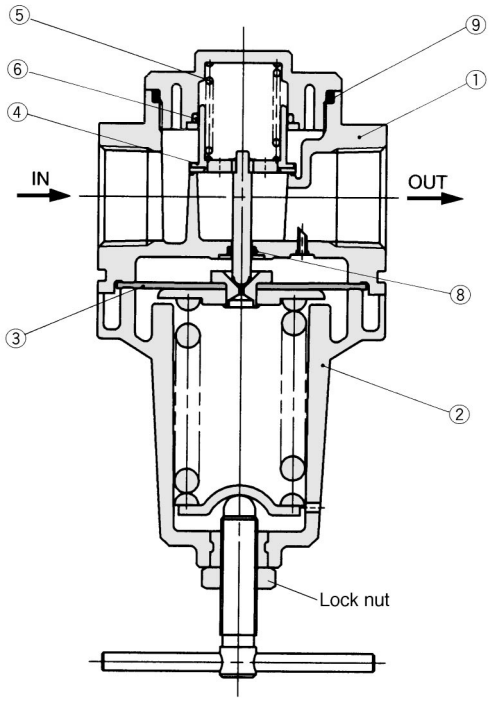
AR2000



AR2500/3000/4000/5000



AR6000



Component Parts

No.	Description	Material			Note
		AR1000/2000	**AR2500/3000**	**AR4000 to AR6000**	
①	Body	Zinc die cast	Aluminum die cast		Painted silver
②	Bonnet	Polyacetal		Aluminum die cast	Painted black

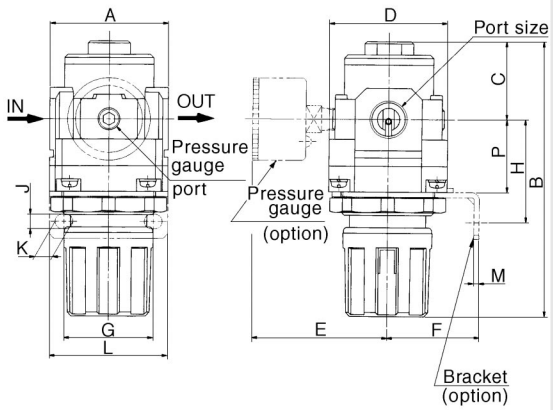
Replacement Parts

No.	Description	Material	Part No.							
			AR1000	**AR2000**	**AR2500**	**AR3000**	**AR4000**	**AR4000-06**	**AR5000**	**AR6000**
③	Diaphragm ass'y	NBR	—	131445A	1349161A	131515A	131614A	131614A	131614A	131815A
④	Valve ass'y	Brass/NBR	134819	1349160	13144A	13154A	13164A	1316102A	131750A	13184A
⑤	Valve spring	Stainless steel	134824	1349158	13143	131558	131613	131613	13174	131810
⑥	Valve O ring	NBR	—	1349247	JISB2401P11	JISB2401P14	131643	131643	131710	131811
⑦	Piston mini Y packing	NBR	MYN-10A	—	—	—	—	—	—	—
⑧	O ring	NBR	—	—	JISB2401P3	JISB2401P5	JISB2401P5	JISB2401P5	JISB2401P5	JISB2401P6
⑨	O ring	NBR	131336	JISB2401P14	JISB2401P22	131545	131647	131647	JISB2401G50	JISB2401G55

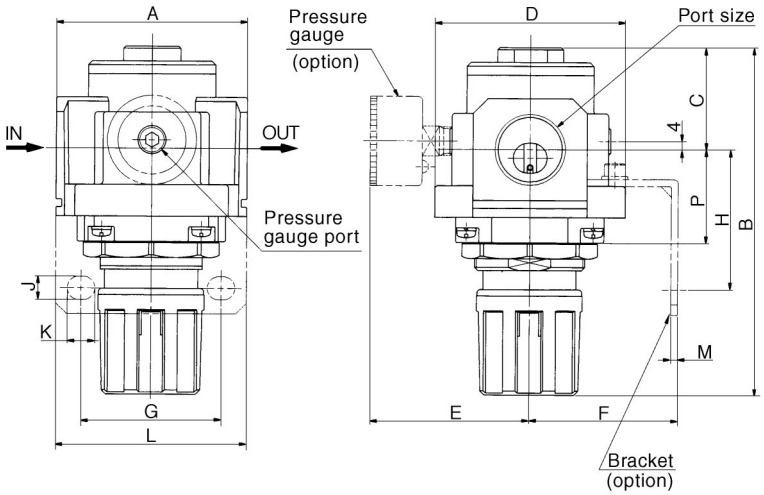
AR1000 to 6000

Dimensions

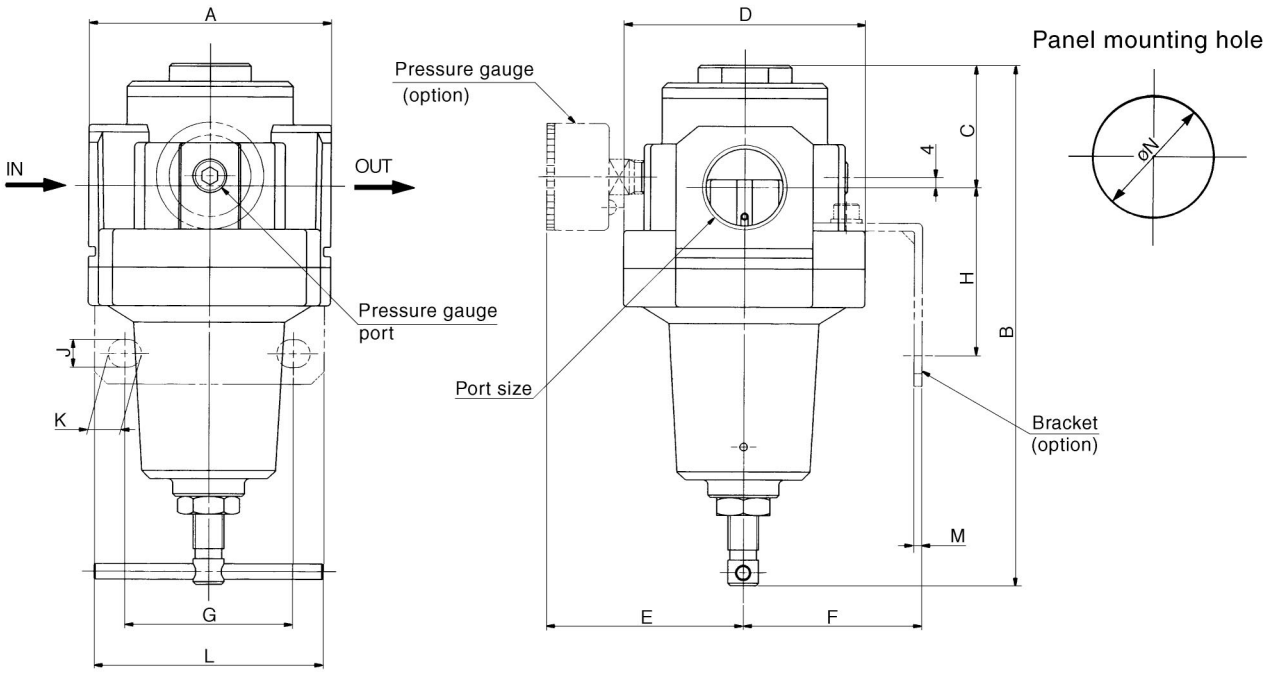
AR1000 to AR4000



AR5000



AR6000



Model	Port size	A	B	C	D	E	Bracket mounting dimensions							øN	P
							F	G	H	J	K	L	M		
AR1000	M5 X 0.8	25	61.5	11	25	26	25	28	30	4.5	6.5	40	2	20.5	19
AR2000	1/8, 1/4	40	95	17	40	56.8	30	34	44	5.4	15.4	55	2.3	33.5	25
AR2500	1/4, 3/8	53	102.5	25	48	60.8	30	34	44	5.4	15.4	55	2.3	33.5	25
AR3000	1/4, 3/8	53	127.5	35	53	60.8	41	40	46	6.5	8	53	2.3	42.5	32.5
AR4000	1/4, 3/8, 1/2	70	149.5	37.5	70	65.5	50	54	54	8.5	10.5	70	2.3	52.5	36
AR4000-06	3/4	75	154.5	40.5	70	69.5	50	54	56	8.5	10.5	70	2.3	52.5	38
AR5000	3/4, 1	90	168	48	90	75.5	70	66	65.8	11	13	90	3.2	52.5	44
AR6000	1	95	204.5	48	95	78	70	66	65.8	11	13	90	3.2	—	—

CAD
AR1000 ——— SAC1000, #2
AR2000 ——— SAC2000, #2
AR3000 ——— SAC2503, #2
AR4000 ——— SAC4000, #2
AR4000-06 ——— SAC4006, #2
AR5000 ——— SAC5000, #2
AR6000 ——— SAC6000, #2

AR2000 to 6000
Made to Order Specifications

❶Special temperature environment

The seal, gasket, and bonnet materials have been changed to a special material to withstand varying environmental conditions such as those in cold climates or tropical regions.

Specifications

Made to Order No.		-X430	-X440
Environment		For low temperature	For high temperature
Ambient temperature°C		–30 to 60	5 to 80
Fluid temperature°C		–5 to 60 (Non-freezing)	–5 to 60 (Non-freezing)
Material	Rubber part	Special NBR	FKM
	Component	Metal (ADC etc.)	Metal (ADC etc.)

Applicable Model

Model	AR2500	AR3000	AR4000	AR4000-06	AR5000	AR6000
Port size	1/4 3/8	1/4 3/8	1/4 3/8 1/2	3/4	3/4 1	1

How to Order

AR **30** 00 – **03** **BG3** – **X430**

Body size

25	1/4
30	3/8
40	1/2
50	3/4
60	1

Port size

02	1/4
03	3/8
04	1/2
06	3/4
10	1

Accessories (Options)

—	None
B	Bracket
G3	Pressure gauge (G43)

For low/high temperature environment

X430	Low temp.
X440	High temp.

❷Metal used for external parts

For environmental conditions in which plastic materials cannot be used, the external parts have been changed to metal materials.

Applicable Model

Model	AR2000	AR2500	AR3000	AR4000	AR4000-06	AR5000
Port size	1/8 1/4	1/4 3/8	1/4 3/8	1/4 3/8 1/2	3/4	3/4 1

How to Order

AR **30** 00 – **03** **BG3** – **X470**

Body size

20	1/8
25	1/4
30	3/8
40	1/2
50	3/4

Port size

01	1/8
02	1/4
03	3/8
04	1/2
06	3/4
10	1

Accessories (Options)

—	None
B	Bracket
G3	Pressure gauge (G43)

External parts metal

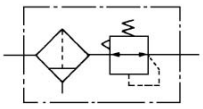
∗"X470" for "AR6000" is not required since metal is used for external parts on the standard model.

Filter Regulator
Series AW10 to 40

Integrated filter and regulator units save space and require less piping.

Direct operated, relieving type

JIS Symbol



Made to Order P. 14-2-72

AW20

AW40

How to Order

AW 30 – F 03 BE – 1N

Filter regulator

Body size

10	20	30	40

Thread type

Nil	Metric thread (M5)
	Rc
N (1)	NPT
F (2)	G

Note 1) Drain guide is NPT 1/4 (applicable to AW30 and 40), and the exhaust port for auto- drain comes with ø3/8" One-touch fitting (applicable to AW30 and AW40).

Note 2) Drain guide is G 1/4 (applicable to AW30 and AW40).

Port size

Symbol	Port size	Body size			
		10	**20**	**30**	**40**
M5	M5	●	—	—	—
01	1/8	—	●	—	—
02	1/4	—	●	●	●
03	3/8	—	—	●	●
04	1/2	—	—	—	●
06	3/4	—	—	—	●

Option

Symbol	Description	Applicable model
1 (5)	0.02 to 0.2 MPa setting	AW10 to 40
2	Metal bowl	AW10 to 40
6	Nylon bowl	AW10 to 40
8	Metal bowl with level gauge	AW30/40
C	With bowl guard	AW20
J (6)	Drain guide 1/4	AW30/40
N	Non-relieving	AW10 to 40
R	Flow direction: Right → Left	AW10 to 40
W	Drain cock with barb fitting: ø6 x ø4 nylon tubing	AW30/40
Z (7)	Name plate, caution plate for bowl, and pressure gauge in imperial units (PSI, °F)	AW10 to 40

∗ When more than one specification is required, indicate in alphanumeric order.

Note 5) The only difference from the standard specifications is the adjusting spring for the regulator. It does not restrict the setting of 0.2 MPa or more.

Note 6) Without a valve function.

Note 7) For M5 and NPT thread types. This product is for overseas use only according to the new Measurement Law. (The SI unit type is provided for use in Japan.)

Accessory (3)

Symbol	Description	Applicable model
Nil	—	—
B	With bracket	AW10 to 40
C	Float type auto-drain (N.C.) (4)	AW10 to 40
D	Float type auto-drain (N.O.) (4)	AW30/40
E	With square embedded type pressure gauge (With limit indicator)	AW20 to 40
G	With round pressure gauge (Without limit indicator)	AW10
	With round pressure gauge (With limit indicator)	AW20 to 40
H	With set nut (For panel mount)	AW10 to 40

Note 3) Optional parts are not assembled and are supplied loose at the time of shipment (except options C, D and E).

Note 4) Applicable tubing O.D for auto drain connection should be ø3/8" in case NPT thread port is chosen.

Accessory/Optional Specifications Combinations

◎: Combination available
○: Varies depending on the model
▭: Combination not available
△: Available only with NPT thread

Accessory/Optional specifications \ Combination		Symbol	Accessory						Optional specifications										Applicable filter regulator		
			B	**C**	**D**	**E**	**G**	**H**	**1**	**2**	**6**	**8**	**C**	**J**	**N**	**R**	**W**	**Z**	**AW10**	**AW20**	**AW30 to 40**
Accessory	With bracket (With set nut)	**B**		◎	○	○	◎		◎	◎	◎	○	○	○	◎	◎	○	△	◎	◎	◎
	Float type auto-drain (N.C.)	**C**	◎			○	◎	◎	◎	◎	◎	○	○		◎	◎		△	◎	◎	◎
	Float type auto-drain (N.O.)	**D**	◎			◎	◎	◎	◎	◎	◎	◎			◎	◎		△			◎
	Square embedded type pressure gauge	**E**	◎	◎	◎			◎	◎	◎	◎	○	○	○	◎	◎	○	△		◎	◎
	Round pressure gauge	**G**	◎	◎	○			◎	◎	◎	◎	○	○	○	◎	◎	○	△	◎	◎	◎
	With set nut (For panel mount)	**H**		◎	○	○	◎		◎	◎	◎	○	○	○	◎	◎	○	△	◎	◎	◎
Optional specifications	0.02 to 0.2 MPa setting	**-1**	◎	◎	○	○	◎	◎		◎	◎	○	○	○	◎	◎	○	△	◎	◎	◎
	Metal bowl	**-2**	◎	◎	○	○	◎	◎	◎					○	◎	◎		△	◎	◎	◎
	Nylon bowl	**-6**	◎	◎	○	○	◎	◎	◎				○	○	◎	◎	○	△	◎	◎	◎
	Metal bowl with level gauge	**-8**	◎	◎	◎	◎	◎	◎	◎					◎	◎	◎		△			◎
	With bowl guard	**-C**	◎	◎		◎	◎	◎	◎		◎				◎	◎		△		◎	
	Drain guide 1/4	**-J**	◎			◎	◎	◎	◎	◎	◎	◎			◎	◎		△			◎
	Non-relieving type	**-N**	◎	◎	○	○	◎	◎	◎	◎	◎	○	○	○		◎	○	△	◎	◎	◎
	Flow direction: Right → Left	**-R**	◎	◎	○	○	◎	◎	◎	◎	◎	○	○	○	◎		○	△	◎	◎	◎
	Drain cock with barb fitting: ø6 x ø4 nylon tubing	**-W**	◎			◎	◎	◎	◎		◎				◎	◎		△			◎
	Name plate, caution plate for bowl, and pressure gauge in imperial units (PSI, °F)	**-Z**	△	△	△	△	△	△	△	△	△	△	△	△	△	△	△		△	△	△

Standard Specifications

Model	AW10	AW20	AW30	AW40	AW40-06
Port sizes	M5 x 0.8	1/8, 1/4	1/4, 3/8	1/4, 3/8, 1/2	3/4
Fluid	Air				
Proof pressure	1.5 MPa				
Maximum operating pressure	1.0 MPa				
Set pressure range	0.05 to 0.7 MPa	0.05 to 0.85 MPa			
Pressure gauge port size (1)	Rc 1/16 (2)	Rc, NPT, G 1/8	Rc, NPT, G 1/8	Rc, NPT, G 1/4	Rc, NPT, G 1/4
Relief pressure	Set pressure + 0.05 MPa (3) (at relief flow rate of 0.1 ℓ/min (ANR))				
Ambient and fluid temperature	–5 to 60°C (With no freezing)				
Nominal filtration rating	5 μm				
Drain capacity (cm³)	2.5	8	25	45	45
Bowl material	Polycarbonate				
Bowl guard	—	Option	Standard		
Construction	Relieving type				
Weight (kg)	0.09	0.32	0.40	0.72	0.75

Note 1) Pressure gauge connection threads are not required for regulators with a square embedded type pressure gauge (AW20 to AW40).
Note 2) Use a bushing (part no: 131368) when connecting R 1/8 pressure gauge to R 1/16 gauge port.
Note 3) Not applicable to AW10.

Accessory Part No.

Accessory \ Applicable model			AW10	AW20	AW30	AW40	AW40-06
Bracket assembly (1)			AR10P-270AS	AW20P-270AS	AR30P-270AS	AR40P-270AS	AR40P-270AS
Set nut			AR10P-260S	AR20P-260S	AR30P-260S	AR40P-260S	AR40P-260S
Pressure gauge (2)	1.0 MPa	Round Type	G27-10-R1	G36-10-□01	G36-10-□01	G46-10-□02	G46-10-□02
		Square embedded type (4)	—	GC3-10AS	GC3-10AS	GC3-10AS	GC3-10AS
	0.2 MPa	Round Type	G27-10-R1 (3)	G36-2-□01	G36-2-□01	G46-2-□02	G46-2-□02
		Square embedded type (4)	—	GC3-2AS	GC3-2AS	GC3-2AS	GC3-2AS
Float type auto-drain (5)		N.O.	—	—	AD38 / AD38N (6)	AD48 / AD48N (6)	AD48 / AD48N (6)
		N.C.	AD17	AD27	AD37 / AD37N (6)	AD47 / AD47N (6)	AD47 / AD47N (6)

Note 1) Assembly includes a bracket and set nuts.
Note 2) □ in part numbers for a round pressure gauge indicates a type of connection thread. No indication is necessary for R; however, indicate N for NPT. Please contact SMC regarding the connection thread NPT and supply of the pressure gauge for PSI unit specifications.
Note 3) For 1 MPa.
Note 4) Includes one O-ring and 2 mounting screws.
Note 5) Minimum operating pressure: N.O. type–0.1 MPa; N.C. type–0.1 MPa (AD17/27) and 0.15 MPa (AD37/47). Please contact SMC regarding the specifications for PSI unit and °F.
Note 6) When "N" is specified in the end of part number of auto-drain, applicable tubing O.D should be ø3/8".

⚠ Precautions

Be sure to read before handling. Refer to pages 14-21-3 to 14-21-4 for Safety Instructions and Common Precautions.

Selection

⚠ Warning

1. Residual pressure release (outlet pressure release) is not completed by releasing inlet pressure. To release residual pressure, use a filter regulator with a back flow mechanism.

Maintenance

⚠ Warning

1. Replace the element every 2 years or when the pressure drop becomes 0.1 MPa, whichever comes first, to prevent damage to the element.

Mounting & Adjustment

⚠ Warning

1. Set the regulator while checking the displayed values of the inlet and outlet pressure gauges. Turning the knob excessively can cause damage to the internal parts.

2. The pressure gauge indicated with regulators for 0.02 to 0.2 MPa setting is for 0.2 MPa use only. Exceeding 0.2 MPa of pressure can damage the gauge.

3. Do not use tools on the pressure regulator knob as this may cause damage. It must be operated manually.

⚠ Caution

1. Be sure to unlock the knob before adjusting the pressure and lock it after setting the pressure.
Failure to follow this procedure can cause damage to the knob and the outlet pressure may fluctuate.

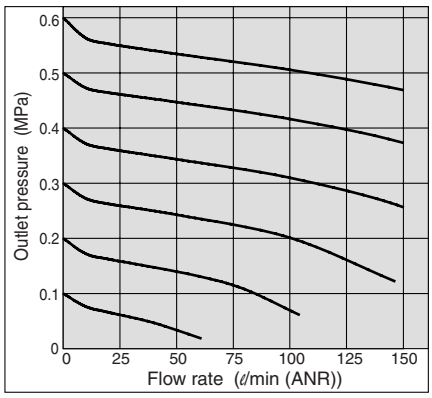
- Pull the pressure regulator knob to unlock. (You can visually verify this with the "orange mark" that appears in the gap.)
- Push the pressure regulator knob to lock. When the knob is not easily locked, turn it left and right a little and then push it (when the knob is locked, the "orange mark" will disappear).

2. A knob cover is available to prevent careless operation of the knob. Refer to page 14-2-6 for details.

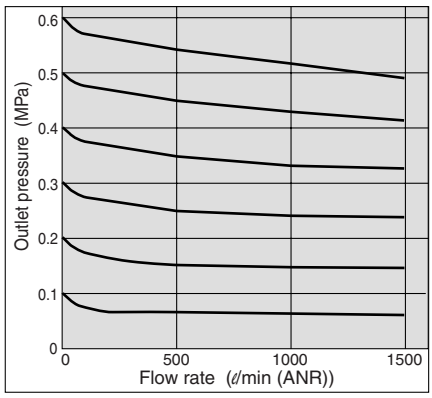
Flow Characteristics (Representative values)

Condition: Inlet pressure 0.7 MPa

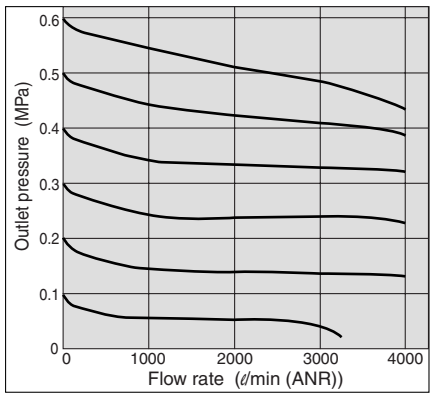
AW10 M5



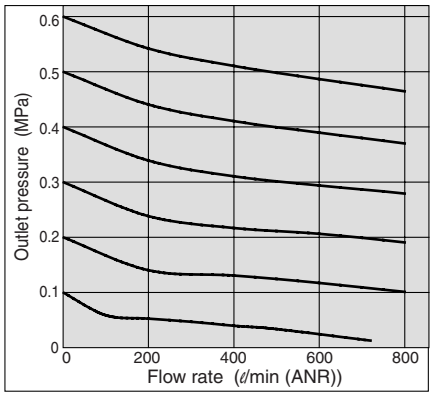
AW30 Rc 3/8



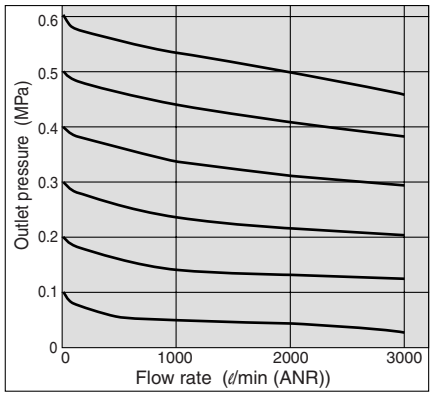
AW40-06 Rc 3/4



AW20 Rc 1/4



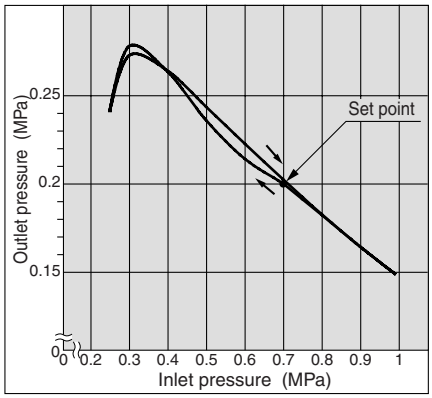
AW40 Rc 1/2



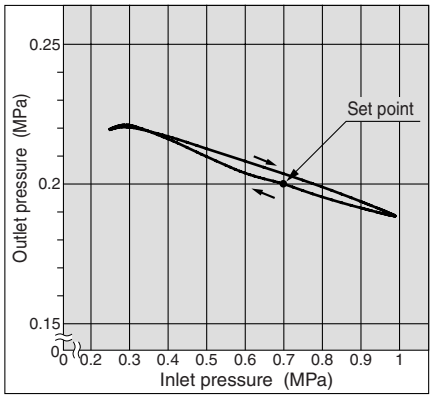
Pressure Characteristics (Representative value)

Conditions: Inlet pressure 0.7 MPa; Outlet pressure 0.2 MPa; Flow rate 20 ℓ/min (ANR)

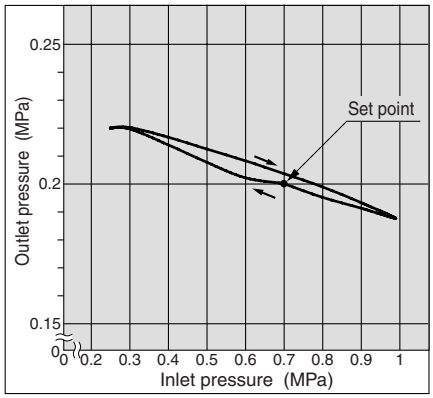
AW10



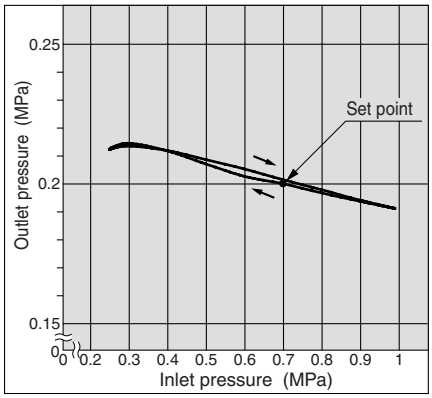
AW30



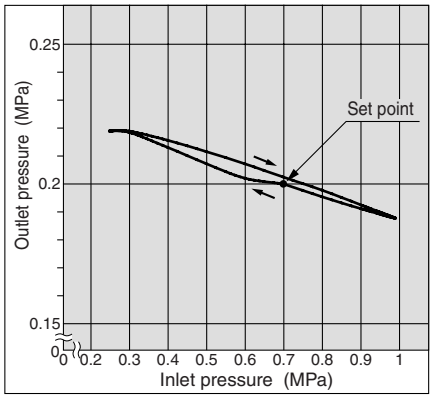
AW40-06



AW20

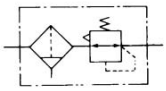


AW40

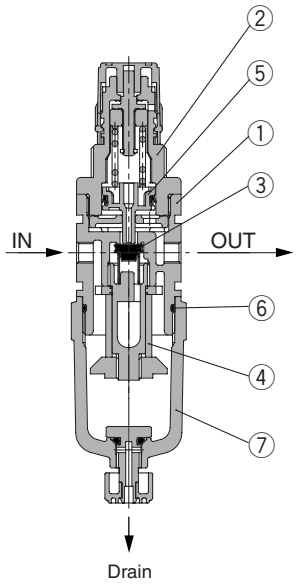


Construction

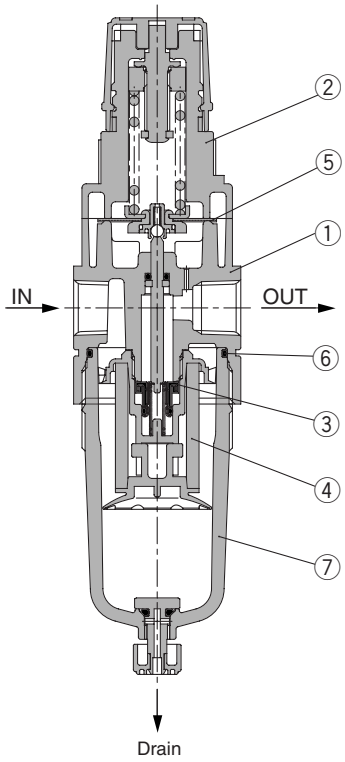
JIS Symbol



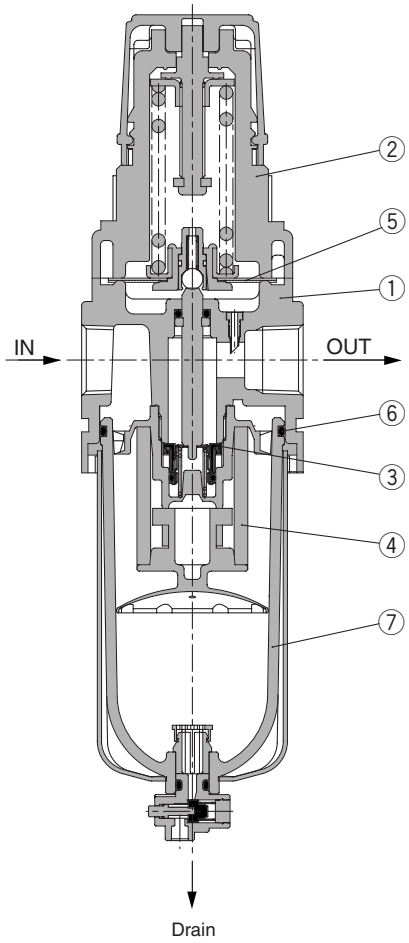
AW10



AW20



AW30/40



Component Parts

No.	Description	Material			Note
		AW10/20	AW30	AW40/40-06	
①	Body	Zinc die-casted	Aluminum die-casted		Platinum silver
②	Bonnet	Polyacetal			Black

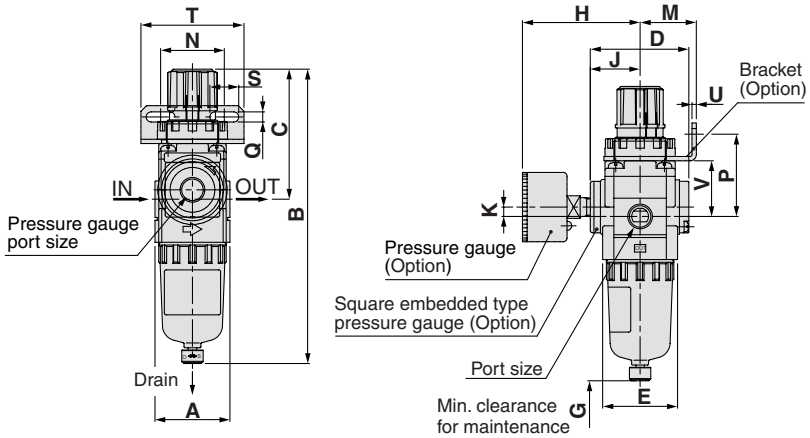
Replacement Parts

No.	Description	Material	Part no.				
			AW10	AW20	AW30	AW40	AW40-06
③	Valve assembly	Stainless steel Brass, HNBR	AR10P-090S	AW20P-360AS (4)	AW30P-360AS (4)	AW40P-360AS (4)	AW40P-380AS (4)
④	Filter element	Non-woven fabric	AF10P-060S	AF20P-060S	AF30P-060S	AF40P-060S	AF40P-060S
⑤	Diaphragm assembly	Weatherability NBR	AR10P-150AS (1)	AR20P-150AS	AR30P-150AS	AR40P-150AS	AR40P-150AS
⑥	Bowl O-ring	NBR	C1SFP-260S	C2SFP-260S	C3SFP-260S	C4SFP-260S	C4SFP-260S
⑦	Bowl assembly (2)	PC	C1SF	C2SF	C3SF (3)	C4SF (3)	C4SF (3)

Note 1) AW10 is a piston and a gasket (KSYP-13) type assembly.
Note 2) Including O-ring. Please contact SMC regarding the bowl assembly supply for PSI and °F unit specifications.
Note 3) Bowl assembly includes a bowl guard (steel band material).
Note 4) Assembly includes valve assembly, valve spring and stem assembly.

Dimensions

AW10/20



Panel fitting dimension

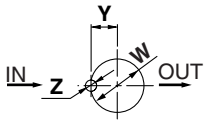
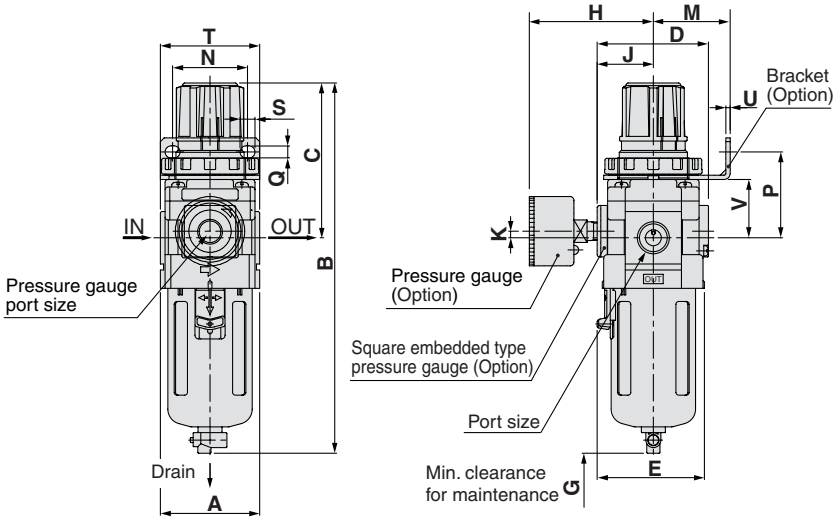


Plate thickness
AW10, AW20: Max. 3.5

AW30/40



Panel fitting dimension

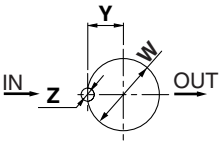
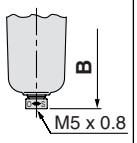
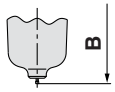
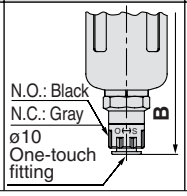
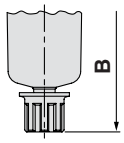
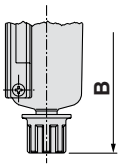
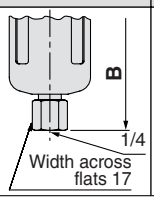
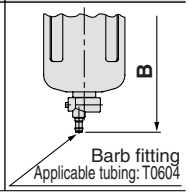


Plate thickness
AW30: Max. 3.5
AW40: 5

Applicable model	AW10, AW20		AW30, AW40, AW40-06				
	With auto-drain (N.C.)	Metal bowl	With auto-drain (N.O./N.C.)	Metal bowl	Metal bowl with level gauge	With drain guide	Drain cock with barb fitting
Optional specifications							

(mm)

Model	Port size	Standard specifications						Accessory specifications														
								With pressure gauge			Bracket mounting size							Panel mount				With auto-drain
		A	B	C	D	E	G	H	J	K	M	N	P	Q	S	T	U	V	W	Y	Z	B
AW10	M5 x 0.8	25	108	48	25	28	25	26	—	0	25	28	30	4.5	6.5	40	2	18	18.5	—	—	125
AW20	1/8, 1/4	40	160	73	52	40	40	63	27	5	30	34	44	5.4	15.4	55	2.3	30	28.5	14	6	177
AW30	1/4, 3/8	53	201	86	59	57	55	66	30.5	3.5	41	40	46	6.5	8	53	2.3	31	38.5	19	7	242
AW40	1/4, 3/8, 1/2	70	239	92	75	73	80	76	38.5	1.5	50	54	54	8.5	10.5	70	2.3	35.5	42.5	21	7	278
AW40-06	3/4	75	242	93	75	73	80	76	38.5	1.2	50	54	56	8.5	10.5	70	2.3	37	42.5	21	7	281

Model	Optional specifications			
	With barb fitting	With drain guide	Metal bowl	Metal bowl with level gauge
	B	B	B	B
AW10	—	—	107	—
AW20	—	—	160	—
AW30	209	208	214	234
AW40	247	246	252	272
AW40-06	250	249	255	275

Filter Regulator with Back Flow Mechanism

Series AW20K/30K/40K

How to Order

AW40K

AW20K

AW | **30** | **K** | **F** | **03** | **BE** | **1N**

Filter regulator

Body size

20	30	40

With back flow mechanism

Note) AW10 comes with a back flow mechanism as a standard feature. If the set pressure is not exceeding 0.15 MPa, back flow may not occur. When a back flow mechanism is required with a set pressure of less than 0.15 MPa, please contact SMC.

Thread type

Nil	Rc
N (1)	NPT
F (2)	G

Note 1) Drain guide is NPT 1/4 (applicable to AW30K and 40K), and the exhaust port for auto-drain comes with ø3/8" One-touch fitting (applicable to AW30K and AW40K).

Note 2) Drain guide is G 1/4 (applicable to AW30K and AW40K).

Port size

Symbol	Port size	Body size 20	30	40
01	1/8	●	—	—
02	1/4	●	●	●
03	3/8	—	●	●
04	1/2	—	—	●
06	3/4	—	—	●

Option

Symbol	Description	Applicable model
1 (4)	0.02 to 0.2 MPa setting	AW20K to 40K
2	Metal bowl	AW20K to 40K
6	Nylon bowl	AW20K to 40K
8	Metal bowl with level gauge	AW30K/40K
C	With bowl guard	AW20K
J (5)	Drain guide 1/4	AW30K/40K
N	Non-relieving type	AW20K to 40K
R	Flow direction: Right → Left	AW20K to 40K
W	Drain cock with barb fitting: ø6 x ø4 nylon tubing	AW30K/40K
Z (6)	Name plate, caution plate for bowl, and pressure gauge in imperial units (PSI, °F)	AW20K to 40K

∗ When more than one specification is required, indicate in alphanumeric order.

Note 4) The only difference from the standard specifications is the adjusting spring for the regulator. It does not restrict the setting of 0.2 MPa or more.

Note 5) Without a valve function.

Note 6) For NPT thread type. This product is for overseas use only according to the new Measurement Law. (The SI unit type is provided for use in Japan.)

Accessory (3)

Symbol	Description	Applicable model
Nil	—	—
B	With bracket	AW20K to 40K
C	Float type auto-drain (N.C.) (2)	AW20K to 40K
D	Float type auto-drain (N.O.) (2)	AW30K/40K
E	With square embedded type pressure gauge (With limit indicator)	AW20K to 40K
G	With round pressure gauge (With limit indicator)	AW20K to 40K
H	With set nut (For panel mount)	AW20K to 40K

Note 1) Optional parts are not assembled and are supplied loose at the time of shipment (except options C, D and E).

Note 2) Applicable tubing O.D for auto drain connection should be ø3/8" in case NPT thread port is chosen.

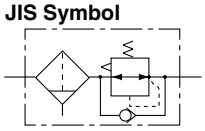
Standard Specifications

Model	AW20K	AW30K	AW40K	AW40K-06
Port sizes	1/8, 1/4	1/4, 3/8	1/4, 3/8, 1/2	3/4
Fluid	Air			
Proof pressure	1.5 MPa			
Maximum operating pressure	1.0 MPa			
Set pressure range (1)	0.05 to 0.85 MPa			
Pressure gauge port size (2)	Rc, NPT, G 1/8	Rc, NPT, G 1/8	Rc, NPT, G 1/4	Rc, NPT, G 1/4
Relief pressure	Set pressure + 0.05 MPa (at relief flow rate of 0.1ℓ/min (ANR))			
Ambient and fluid temperature	–5 to 60°C (With no freezing)			
Nominal filtration rating	5 μm			
Drain capacity (cm³)	8	25	45	45
Bowl material	Polycarbonate			
Bowl guard	Option	Standard		
Construction	Relieving type			
Weight (kg)	0.32	0.40	0.72	0.75

Note 1) Set the inlet pressure 0.05 MPa or higher than the set pressure.

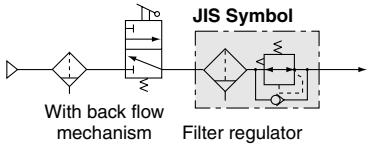
Note 2) Pressure gauge connection threads are not required for regulators with a square embedded type pressure gauge (AW20K to AW40K).

JIS Symbol



Circuit Diagram

When the air supply is cut off and releasing the inlet pressure to the atmosphere, the residual pressure release of the outlet side can be ensured for a safety purpose.



Accessory Part No.

Accessory \ Applicable model			AW20K	AW30K		AW40K		AW40K-06	
Bracket assembly (1)			AW20P-270AS	AR30P-270AS		AR40P-270AS		AR40P-270AS	
Set nut			AR20P-260S	AR30P-260S		AR40P-260S		AR40P-260S	
Pressure gauge (2)	1.0 MPa	Round type	G36-10-□01	G36-10-□01		G46-10-□02		G46-10-□02	
		Square embedded type (3)	GC3-10AS	GC3-10AS		GC3-10AS		GC3-10AS	
	0.2 MPa	Round type	G36-2-□01	G36-2-□01		G46-2-□02		G46-2-□02	
		Square embedded type (3)	GC3-2AS	GC3-2AS		GC3-2AS		GC3-2AS	
Float type auto-drain (4)		N.O.	—	AD38	AD38N (5)	AD48	AD48N (5)	AD48	AD48N (5)
		N.C.	AD27	AD37	AD37N (5)	AD47	AD47N (5)	AD47	AD47N (5)

Note 1) Assembly includes a bracket and set nuts.

Note 2) □ in part numbers for a round pressure gauge indicates a type of connection thread. No indication is necessary for R; however, indicate N for NPT. Please contact SMC regarding the connection thread NPT and pressure gauge supply for PSI unit specifications.

Note 3) Includes one O-ring and 2 mounting screws.

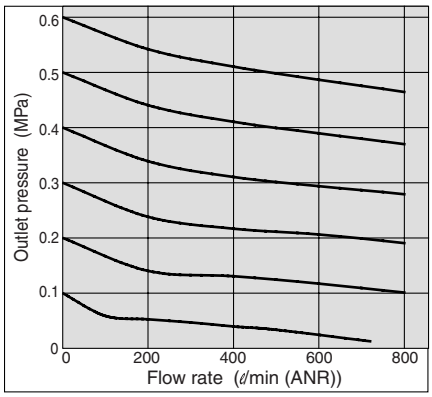
Note 4) Minimum operating pressure: N.O. type–0.1 MPa; N.C. type–0.1 MPa (AD27) and 0.15 MPa (AD37/47). Please contact SMC regarding the specifications for PSI unit and °F.

Note 5) When "N" is specified in the end of part number of auto-drain, applicable tubing O.D should be ø3/8".

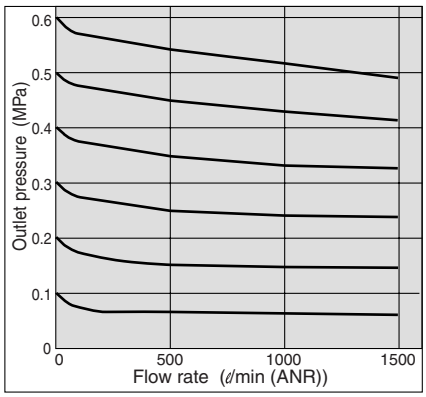
Flow Characteristics (Representative values)

Condition:
Inlet pressure 0.7 MPa

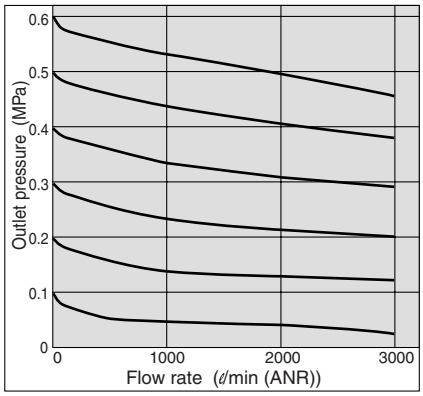
AW20K Rc 1/4



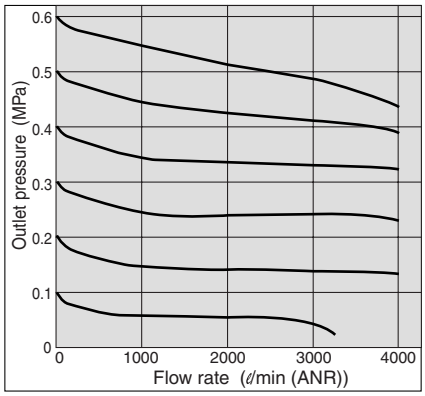
AW30K Rc 3/8



AW40K Rc 1/2



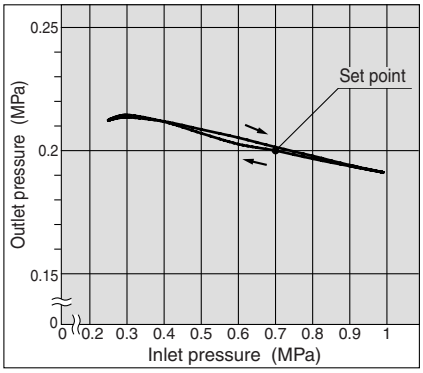
AW40K-06 Rc 3/4



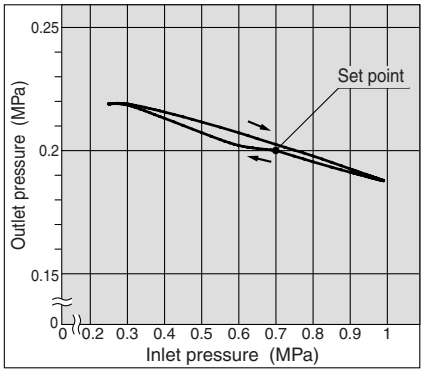
Pressure Characteristics (Representative values)

Conditions:
Inlet pressure 0.7 MPa
Outlet pressure 0.2 MPa
Flow rate 20 ℓ/min (ANR)

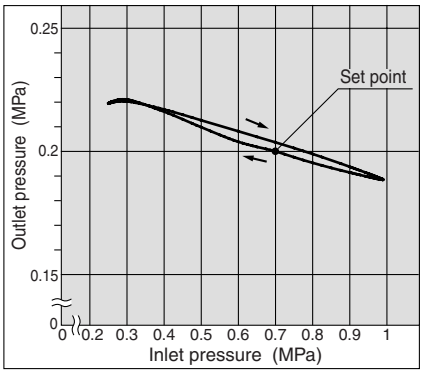
AW20K



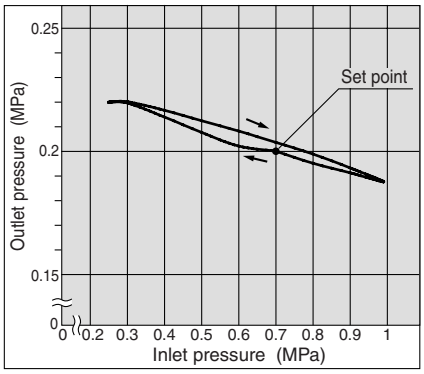
AW40K



AW30K



AW40K-06



⚠ Precautions

Be sure to read before handling. Refer to pages 14-21-3 to 14-21-4 for Safety Instructions and Common Precautions.

Mounting & Adjustment

⚠ Warning

1. Set the regulator while checking the displayed values of the inlet and outlet pressure gauges. Turning the knob excessively can cause damage to the internal parts.

2. The pressure gauge included with regulators for 0.02 to 0.2 MPa setting is for up to 0.2 MPa use. Exceeding 0.2 MPa of pressure can damage the gauge.

3. Do not use tools on the pressure regulator knob as this may cause damage. It must be operated manually.

⚠ Caution

1. Be sure to unlock the knob before adjusting the pressure and lock it after setting the pressure.

   Failure to follow this procedure can cause damage to the knob and the outlet pressure may fluctuate.

- Pull the pressure regulator knob to unlock. (You can visually verify this with the "orange mark" that appears in the gap.)
- Push the pressure regulator knob to lock. When the knob is not easily locked, turn it left and right a little and then push it (when the knob is locked, the "orange mark", i.e., the gap will disappear).

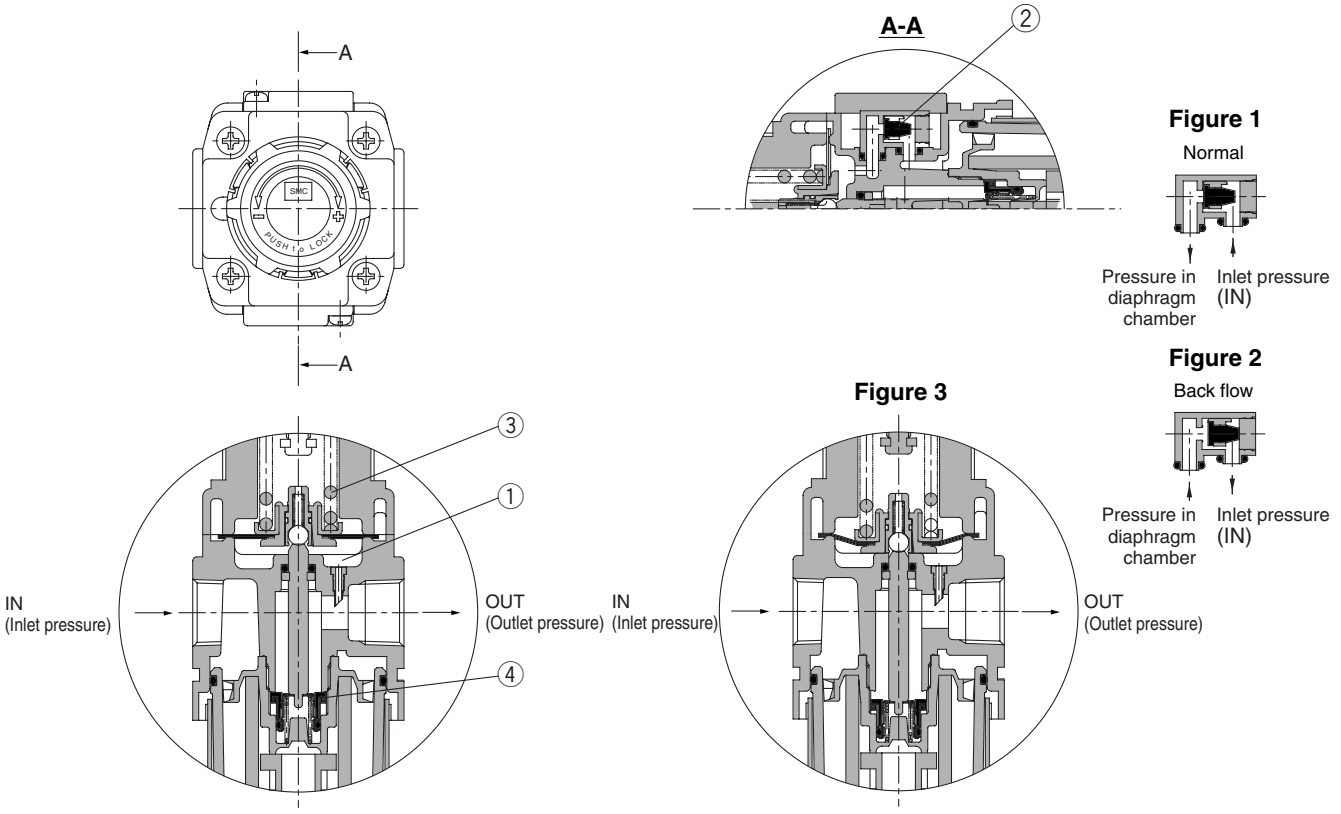
2. A knob cover is available to prevent careless operation of the knob. Refer to page 14-2-6 for details.

Maintenance

⚠ Warning

1. Replace the element every 2 years or when the pressure drop becomes 0.1 MPa, whichever comes first to prevent damage to the element.

Working Principle



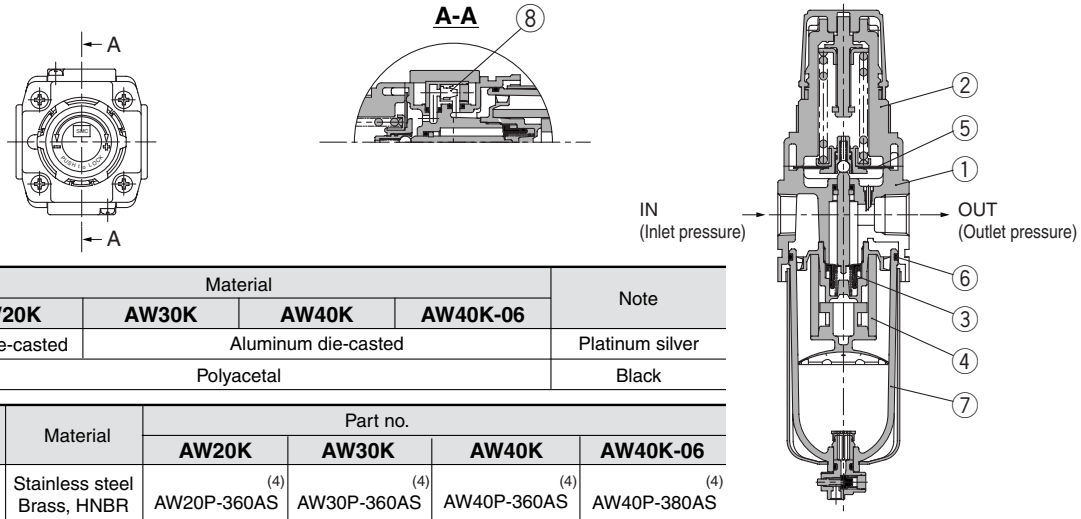
When the inlet pressure (P1) is higher than the set pressure, the check valve ② closes and operates as a normal regulator (Figure 1).

When the inlet pressure (P1) is shut off and released, the check valve ②, opens and the pressure in the diaphragm chamber ① is released into the inlet side (Figure 2).

This lowers the pressure in the diaphragm chamber ①, and the force generated by pressure regulator spring ③ lifts the diaphragm. Valve ④ opens through the stem, and the outlet pressure is released to the inlet side (Figure 3).

Construction

AW20K to 40K



Component Parts

No.	Description	Material				Note
		AW20K	AW30K	AW40K	AW40K-06	
①	Body	Zinc die-casted	Aluminum die-casted			Platinum silver
②	Bonnet	Polyacetal				Black

No.	Description	Material	Part no.			
			AW20K	AW30K	AW40K	AW40K-06
③	Valve assembly	Stainless steel Brass, HNBR	(4) AW20P-360AS	(4) AW30P-360AS	(4) AW40P-360AS	(4) AW40P-380AS
④	Filter element	Non-woven fabric	AF20P-060S	AF30P-060S	AF40P-060S	AF40P-060S
⑤	Diaphragm assembly	Weatherability NBR	AR20P-150AS	AR30P-150AS	AR40P-150AS	AR40P-150AS
⑥	Bowl O-ring	NBR	C2SFP-260S	C3SFP-260S	C4SFP-260S	C4SFP-260S
⑦	Bowl assembly (1)	PC	C2SF	C3SF (2)	C4SF (2)	C4SF (2)
⑧	Check valve assembly (3)	POM, PBT	AR20KP-020AS	AR20KP-020AS	AR20KP-020AS	AR20KP-020AS

Note 1) Including O-ring. Please contact SMC regarding the bowl assembly supply for PSI and °F unit specifications.
Note 2) Bowl assembly includes a bowl guard (steel band material).
Note 3) Check valve assembly includes check valve cover, check valve body assembly and screws (2 pcs.).
Note 4) Assembly includes valve assembly, valve spring and stem assembly.

Dimensions

AW20K/30K/40K

Panel fitting dimension

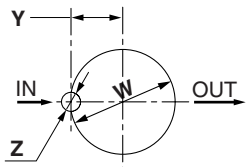
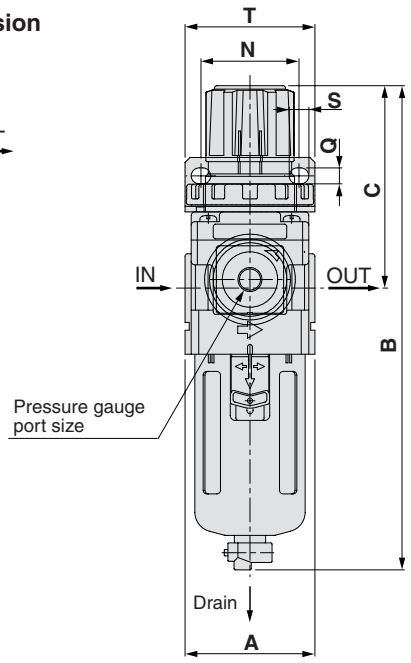
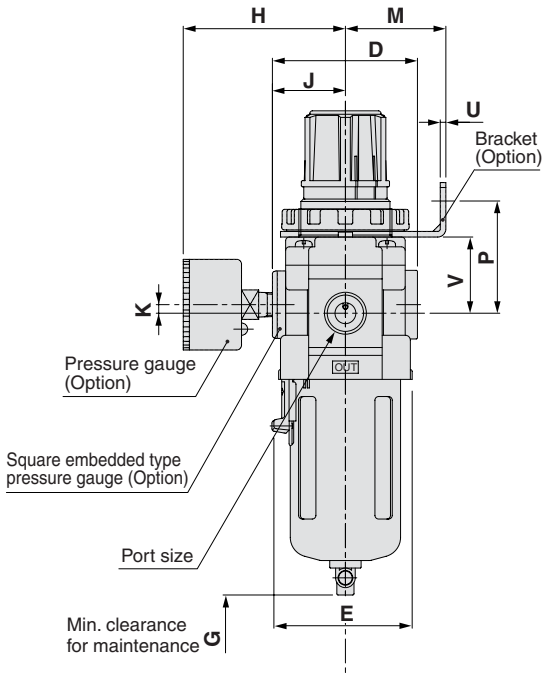
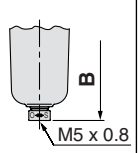
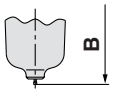
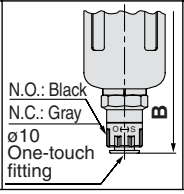
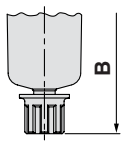
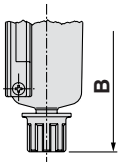
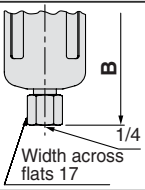
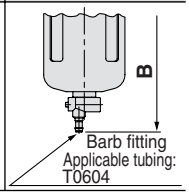


Plate thickness
AW20K, 30K: Max. 3.5
AW40K: Max. 5





Applicable model	AW20K		AW30K, AW40K, AC40K-06				
	With auto-drain (N.C.)	Metal bowl	With auto-drain (N.O./N.C.)	Metal bowl	Metal bowl with level gauge	With drain guide	Drain cock with barb fitting
Optional specifications							

(mm)

Model	Port size	Standard specifications						Accessory specifications														
								With pressure gauge			Bracket mounting size							Panel mount				With auto-drain
		A	B	C	D	E	G	H	J	K	M	N	P	Q	S	T	U	V	W	Y	Z	B
AW20K	1/8, 1/4	40	160	73	52	40	40	63	27	5	30	34	44	5.4	15.4	55	2.3	30	28.5	14	6	177
AW30K	1/4, 3/8	53	201	86	59	57	55	66	30.5	3.5	41	40	46	6.5	8	53	2.3	31	38.5	19	7	242
AW40K	1/4, 3/8, 1/2	70	239	92	75	73	80	76	38.5	1.5	50	54	54	8.5	10.5	70	2.3	35.5	42.5	21	7	278
AW40K-06	3/4	75	242	93	75	73	80	76	38.5	1.2	50	54	56	8.5	10.5	70	2.3	37	42.5	21	7	281

Model	Port size	Optional specifications			
		With barb fitting	With drain guide	Metal bowl	Metal bowl with level gauge
		B	B	B	B
AW20K	1/8, 1/4	—	—	160	—
AW30K	1/4, 3/8	209	208	214	234
AW40K	1/4, 3/8, 1/2	247	246	252	272
AW40K-06	3/4	250	249	255	275

Filter Regulator *Series AW20 to 40*

Made to Order Specifications:

Please contact SMC for detailed dimensions, specifications, and lead times.

1. Special Temperature Environment

Special materials are used in the manufacturing of seals and resin parts to allow them to withstand various temperature conditions in cold or tropical (hot) regions.

Specifications

Part no.		-X430	-X440
Environment		Low temperature	High temperature
Ambient temperature		–30 to 60°C	–5 to 80C°
Fluid temperature		–5 to 60°C (With no freezing)	
Material	Rubber parts	Special NBR	FPM
	Main parts	Aluminum die-casted	

Applicable Model

Model	AW30	AW40	AW40-06
Port size	1/4, 3/8	1/4, 3/8, 1/2	3/4

How to Order

AW 30 – F 03 BG – 2 N – X430

Filter regulator

Body size

30	40

Thread type

Nil	Rc
N (1)	NPT
F (2)	G

Note 1) Drain guide is NPT 1/4 (applicable to AW30 to 40)
Note 2) Drain guide is G 1/4 (applicable to AW30 to 40).

Port size

Symbol	Port size	Body size 30	Body size 40
02	1/4	●	●
03	3/8	●	●
04	1/2	—	●
06	3/4	—	●

For high/low temperature

X430	Low temperature
X440	High temperature

Option (3)

Symbol	Description	Applicable model
Nil	—	—
B	With bracket	AW30/40
G (4)	With round pressure gauge (With limit indicator)	AW30/40
H	With set nut (For panel mount)	AW30/40

Note 3) Bracket is not assembled and is supplied loose at the time of shipment.
Note 4) Mounting thread for pressure gauge: 1/8 for AW30; 1/4 for AW40
Pressure gauge type: G43

Bowl

Symbol	Description	Applicable model
Nil (5)	Metal bowl	AW30/40

Note 5) Only metal bowl available

Option

Symbol	Description	Applicable model
1 (6)	0.02 to 0.2 MPa setting	AW30/40
J (7)	Drain guide 1/4	AW30/40
N	Non-relieving type	AW30/40
R	Flow direction: Right → Left	AW30/40
Z (8)	Name plate, caution plate for bowl, and pressure gauge in imperial units (PSI, °F)	AW30/40

∗ When more than one specification is required, indicate in ascending alphanumeric order.
Note 6) The only difference from the standard specifications is the adjusting spring for the regulator. It does not restrict the setting of 0.2 MPa or more.
Note 7) Without a valve function.
Note 8) For thread type NPT. This product is for overseas use only according to the new Measurement Law. (The SI unit type is provided for use in Japan.)

2. High Pressure

Strong materials are used in the manufacturing of air filters intended for high pressure operation.

Specifications

Part no.	-X425
Proof pressure	3.0 MPa
Max. operating pressure	2.0 MPa
Set pressure range	0.1 to 1.6 MPa
Ambient and fluid temperature	–5 to 60°C (With no freezing)

Applicable Model

Model	AW20	AW30	AW40	AW40-06
Port size	1/8, 1/4	1/4, 3/8	1/4, 3/8, 1/2	3/4

How to Order

AW 30 – F 03 BG – 2 N – X425

Filter regulator

Body size

20	30	40

Thread type

Nil	Rc
N (1)	NPT
F (2)	G

Note 1) Drain guide is NPT 1/4 (applicable to AW30 to 40)
Note 2) Drain guide is G 1/4 (applicable to AW30 to 40).

Port size

Symbol	Port size	Body size 20	Body size 30	Body size 40
01	1/8	●	—	—
02	1/4	●	●	●
03	3/8	—	●	●
04	1/2	—	—	●
06	3/4	—	—	●

For high pressure

Option (3)

Symbol	Description	Applicable model
Nil	—	—
B	With bracket	AW20/40
G (4)	With round pressure gauge (With limit	AW20/40
H	indicator)	AW20/40

Note 3) Bracket is not assembled and is supplied loose at the time of shipment.
Note 4) Mounting thread for pressure gauge: 1/8 for AW20 to 30; 1/4 for AW40
Pressure gauge type: G46

Bowl

Symbol	Description	Applicable model
2 (5)	Metal bowl	AW20 to 40
8 (5)	Metal bowl with level gauge	AW30/40

Note 5) Only metal bowl or metal bowl with level gauge available.

Optional specifications

Symbol	Description	Applicable model
J (6)	Drain guide 1/4	AW30/40
N	Non-relieving type	AW20 to 40
R	Flow direction: Right → Left	AW20 to 40
Z (7)	Name plate, caution plate for bowl, and pressure gauge in imperial units (PSI, °F)	AW20 to 40

∗ When more than one specification is required, indicate in ascending alphanumeric order.
Note 6) Without a valve function.
Note 7) For thread type NPT.
This product is for overseas use only according to the new Measurement Law. (The SI unit type is provided for use in Japan.)

Note 9) Please consult with SMC for detailed dimensions and available attachments and options.
Note 10) Comes with type T handle.

Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by labels of **"Caution", "Warning"** or **"Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠ **Caution :** Operator error could result in injury or equipment damage.

⚠ **Warning :** Operator error could result in serious injury or loss of life.

⚠ **Danger :** In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power--General rules relating to systems.
Note 2) JIS B 8370: General Rules for Pneumatic Equipment

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driver objects have been confirmed.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc.

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Common Precautions

Be sure to read before handling.
For detailed precautions on every series, refer to main text.

Selection

⚠ Warning

1. Confirm the specifications.

Products represented in this catalog are designed for use in compressed air appllications only (including vacuum), unless otherwise indicated.
Do not use the product outside their design parameters.
Please contact SMC when using the products in applications other than compressed air (including vacuum).

Mounting

⚠ Warning

1. Instruction manual

Install the products and operate them only after reading the instruction manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

2. Securing the space for maintenance

When installing the products, please allow access for maintenance.

3. Tightening torque

When installing the products, please follow the listed torque specifications.

Piping

⚠ Caution

1. Before piping

Make sure that all debris, cutting oil, dust, etc, are removed from the piping.

2. Wrapping of pipe tape

When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not get inside the piping. Also, when the pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.

Air Supply

⚠ Warning

1. Operating fluid

Please consult with SMC when using the product in applications other than compressed air (including vacuum).
Regarding products for general fluid, please ask SMC about applicable fluids.

2. Install an air dryer, aftercooler, etc.

Excessive condensate in a compressed air system may cause valves and other pneumatic equipment to malfunction.
Installation of an air dryer, after cooler etc. is recommended.

3. Drain flushing

If condensate in the drain bowl is not emptied on a regular basis, the bowl will over flow and allow the condensate to enter the compressed air lines.
If the drain bowl is difficult to check and remove, it is recommended that a drain bowl with the auto-drain option be installed.
For compressed air quality, refer to “Air Preparation Equipment” catalog.

4. Use clean air

If the compressed air supply is contaminated with chemicals, cynthetic materials, corrosive gas, etc., it may lead to break down or malfunction.

Operating Environment

⚠ Warning

1. Do not use in environments where the product is directly exposed to corrosive gases, chemicals, salt water, water or steam.

2. Do not expose the product to direct sunlight for an extended period of time.

3. Do not use in a place subject to heavy vibrations and/or shocks.

4. Do not mount the product in locations where it is exposed to radiant heat.

Maintenance

⚠ Warning

1. Maintenance procedures are outlined in the operation manual.

Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.

2. Maintenance work

If handled improperly, compressed air can be dangerous.
Assembly, handling and repair of pneumatic systems should be performed by qualified personnel only.

3. Drain flushing

Remove drainage from air filters regularly. (Refer to the specifications.)

4. Shut-down before maintenance

Before attempting any kind of maintenance make sure the supply pressure is shut of and all residual air pressure is released from the system to be worked on.

5. Start-up after maintenance and inspection

Apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, please verify product set-up parameters.

6. Do not make any modifications to be product.

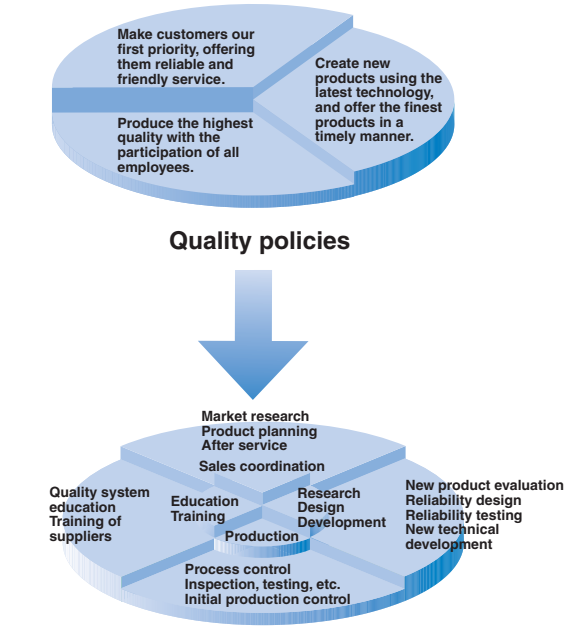
Do not take the product apart.

Quality Assurance Information (ISO 9001, ISO 14001)

Reliable quality of products in the global market

To enable our customers throughout the world to use our products with even greater confidence, SMC has obtained certification for international standards “ISO 9001” and “ISO 14001”, and created a complete structure for quality assurance and environmental controls. SMC products pursue to meet its customers’ expectations while also considering company’s contribution in society.

SMC’s quality control system



Quality management system

ISO 9001

This is an international standard for quality control and quality assurance. SMC has obtained a large number of certifications in Japan and overseas, providing assurance to our customers throughout the world.



Environmental management system

ISO 14001

This is an international standard related to environmental management systems and environmental inspections. While promoting environmentally friendly automation technology, SMC is also making diligent efforts to preserve the environment.



SMC Product Conforming to Inter

SMC products complying with EN/ISO, CSA/UL standards are supporting

CE Mark

The CE mark indicates that machines and components meet essential requirements of all the EC Directives applied.
It has been obligatory to apply CE marks indicating conformity with EC Directives when machines and components are exported to the member Nations of the EU.
Once “A manufacturer himself” declares a product to be safe by means of CE marking (declaration of conformity by manufacturer), free distribution inside the member Nations of the EU is permissible.

■ CE Mark

SMC provides CE marking to products to which EMC and Low Voltage Directives have been applied, in accordance with CETOP (European hydraulics and pneumatics committee) guide lines.

■ As of February 1998, the following 18 countries will be obliged to conform to CE mark legislation

Iceland, Ireland, United Kingdom, Italy, Austria, Netherlands, Greece, Liechtenstein, Sweden, Spain, Denmark, Germany, Norway, Finland, France, Belgium, Portugal, Luxembourg

■ EC Directives and Pneumatic Components

• Machinery Directive

The Machinery Directive contains essential health and safety requirements for machinery, as applied to industrial machines e.g. machine tools, injection molding machines and automatic machines. Pneumatic equipment is not specified in Machinery Directive. However, the use of SMC products that are certified as conforming to EN Standards, allows customers to simplify preparation work of the Technical Construction File required for a Declaration of Conformity.

• Electromagnetic Compatibility (EMC) Directive

The EMC Directive specifies electromagnetic compatibility. Equipment which may generate electromagnetic interference or whose function may be compromised by electromagnetic interference is required to be immune to electromagnetic affects (EMS/immunity) without emitting excessive electromagnetic affects (EMI/emission).

• Low Voltage Directive

This directive is applied to products, which operate above 50 VAC to 1000 VAC and 75 VDC to 1500 VDC operating voltage, and require electrical safety measures to be introduced.

• Simple Pressure Vessels Directive

This directive is applied to welded vessels whose maximum operating pressure (PS) and volume of vessel (V) exceed 50 bar/L. Such vessels require EC type examination and then CE marking.

national Standards

you to comply with EC directives and CSA/UL standards.

Mark of compliance for CSA/UL

Mark of compliance for CSA

NRTL /C

■ CSA Standards & UL Standards

UL and CSA standards have been applied in North America (U.S.A. and Canada) symbolizing safety of electric products, and are defined to mainly prevent danger from electric shock or fire, resulting from trouble with electric products. Both UL and CSA standards are acknowledged in North America as the first class certifying body. They have a long experience and ability for issuing product safety certificate. Products approved by CSA or UL standards are accepted in most states and governments beyond question.
Since CSA is a test certifying body as the National Recognized Testing Laboratory (NRTL) within the jurisdiction of Occupational Safety and Health Administration (OSHA), SMC was tested for compliance with CSA Standards and UL Standards at the same time and was approved for compliance with the two Standards. The above CSA NRTL/C logo is described on a product label in order to indicate that the product is approved by CSA and UL Standards.

■ TSSA (MCCR) Registration Products

TSSA is the regulation in Ontario State, Canada. The products that the operating pressure is more than 5 psi (0.03 MPa) and the piping size is bigger than 1 inch. fall into the scope of TSSA regulation.

Products conforming to CE Standard

With CE symbol for simple visual recognition

In this catalog each accredited product series is indicated with a CE mark symbol. However, in some cases, every available models may not meet CE compliance. Please visit our web site for the latest selection of available models with CE mark.

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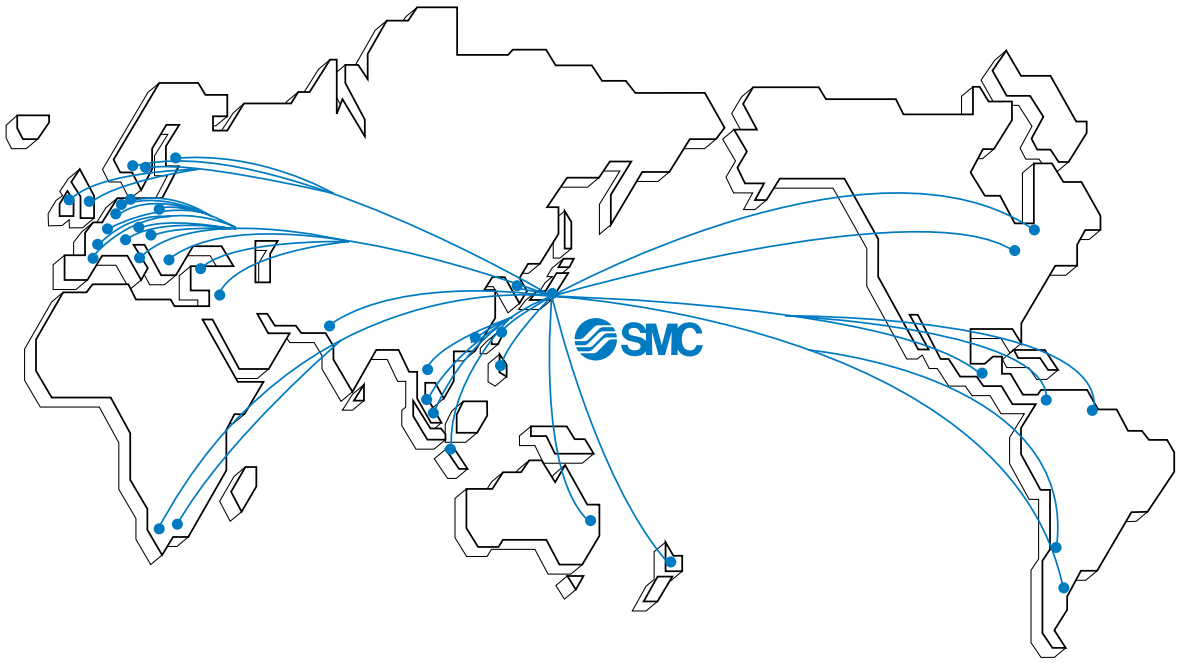

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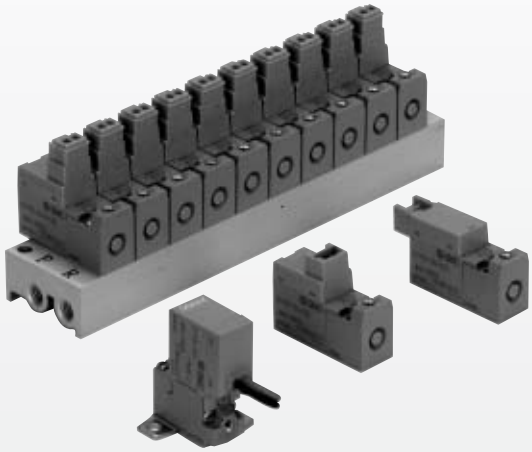
3 Port Solenoid Valve
Rubber Seal
Series SY100

Low power consumption: 0.5 W (Standard, Without indicator light) (Current draw: 21 mA at 24 VDC)

∗ Large flow type: 0.75 W (Current draw: 31 mA at 24 VDC)
[Energy saving type [0.22 W] is available, too. For details, refer to catalog on page 4-3-15.]
[Low wattage [0.45 W] is available, too. For details, refer to catalog on page 4-3-15.]

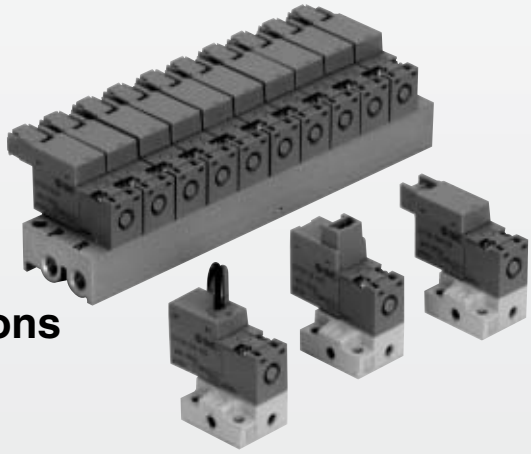
Body width: 10 mm

Effective area 0.14 mm² (Standard type)
Effective area 0.22 mm² (Large flow type)



High reliability

100 million cycles or more (By SMC life test data)



Available in vacuum applications

(Up to –100 kPa)

Copper-free

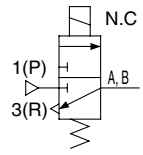
No copper used for sections in contact with fluids.

Bright color tone and neat design

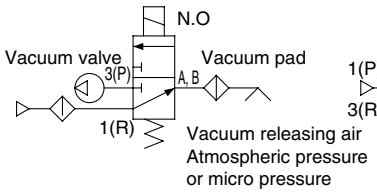
A bright gray concept has been adopted for this product to compliment the surrounding operational environment.

SY100/Application Example (Pneumatic JIS symbols shown are typical examples.)

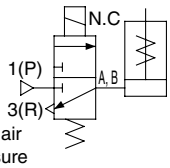
1. For blowing off



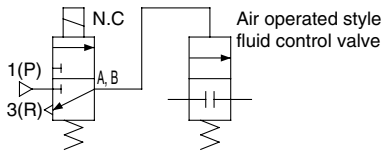
2. For vacuum control



3. For driving single acting cylinders



4. For driving air operated valves for fluid control



The characteristic values shown in the catalog are representative values, not warranting the performance.

⚠Precautions

Be sure to read before handling. For Safety Instructions and Solenoid Valve Precautions, refer to page 4-18-2.

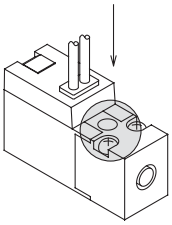
Manual Override Operation

⚠Warning

Since connected equipment will be actuated when the manual override is operated,first confirm that conditions are safe.

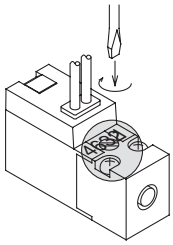
■ Non-locking push type [Standard type]

Press in the direction of the arrow

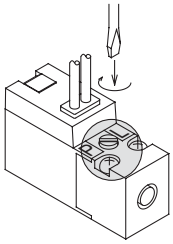


■ Locking slotted type [B]

Turn in the direction of arrow.



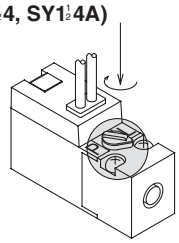
■ Push-turn locking slotted type [D]



Pressing makes the valve operate. The valve can be locked in the manual override position by turning it to the direction that the arrow shows while keeping it pressed. If it is not turned, it can be used as a non-locking push type.

■ Push-turn locking lever type [E]

(SY1$\frac{1}{2}$4, SY1$\frac{1}{2}$4A)



Pressing makes the valve operate. The valve can be locked in the manual override position by turning it to the direction that the arrow shows while keeping it pressed. If it is not turned, it can be used as a non-locking push type.

⚠Caution

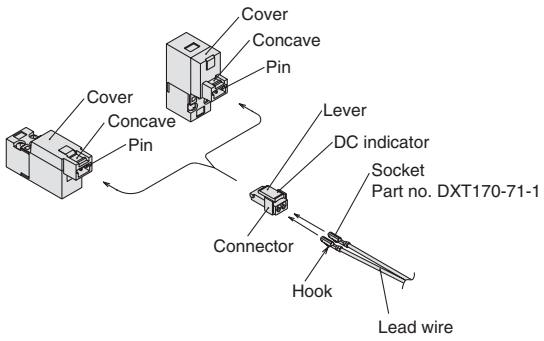
When operating the lock with the driver, use a watchmakers' screwdriver and turn lightly.
[Torque: 0.1 N·m or less]

How to Use Plug Connector

⚠Caution

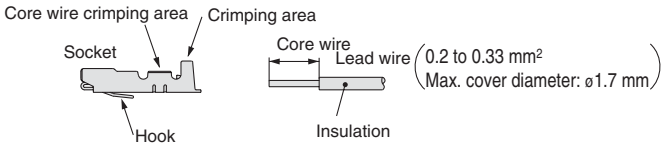
1. Attaching and detaching connectors

- To attach a connector, hold the lever and connector unit between your fingers and insert straight onto the pins of the solenoid valve so that the lever's pawl is pushed into the groove and locks.
- To detach a connector, remove the pawl from the groove by pushing the lever downward with your thumb, and pull the connector straight out.



2. Crimping of lead wires and sockets

Peel 3.2 to 3.7 mm of the tip of lead wire, enter the core wires neatly into a socket and crimp it with a special crimp tool. Be careful so that the cover of lead wire does not enter into the crimping part.
(For special crimping tool, please contact SMC.)



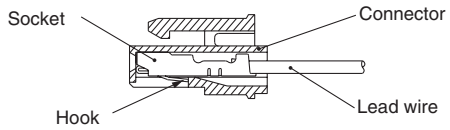
3. Attaching and detaching lead wires with sockets

● Attaching

Insert the sockets into the square holes of the connector (with ⊕ and ⊖ indication) and, continue to push the sockets all the way in until the lock by hooking into the seats in the connector. (When they are pushed in, their hooks open and they are locked automatically.) Then confirm that they are locked by pulling lightly on the lead wires.

● Detaching

To detach a socket from a connector, pull out the lead wire while pressing the socket's hook with a stick having a thin tip (approx. 1 mm). If the socket will be used again, first spread the hook outward.



Plug Connector Lead Wire Length

Standard length is 300 mm, but the following length is also available.

How to Order Connector Assembly

For DC: **SY100 – 30 – 4A –** □

For 100 VAC: **SY100 – 30 – 1A –** □

For 200 VAC: **SY100 – 30 – 2A –** □

For other voltages of AC: **SY100 – 30 – 3A –** □

Without lead wire: **SY100 – 30 – A**
(With connector and 2 pcs. of socket)

● Lead wire length

Nil	300 mm
6	600 mm
10	1000 mm
15	1500 mm
20	2000 mm
25	2500 mm
30	3000 mm
50	5000 mm

How to Order

Include the connector assembly part number together with the part number for the plug connector's solenoid valve without connector.
<Example> Lead wire length 2000 mm

For DC (+COM)	**For AC**
SY114-5LO	**SY114-1LO**
SY100-30-4A-20	**SY100-30-1A-20**

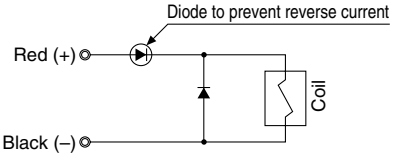
Surge Voltage Suppressor

<For DC>

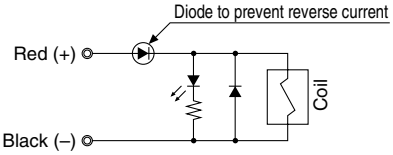
Grommet, L/M Plug Connector Type

■ Standard type (With polarity)

With surge voltage suppressor (□S)

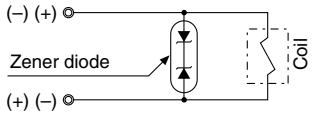


Light/Surge voltage suppressor (□Z)

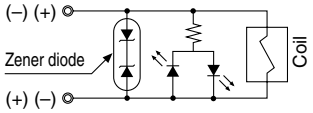


■ Non-polar type

With surge voltage suppressor (□R)



Light/Surge voltage suppressor (□U)



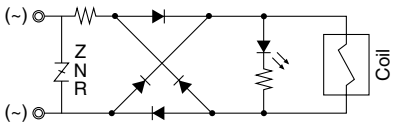
- Please connect correctly the lead wires to + (positive) and – (negative) indications on the connector.
  (For non-polar type, the lead wires can be connected to either one.)
- For DC voltages other than 12 and 24 VDC, incorrect wiring will cause damage to the surge voltage suppressor circuit. (Wrong polarity will cause trouble.)
- Solenoids, whose lead wires have been pre-wired: positive side red and negative side black.

<For AC>

("S" option is not available since voltage surge is suppressed by the converter.)

Grommet, L/M Plug Connector Type

With indicator light (□Z)



⚠Caution

In the case of zener diode and protection circuit for surge voltage of ZNR, use caution to the surge voltage protection in the controller side, since there remains the residual voltage according to the protecting element and the rated voltage.
Moreover, the residual voltage of the diode is approximately 1 V.

Connector Assembly with Protective Cover

Connector assembly with a protective cover which's taken countermeasures against dusttight.

- Effective to prevent short circuit accidents caused by invasion of foreign matters into the connector section, etc.
- Cover material adopts the chloroprene rubber which is excellent in weatherability and electric insulation properties. However, use caution not to allow contact with cutting oil, etc.
- Simple and unencumbered appearance by adopting round-shaped cord.

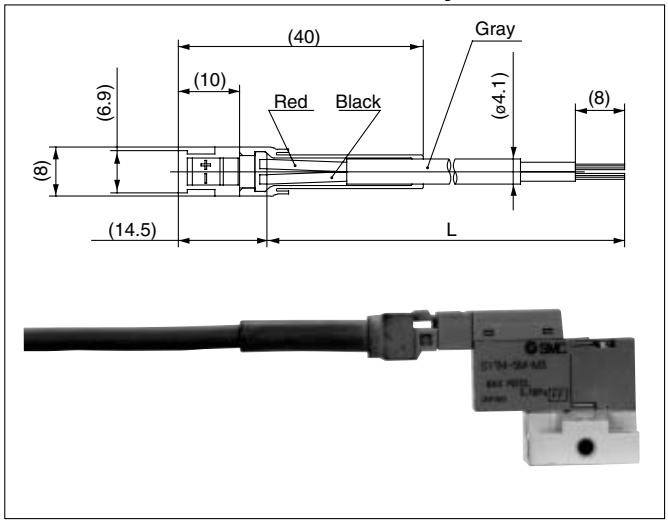
How to Order

SY100-68-A-□

● Lead wire length (L)

Nil	300 mm
6	600 mm
10	1000 mm
15	1500 mm
20	2000 mm
25	2500 mm
30	3000 mm
50	5000 mm

Dimensions: Connector Assembly with Cover



● How to Order

Include the connector assembly part number together with the part number for the plug connector's solenoid valve without connector.

<Example 1> For lead wire length: 2000 mm
SY114-5LOZ-M3
SY100-68-A-20

<Example 2> For lead wire length: 300 mm (Standard)
SY114-5LPZ-M3

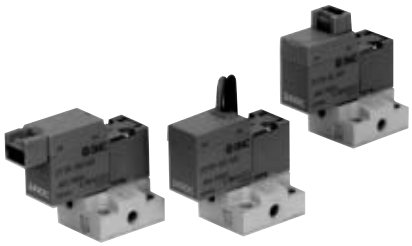
Symbol of connector assembly with protective cover

∗ No part numbers of connector assembly with cover are needed to be indicated in this case.

3 Port Direct Operated Solenoid Valve Rubber Seal

Series SY100

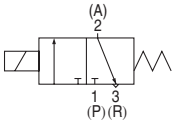
Body ported



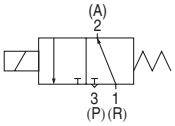
Base mounted

JIS Symbol

$SY11^{3}_{4}$ (A)



$SY12^{3}_{4}$ (A)



Made to Order Specifications (For details, refer to page 4-3-17.)

Specifications

Fluid	Air
Ambient and fluid temperature (°C)	–10 to 50°C (No freezing. Refer to page 4-18-4.)
Response time (ms) (1)	10 or less
Max. operating frequency (Hz)	20
Manual override	Non-locking push type, Locking slotted type Push-turn locking slotted type Push-turn locking lever type {$SY1\frac{1}{2}4$, $SY1\frac{1}{2}4A$ only}
Lubrication	Not required
Mounting position	Unrestricted
Impact/Vibration resistance (m/s²) (2)	150/30
Enclosure	Dustproof

Note 1) Based on dynamic performance test, JIS B 8374-1981. (Coil temperature: 20°C, at rated voltage, without surge suppressor.)
Note 2) Impact resistance: No malfunction occurred when it is tested with a drop tester in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states every once for each condition. (Values at the initial period)
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Test was performed at both energized and de-energized states in the axial direction and at the right angles to the main valve and armature. (Values at the initial period)

Solenoid Specifications

Series			$SY1^{13}_{24}$	$SY1^{13}_{24}A$
Electrical entry			Grommet (G)/(H), L plug connector (L) M plug connector (M)	
Coil rated voltage (V)	DC		24, 12, 6, 5, 3	
	AC 50/60 Hz		100, 110, 200, 220	—
Allowable voltage fluctuation			–10 to +10%	
Power consumption (W)	DC		0.5 (With indicator light: 0.55)	0.75 W (With indicator light: 0.8 W)
Apparent power (VA)	AC	100 V	0.9 (With indicator light: 1.0)	—
		110 V [115 V]	1.0 (With indicator light: 1.1) [1.1 (With indicator light: 1.2)]	
		200 V	1.8 (With indicator light: 1.9)	
		220 V [230 V]	1.9 (With indicator light: 2.0) [2.2 (With indicator light: 2.3)]	
Surge voltage suppressor			Diode	
Indicator light			LED	

∗ It is in common between 110 VAC and 115 VAC, and between 220 VAC and 230 VAC.
[Low wattage [0.45 W] is available, too. For details, refer to catalog on page 4-18-4.]

Model

Function	Valve model	Type	Operating pressure range (MPa)	Vacuum specifications (MPa)		Port size		Effective area (mm²)	Weight (g) (2)	
				1(P) port	3(R) port	1(P), 3(R) port	2(A) port		Grommet	L plug connector, M plug connector
N.C.	$SY11^{3}_{4}$	Standard	0 to 0.7	–100 kPA to 0.6	–100 kPA to 0	M3 x 0.5	M3 x 0.5	0.14	SY1□3(A): 13 SY1□4(A): 24 (12)	SY1□3(A): 15 SY1□4(A): 26 (14)
N.C.	$SY11^{3}_{4}A$	Large flow	0 to 0.7	–100 kPA to 0.6	–100 kPA to 0	M3 x 0.5	M3 x 0.5	0.22		
N.O.	$SY12^{3}_{4}$ (1)	Standard	0 to 0.7	–100 kPA to 0	–100 kPA to 0.6	M3 x 0.5	M3 x 0.5	0.14		
N.O.	$SY12^{3}_{4}A$ (1)	Large flow	0 to 0.7	–100 kPA to 0	–100 kPA to 0.6	M3 x 0.5	M3 x 0.5	0.22		

Note 1) SY123/SY124$^{3}_{4}$ and SY123/SY124$^{3}_{4}$A: Supply pressure to 1(R) port and exhaust air from 3(P) port.
Note 2) Value for DC. Add 1 g for AC. ( ): Without sub-plate.

How to Order

Standard type (Cv0.008)

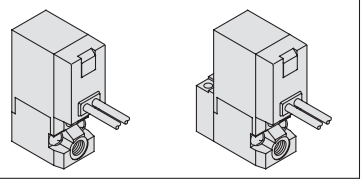
Light/Surge voltage suppressor

Nil	Without light/surge voltage suppressor
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
R	With surge voltage suppressor (Non-polar type)
U	With light/surge voltage suppressor (Non-polar type)

∗ For AC voltage valves there is no "S" option. It is already built into the rectifier circuit.
∗ For "R" and "U", DC voltage is only available.

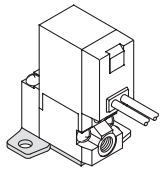
Porting specifications

Nil: For manifold
P: For body ported type to P, R, A port



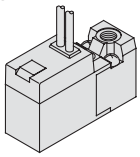
Bracket

Nil: Without bracket
F: With bracket



"P" piping specifications only.

3 port



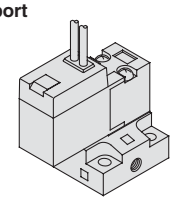
For manifold type 30, 31

Type of actuation

1	Normally closed
2	Normally open

Standard type (Cv: 0.008): Body ported	SY1	1	3	5	L				M3	
Standard type (Cv: 0.008): Base mounted	SY1	1	4	5	M					

3 port



Sub-plate style
For manifold type S41

Rated voltage

For DC

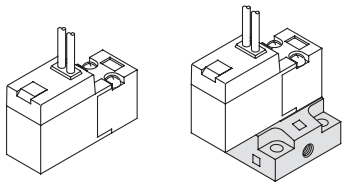
5	24 VDC
6	12 VDC
V	6 VDC
S	5 VDC
R	3 VDC

For AC (50/60 Hz)

1	100 VAC
2	200 VAC
3	110 VAC [115 VAC]
4	220 VAC [230 VAC]

Port size

Nil: Without sub-plate
M3: With sub-plate

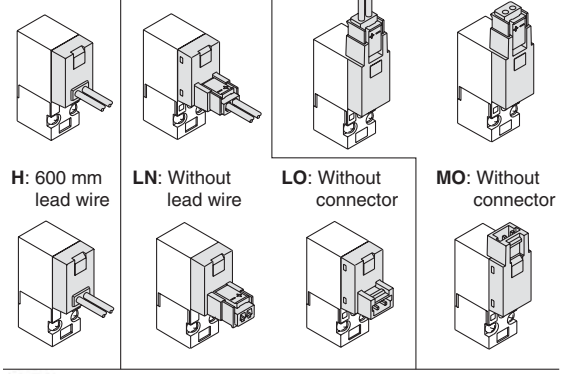


(With gasket and screws)

Electrical entry

24 V, 12 V, 6 V, 5 V, 3 VDC/100 V, 110 V, 200 V, 220 VAC

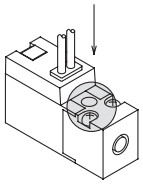
Grommet	L plug connector	M plug connector	
G: 300 mm lead wire	**L**: With lead wire (Length 300 mm)	**M**: With lead wire (Length 300 mm)	**MN**: Without lead wire
H: 600 mm lead wire	**LN**: Without lead wire	**LO**: Without connector	**MO**: Without connector



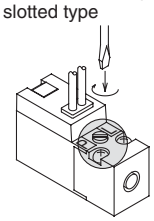
∗ "LN" and "MN" types are with 2 sockets.

Manual override

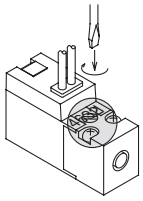
Nil: Non-locking push type



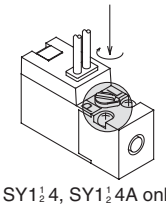
D: Push-turn locking slotted type



B: Locking slotted type



E: Push-turn locking lever type



SY1$\frac{1}{2}$4, SY1$\frac{1}{2}$4A only

How to Order

Large flow type
(Cv: 0.012)

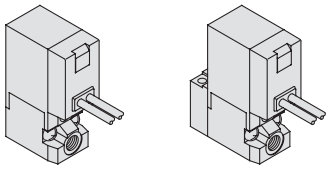
Light/Surge voltage suppressor

Nil	Without light/surge voltage suppressor
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
R	With surge voltage suppressor (Non-polar type)
U	With light/surge voltage suppressor (Non-polar type)

Porting specifications

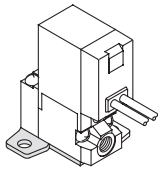
Nil: For manifold

P: For body ported type to P, R, A port



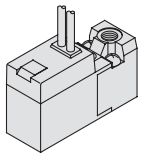
Bracket

Nil: Without bracket
F: With bracket



"P" piping specifications only.

3 port



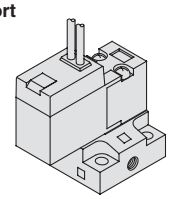
For manifold type 30, 31

Type of actuation

1	Normally closed
2	Normally open

Large flow type (Cv: 0.012): Body ported	SY1	1	3	A	–	5	L			–	M3 –
Large flow type (Cv: 0.012): Base mounted	SY1	1	4	A	–	5	M			–	

3 port



Sub-plate type
For manifold type S41

Rated voltage

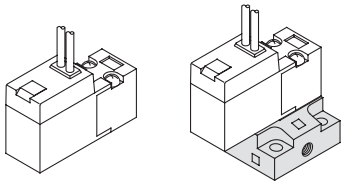
5	24 VDC
6	12 VDC
V	6 VDC
S	5 VDC
R	3 VDC

Large flow type

Port size

Nil: Without sub-plate

M3: With sub-plate

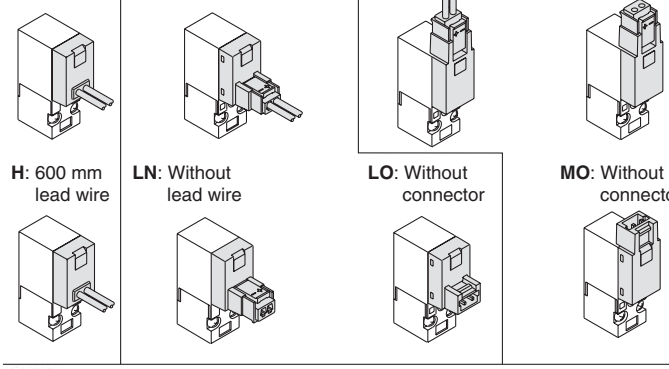


(With gasket and screws)

Electrical entry

24 V, 12 V, 6 V, 5 V, 3 VDC

Grommet	L plug connector	M plug connector	
G: 300 mm lead wire	**L**: With lead wire (Length 300 mm)	**M**: With lead wire (Length 300 mm)	**MN**: Without lead wire
H: 600 mm lead wire	**LN**: Without lead wire	**LO**: Without connector	**MO**: Without connector



∗ "LN" and "MN" types are with 2 sockets.

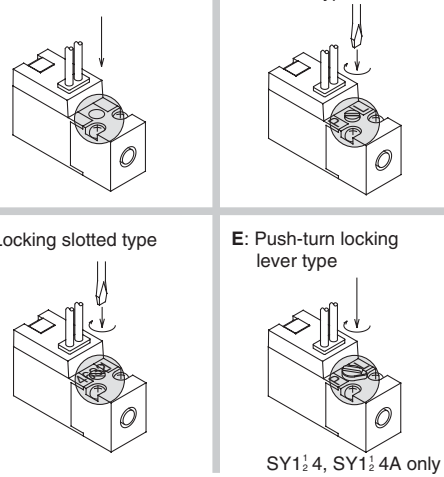
Manual override

Nil: Non-locking push type

D: Push-turn locking slotted type

B: Locking slotted type

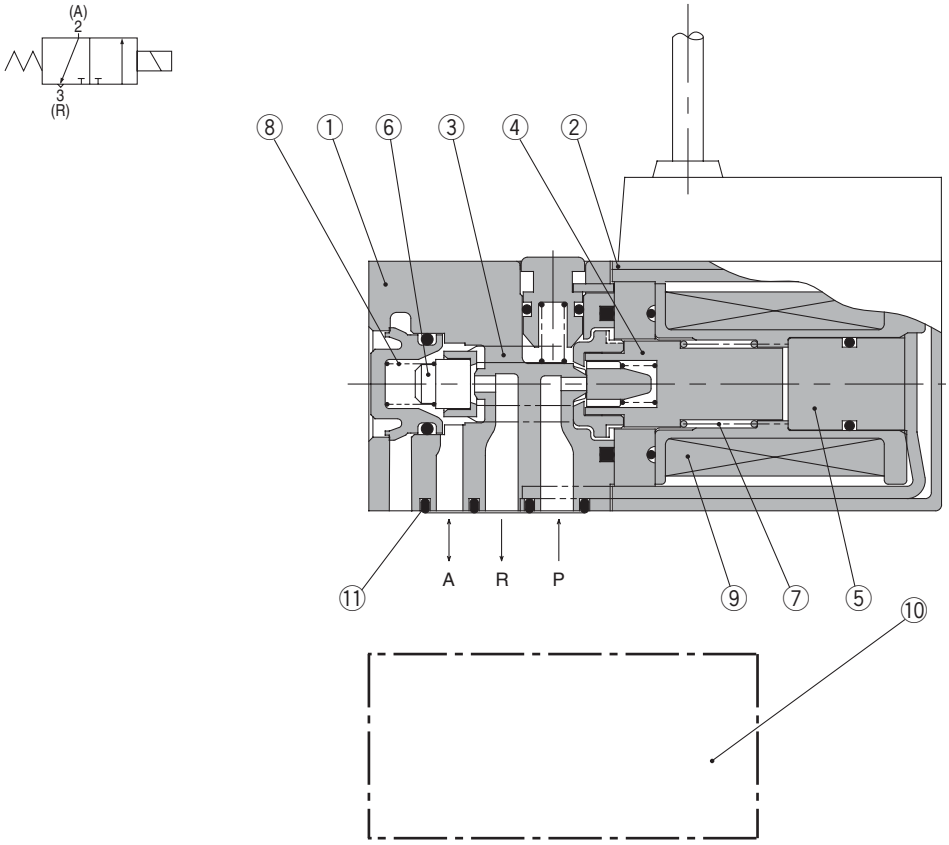
E: Push-turn locking lever type



SY1$\frac{1}{2}$4, SY1$\frac{1}{2}$4A only

Construction

SY114, SY114A



Component Parts

No.	Description	Material	Note
①	Body	Resin	Gray
②	Cover	Resin	Gray
③	Push rod	Resin	—
④	Movable iron core assembly	HNBR/Stainless steel	—
⑤	Fixed iron core	Stainless steel	—
⑥	Exhaust poppet	HNBR	—
⑦	Return spring	Stainless steel	—
⑧	Poppet spring	Stainless steel	—
⑨	Coil assembly	—	—

Replacement Parts

No.	Description	Part no.	Material
⑩	Sub-plate	SY100-74-1	Zinc die-casted
⑪	Gasket	VJ100-6-8	HNBR

How to Order Connector Assembly

For DC: **SY100 – 30 – 4A** –□

For 100 VAC: **SY100 – 30 – 1A** –□

For 200 VAC: **SY100 – 30 – 2A** –□

For other voltages of AC: **SY100 – 30 – 3A** –□

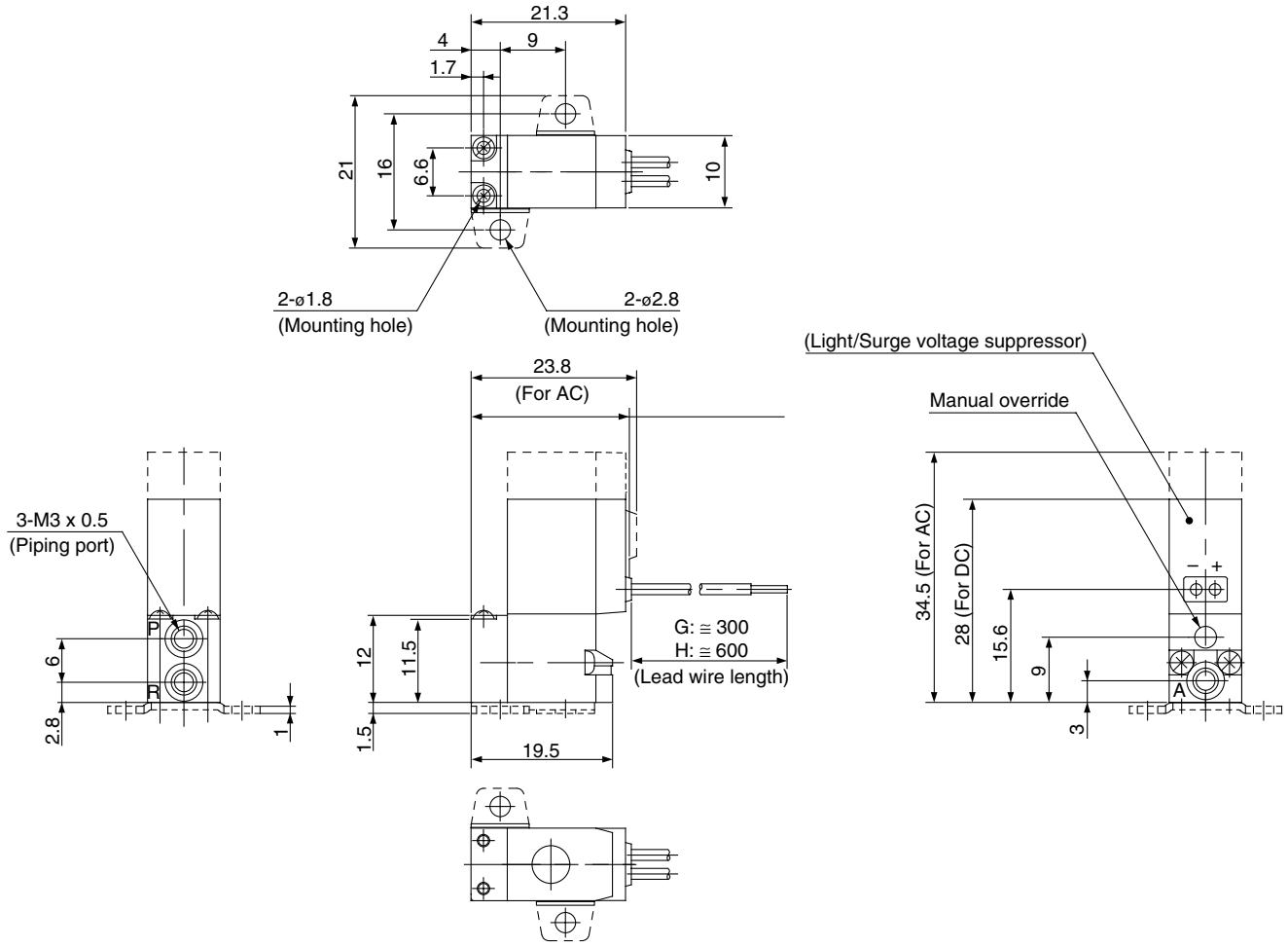
Without lead wire: **SY100 – 30 – A**
(With connector and 2 pcs. of socket)

Lead wire length

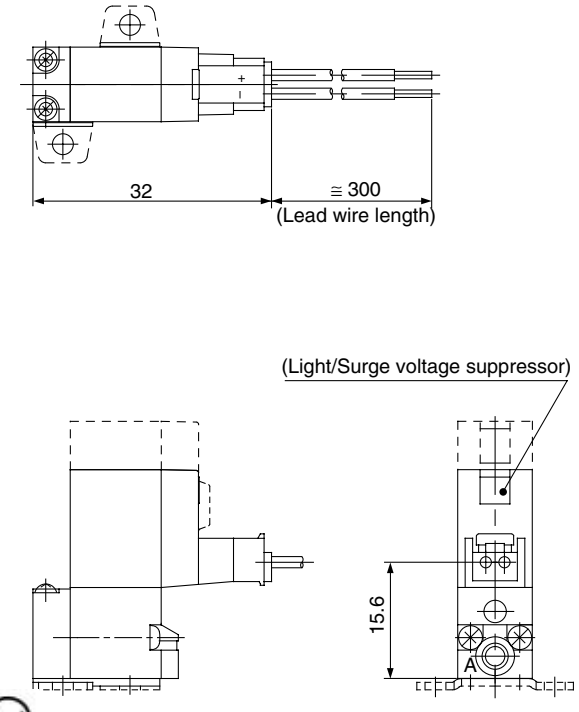
Nil	300 mm
6	600 mm
10	1000 mm
15	1500 mm
20	2000 mm
25	2500 mm
30	3000 mm
50	5000 mm

Body Ported

Grommet (G), (H): SY1$^{1}_{2}$3 (A)-□$^{G}_{H}$□□-PM3(-F)

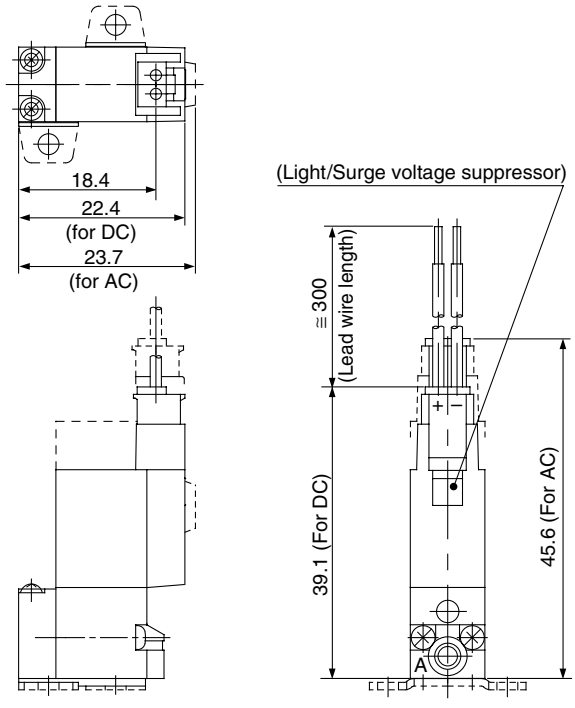


L plug connector (L): SY1$^{1}_{2}$3(A)-□L□□-PM3(F)



∗ Other dimensions are same as grommet type.

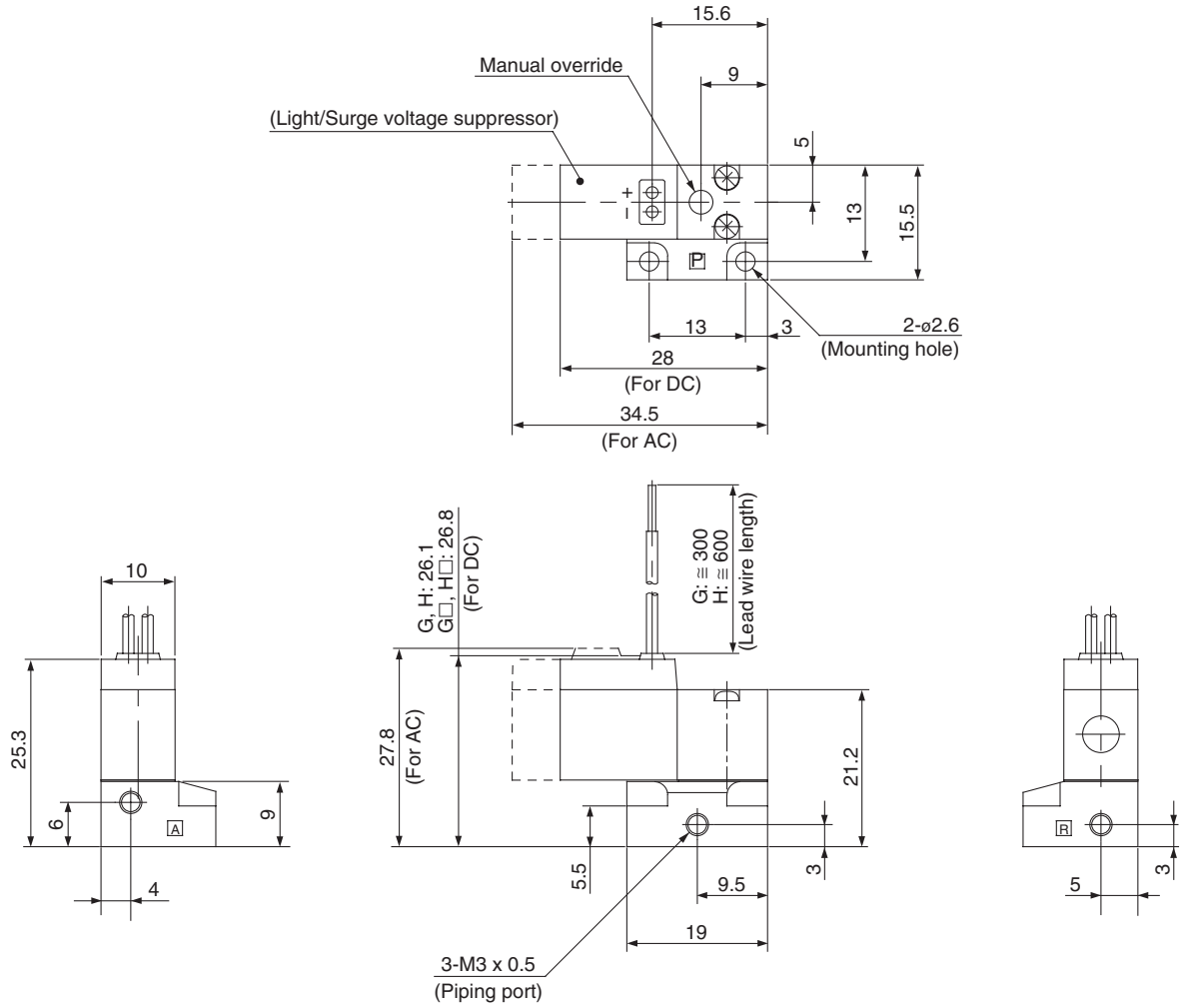
M plug connector (M): SY1$^{1}_{2}$3(A)-□M□□-PM3(-F)



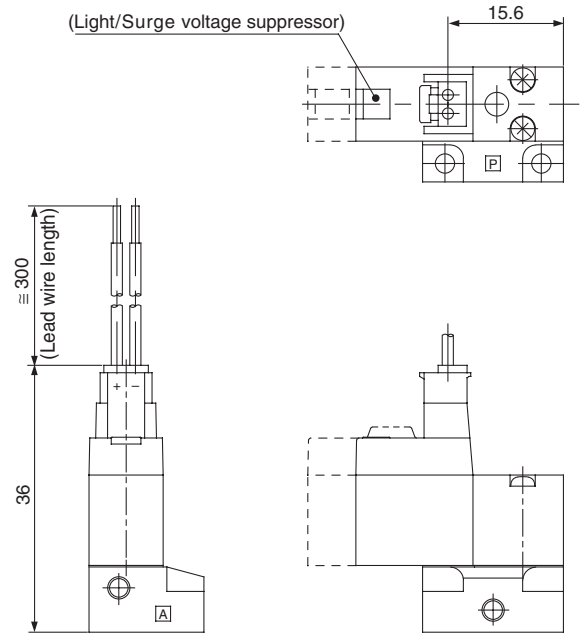
∗ Other dimensions are same as grommet type.

Base Mounted (With sub-plate)

Grommet (G), (H): SY1$\frac{1}{2}$4(A)-□$^{G}_{H}$□□-M3

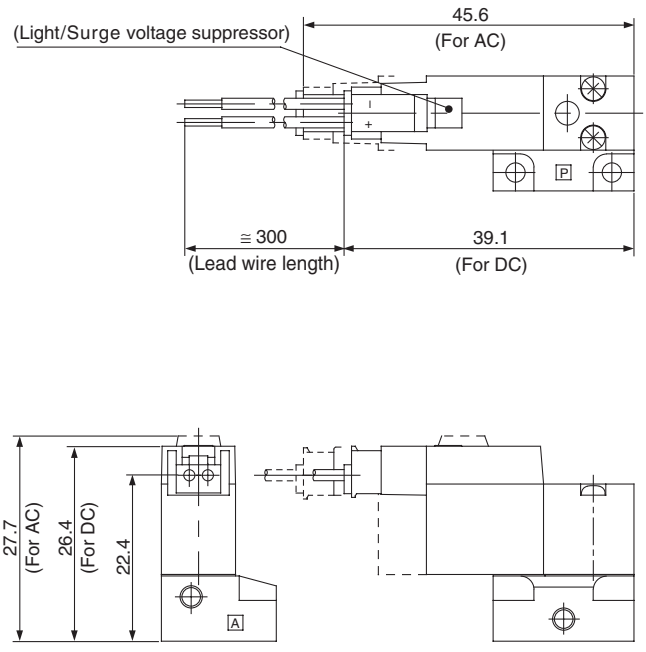


L plug connector (L): SY1$\frac{1}{2}$4(A)-□L□□-M3



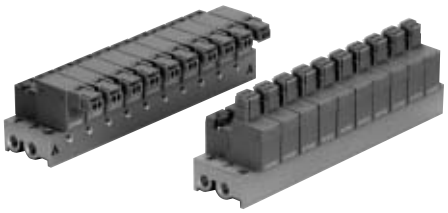
∗ Other dimensions are same as grommet type.

M plug connector (M): SY1$\frac{1}{2}$4(A)-□M□□-M3



∗ Other dimensions are same as grommet type.

Series SY100
Manifold Specifications



Manifold Specifications

Model		Type 30 (3)	Type 31	Type S41
Manifold		Single base/B mount		
P(SUP)/R(EXH)		Common SUP/Common EXH		
Valve stations		2 to 10 stations	2 to 20 stations	
A port porting specifications	Position	Valve		Base
	Direction	Top		Side
Port size	P, R ports	M5 x 0.8		
	A port	M3 x 0.5		M3 x 0.5, M5 x 0.8

Note 1) SY114(A) and SY124(A) can not be mounted on the same manifold.
Note 2) Supply to R port and exhaust from P port for SY124(A).
Note 3) 30 Type is applicable only for SY113 and SY113A. Piping to exhaust port is not possible.

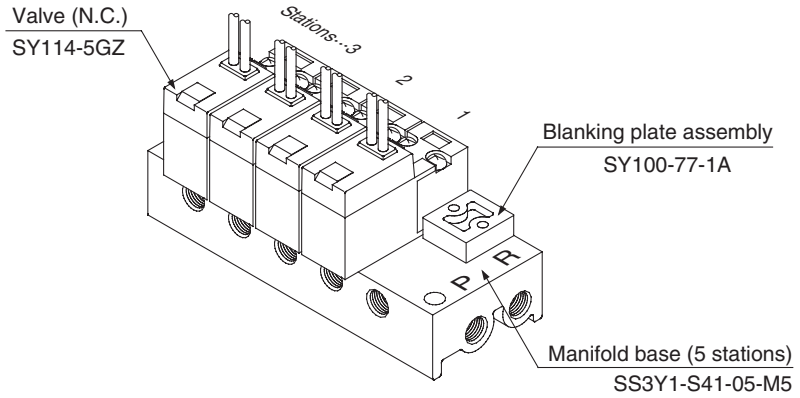
Flow Characteristics

Manifold		Port size		Effective area (mm^2)
		1(P), 3(R) port	2(A) port	
SS3Y1-30	SY1□3	M5 x 0.8	M3 x 0.5	0.14
	SY1□3(A)			0.21
SS3Y1-31	SY1□3	M5 x 0.8	M3 x 0.5	0.14
	SY1□3(A)			0.21
SS3Y1-S41	SY1□4	M5 x 0.8	M3 x 0.5	0.14
	SY1□4(A)			0.21
	SY1□4	M5 x 0.8	M5 x 0.8	0.14
	SY1□4(A)			0.21

Note) Value at manifold base mounted

How to Order Valve Manifold Assembly

Example

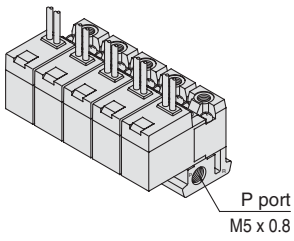


SS3Y1-S41-05-M5····· 1 set (Type S41, 5 station manifold part number)
∗ SY100-77-1A····· 1 set (Blanking plate assembly part number)
∗ SY114-5GZ····· 4 sets (Valve)
→The asterisk denotes the symbol for assembly. Prefix it to the part nos. of the solenoid valve, etc.

List part numbers of the installed valve and option in required station location separately under manifold part no.

Common SUP/Common EXH

Type 30



How to Order

SS3Y1 – 30 – 05 – F

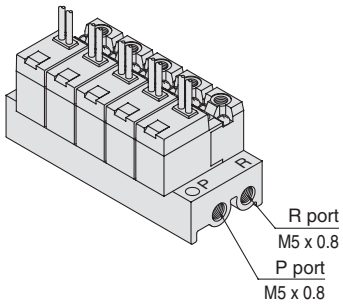
Stations

02	2 stations
⋮	⋮
10	10 stations

Note) Piping to exhaust port not possible.

Applicable solenoid valve
SY113-□□□□-M3
SY113A-□□□□-M3
Applicable blanking plate assembly
SY100-77-1A

Type 31



How to Order

SS3Y1 – 31 – 05

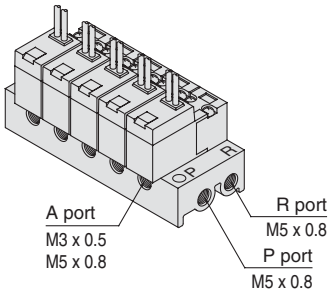
Stations

02	2 stations
⋮	⋮
20	20 stations

Note) SY113(A) and SY123(A) cannot be mounted on the same manifold.

Applicable solenoid valve Note)
SY113-□□□□-M3
SY113A-□□□□-M3
SY123-□□□□-M3
SY123A-□□□□-M3
Applicable blanking plate assembly
SY100-77-1A

Type S41



How to Order

SS3Y1 – S41 – 05 – M3

Stations

02	2 stations
⋮	⋮
20	20 stations

A port side

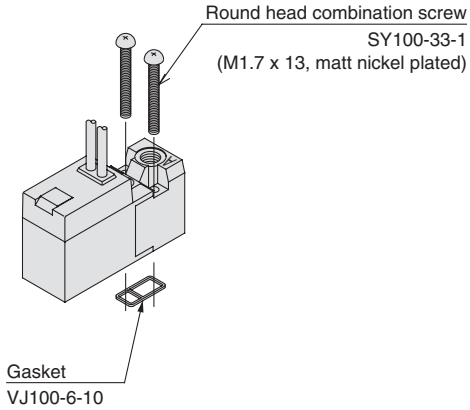
M3	M3 x 0.5
M5	M5 x 0.8

Note) SY114(A) and SY124(A) cannot be mounted on the same manifold.

Applicable solenoid valve Note)
SY114-□□□□
SY114A-□□□□
SY124-□□□□
SY124A-□□□□
Applicable blanking plate assembly
SY100-77-1A

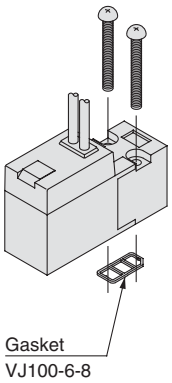
Combination with Solenoid Valve and Gasket Manifold Base

Body ported



Applicable base
- **Sub-plate (For body ported type)**
- **SS3Y1-30 type** | **Manifold base**
- **SS3Y1-31 type** |

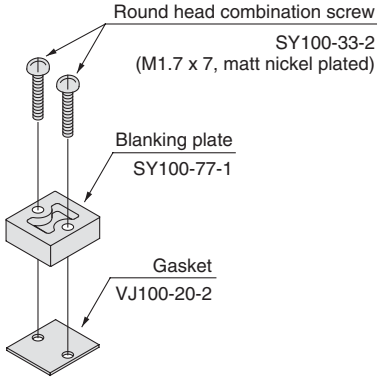
Base mounted



Applicable base
Sub-plate
Type SS3Y1- S41
Manifold base

Blanking Plate Assembly

Part no.: SY100-77-1A



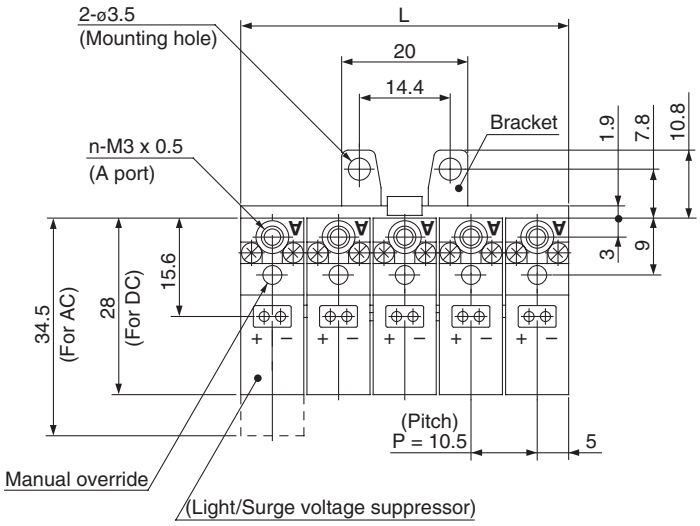
Applicable base
Sub-plate
Type SS3Y1-30
Type SS3Y1-31
Type SS3Y1-S41 | **Manifold base**

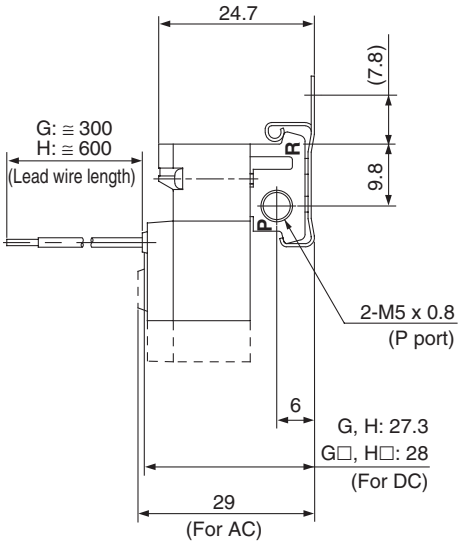
⚠Caution

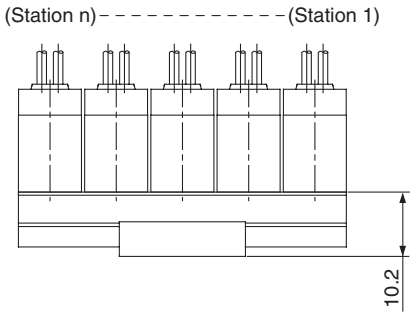
Mounting Screw Tightening Torques **M1.7: 0.12 N·m**

Type 30 Manifold: Top Ported/SS3Y1-30-Stations-F

Grommet (G), (H)

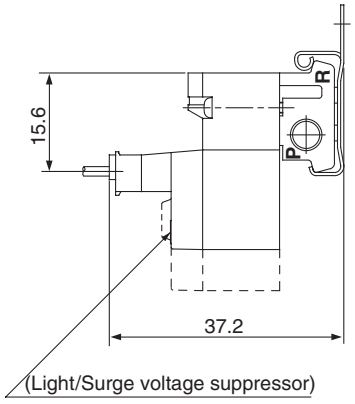






* No bracket is assembled prior to delivery. Mount one to the appropriate position.
(Attach two brackets if more than five stations.)

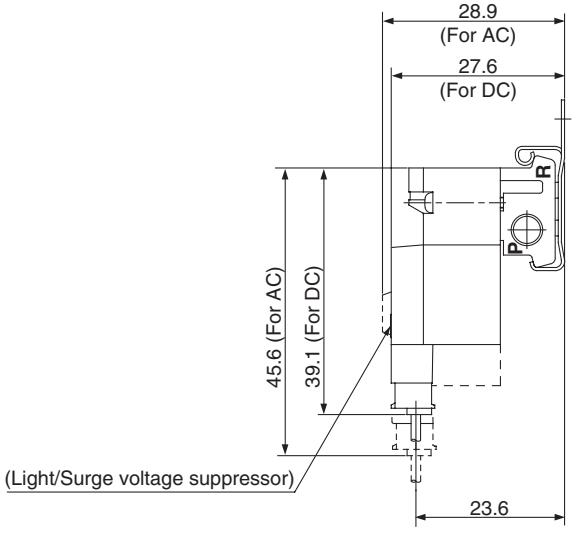
L plug connector (L)



* Other dimensions are same as grommet type.

Station	2	3	4	5	6	7	8	9	10
L	20.5	31	41.5	52	62.5	73	83.5	94	104.5

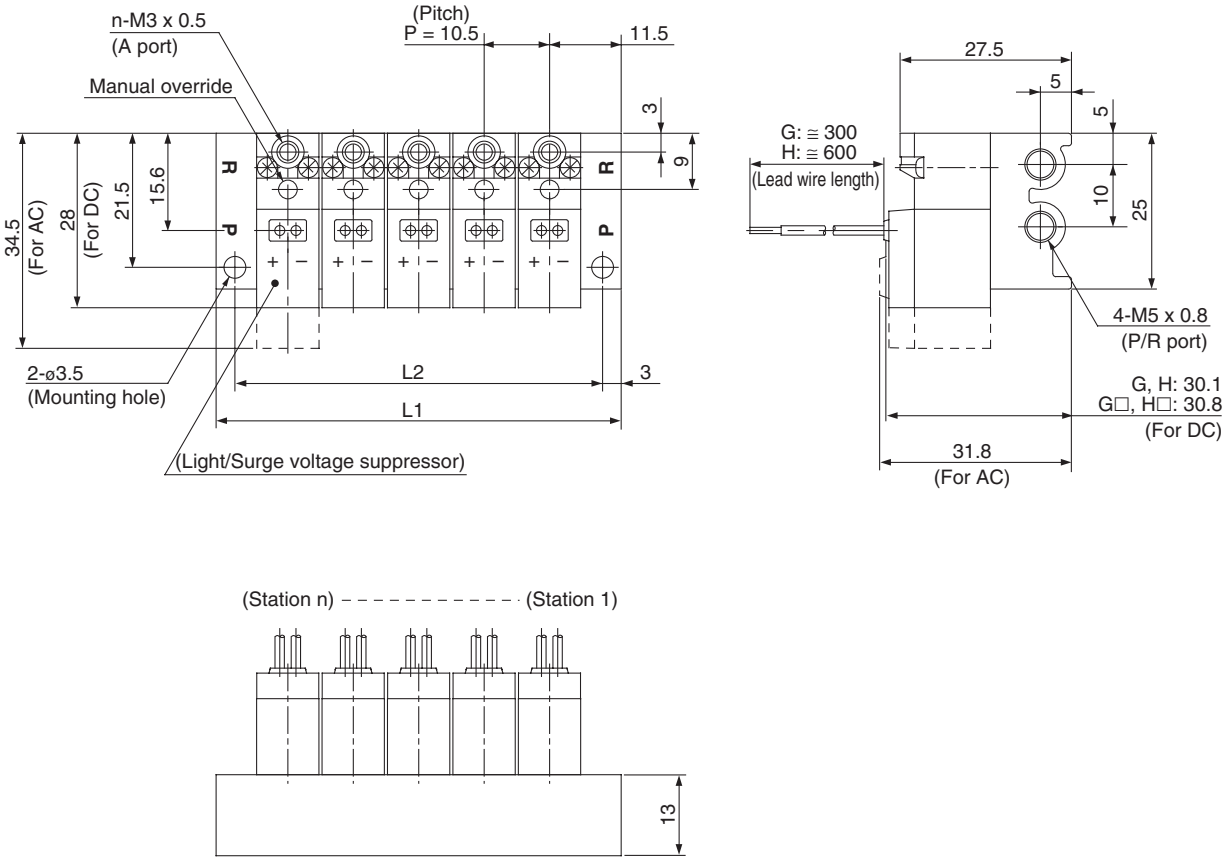
M plug connector (M)



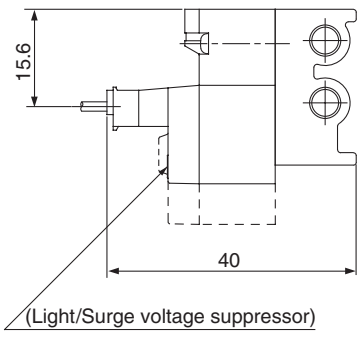
* Other dimensions are same as grommet type.

Type 31 Manifold: Top Ported/SS3Y1-31- Stations

Grommet (G), (H)

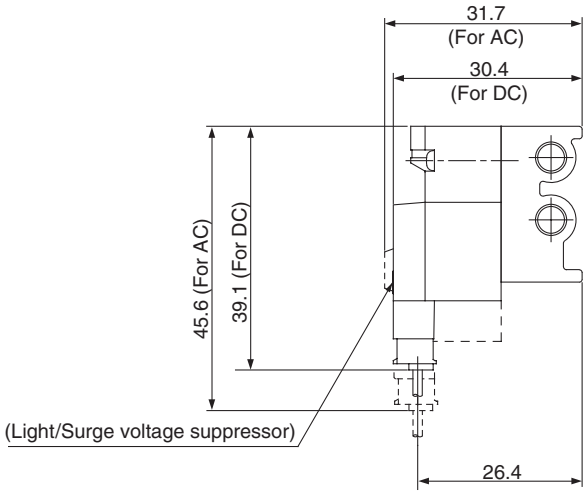


L plug connector (L)



∗ Other dimensions are same as grommet type.

M plug connector (M)

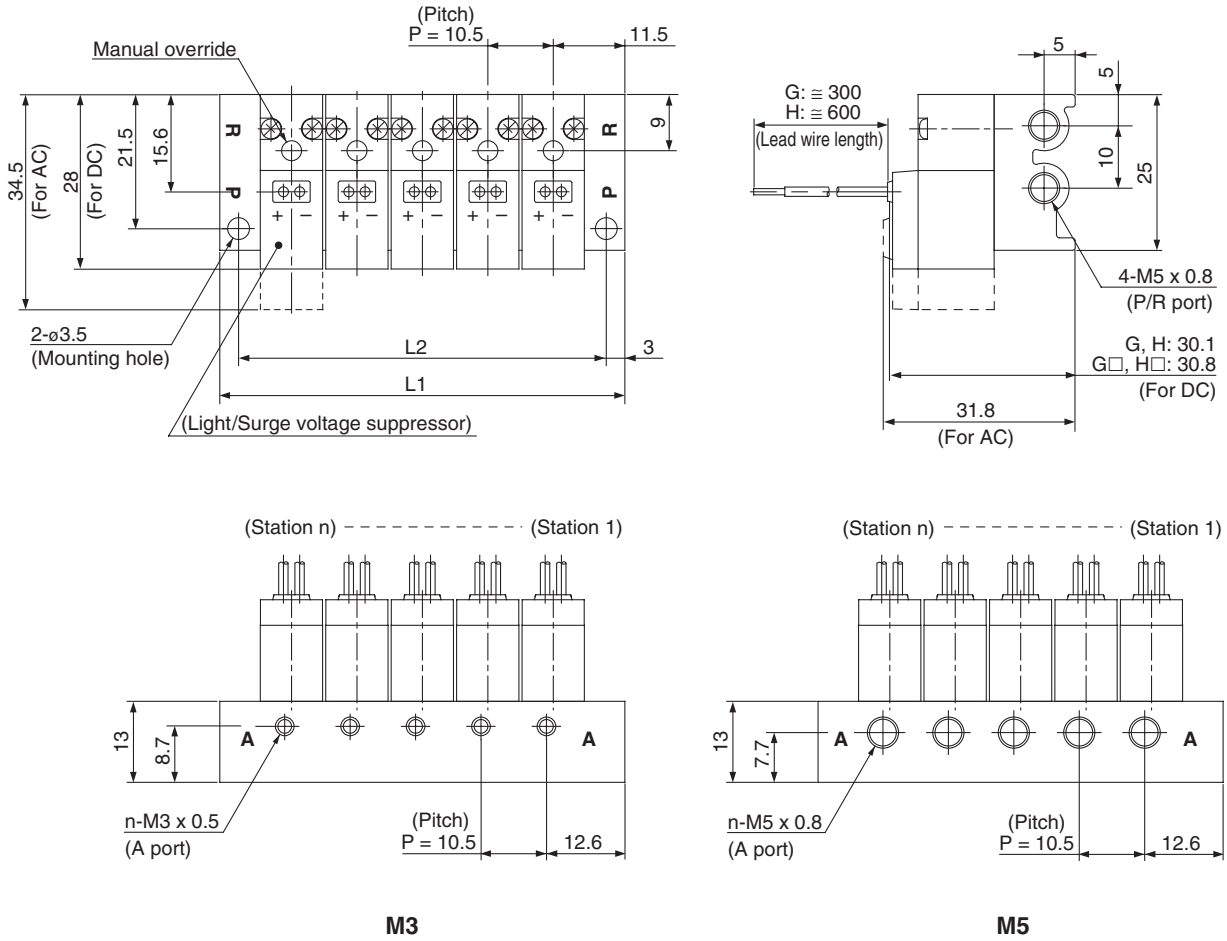


∗ Other dimensions are same as grommet type.

Station	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L_1	33.5	44	54.5	65	75.5	86	96.5	107	117.5	128	138.5	149	159.5	170	180.5	191	201.5	212	222.5
L_2	27.5	38	48.5	59	69.5	80	90.5	101	111.5	122	132.5	143	153.5	164	174.5	185	195.5	206	216.5

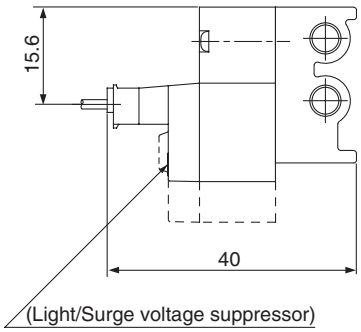
Type S41 Manifold: Side Ported/SS3Y1-S41-Stations-M3/M5

Grommet (G), (H)



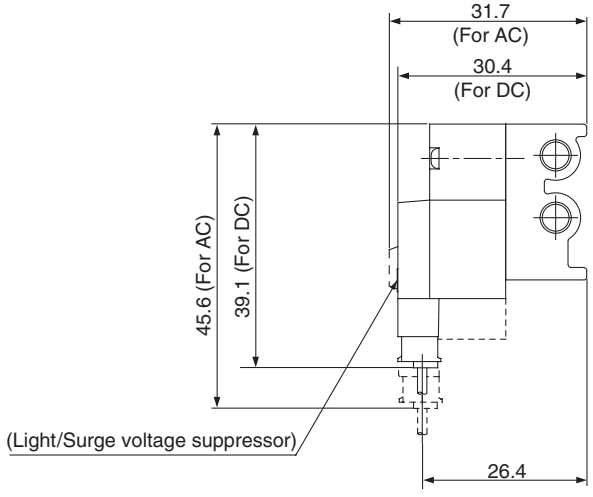
M3 **M5**

L plug connector (L)



∗ Other dimensions are same as grommet type.

M plug connector (M)



∗ Other dimensions are same as grommet type.

Station	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L_1	33.5	44	54.5	65	75.5	86	96.5	107	117.5	128	138.5	149	159.5	170	180.5	191	201.5	212	222.5
L_2	27.5	38	48.5	59	69.5	80	90.5	101	111.5	122	132.5	143	153.5	164	174.5	185	195.5	206	216.5

Series SY
Made to Order Specifications:

Please contact SMC for detailed specifications, delivery and pricing.

Energy-saving Type

Power consumption is decreased by 1/3 by reducing the wattage required to hold the valve in an energized state. (Effective energizing time is over 62 ms at 24 VDC.)

Specifications

Series		SY1$^{1}_{2}{}^{3}_{4}$T	SY1$^{1}_{2}{}^{3}_{4}$AT
Coil rated voltage (V)		24 DC, 12 DC	
Power consumption (W)	Inrush	0.55	0.8
	Holding	0.22	0.3

Specifications other than above are the same as standard models.

How to Order

Body ported	SY1	1	3	□	T	5	L	Z	□	□	M3	□	
Base mounted	SY1	1	4	□	T	5	M	Z	□	□			

Type of actuation

1	Normally closed
2	Normally open

Body option

Nil	Standard
A	Large flow capacity

Rated voltage

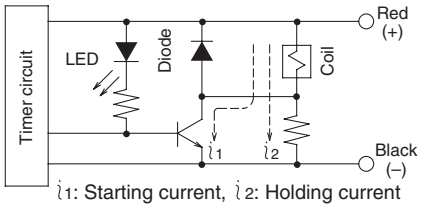
5	24 VDC
6	12 VDC

Entry is the same as standard products.

Working Principle

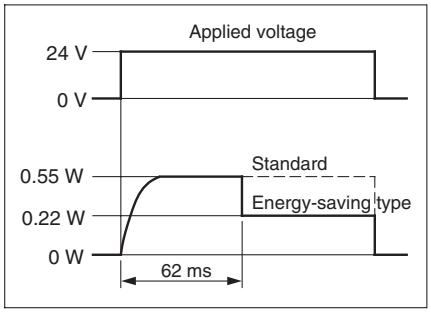
The circuit shown below reduces current consumption at holding which reduces the overall power consumption.
Refer to electrical power waveform as shown below.

Electrical circuit (With energy-saving circuit)

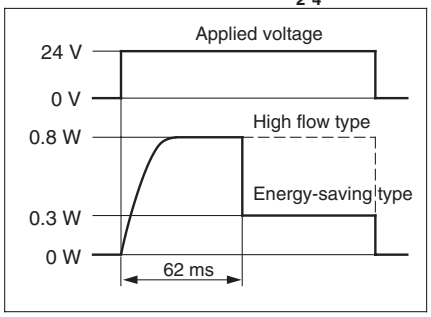


i1: Starting current, i2: Holding current

<Energy-saving Type, Electrical Power Waveform for SY1$^{1}_{2}{}^{3}_{4}$T>



<Energy-saving Type, Electrical Power Waveform for SY1$^{1}_{2}{}^{3}_{4}$AT>



Low Wattage Specifications (0.45 W)

How to Order

SY1□□−□□□□−X200

Entry is the same as standard products.

FA, FC, FH, SFA and SFH Circuit Breakers
Interruptores automáticos FA, FC, FH, SFA y SFH
Disjoncteurs FA, FC, FH, SFA et SFH

NOTE: The following symbols may be used on the circuit breaker faceplate.

NOTA: Los siguientes símbolos pueden utilizarse en la placa frontal del interruptor automático.

REMARQUE : Les symboles suivants peuvent être utilisés sur la plaque avant du disjoncteur.

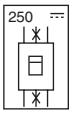
05200002

V ~ Volts ac/Volts ca/Volts CA

V ⎓ Volts dc/Volts cd/Volts CC

1Ø–3Ø Grounded B Phase/Fase B aterrizada/Phase B m.à.l.t.

Isolator per IEC 60947-2/Desconectador según IEC 60947-2/
Sectionneur selon IEC 60947-2



For 250 V⎓ service use
outside poles only
Para acometida de 250 V ⎓ (cd)
utilice los polos exteriores solamente
Pour service à 250 VCC utiliser les
pôles extérieurs seulement

Lug/wiring Information/
Información de las zapatas y del cableado/
Information des cosses et du câblage

Solid Wire/Cable sencillo/Câble rigide

Stranded Wire/Cable trenzado/Câble toronné

Wire Strip Length/Sección sin aislamiento del cable/
Longueur de dénudage du câble

Ii Magnetic Trip Current/Corriente de disparo magnético/
Courant de déclenchement magnétique

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía (consulte la norma NFPA 70E).
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

RISQUE D'ELECTROCUTION, D'EXPLOSION OU D'ECLAIR D'ARC

- Portez un équipement de protection personnel (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si cette directive n'est pas respectée, cela entraînera la mort ou des blessures graves.

FACTORY INSTALLED ACCESSORIES

If circuit breaker has factory-installed accessories, refer to label on circuit breaker for electrical specifications and lead colors.

I-LINE® CIRCUIT BREAKER INSTALLATION

Turn off all power supplying this equipment before working on or inside equipment.

Turn off circuit breaker or trip circuit breaker before installation.

ACCESORIOS INSTALADOS EN LA FABRICA

Si el interruptor automático cuenta con accesorios instalados en la fábrica, consulte la etiqueta en el interruptor para obtener las especificaciones eléctricas y los colores de conductores.

INSTALACIÓN DEL INTERRUPTOR AUTOMÁTICO I-LINE®

Desenergice el equipo antes de realizar cualquier trabajo en él.

Desconecte o dispare el interruptor automático antes de su instalación.

ACCESSOIRES INSTALLÉS À L'USINE

Si le disjoncteur est muni des accessoires installés à l'usine, se reporter à l'etiquette sur le disjoncteur pour obtenir les spécifications électriques et la couleur des conducteurs.

INSTALLATION DU DISJONCTEUR I-LINE®

Couper l'alimentation de l'appareil avant d'y travailler.

Déclencher ou mettre le disjoncteur hors tension avant l'installation.

⚠ CAUTION / PRECAUCIÓN / ATTENTION

HAZARD OF EQUIPMENT DAMAGE

- Do not adjust jaws.
- Do not remove joint compound.
- If necessary, use Square D joint compound PJC7201.

Failure to follow this instruction can result in injury or equipment damage.

PELIGRO DE DAÑO AL EQUIPO

- No ajuste las mordazas.
- No retire el compuesto para juntas.
- Si es necesario, utilice el compuesto para juntas PJC7201 de Square D.

El incumplimiento de esta instrucción puede causar lesiones o daño al equipo.

RISQUE DE DOMMAGES MATÉRIELS

- N'ajustez pas les mâchoires.
- Ne retirez pas la pâte à joint.
- Utilisez, au besoin, la pâte à joint Square D PJC7201.

Si cette directive n'est pas respectée, cela peut entraîner des blessures ou des dommages matériels.

NOTE: Install main circuit breaker adjacent to main lugs.

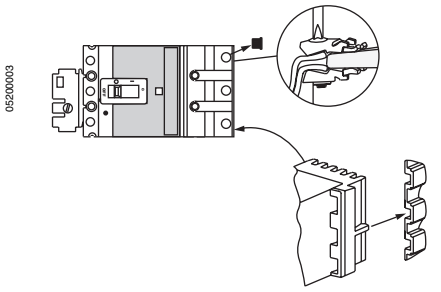
1. Loosen screws, if equipped.
2. Tighten screw (A) firmly without bending mounting bracket.

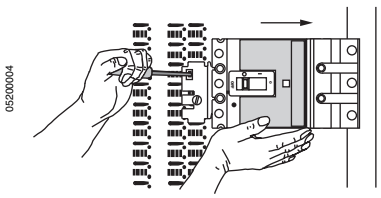
NOTA: Instale el interruptor automático principal junto a las zapatas principales.

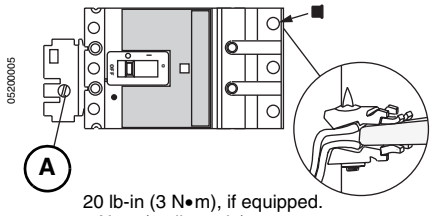
1. Afloje los tornillos, si están instalados.
2. Apriete firmemente el tornillo (A) sin doblar el soporte de montaje.

REMARQUE : Installer le disjoncteur principal à côté des cosses principales.

1. Desserrer les vis, si muni.
2. Serrer fermement la vis (A) sans tordre le support de montage.







INDIVIDUALLY-MOUNTED CIRCUIT BREAKER INSTALLATION

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Turn off circuit breaker or trip circuit breaker before installation.
3. See page 8 for mounting dimensions.

NOTE: For air gap between cover and face of circuit breaker equal to or greater than 0.68 in (17 mm) no additional installation fiber required.

For air gap less than 0.68 in (17 mm) attach fiber insulating plate (customer supplied) to enclosure cover.

INSTALACIÓN DEL INTERRUPTOR AUTOMÁTICO DE MONTAJE INDIVIDUAL

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Desconecte o dispare el interruptor automático antes de su instalación.
3. Consulte la página 8 para obtener las dimensiones de montaje.

NOTA: Si existe un espacio de 17 mm (0,68 pulg) o mayor entre la cubierta y la parte frontal del interruptor automático no se necesitará fibra adicional para la instalación. Si el espacio es menor que 17 mm (0,68 pulg) instale una placa de aislamiento de fibra (provista por el cliente) en la cubierta del gabinete.

INSTALLATION DU DISJONCTEUR MONTÉ INDIVIDUELLEMENT

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Déclencher ou mettre le disjoncteur hors tension avant l'installation.
3. Voir la page 8 pour obtenir les dimensions de montage.

REMARQUE : Pour une couche d'air entre le couvercle et la face du disjoncteur égale ou supérieure à 17 mm (0,68 po), aucune installation supplémentaire de fibre n'est nécessaire.

Pour une couche d'air inférieure à 17 mm (0,68 po), fixer une plaque isolante de fibre (fournie par le client) au couvercle du boîtier.

⚠ CAUTION / PRECAUCIÓN / ATTENTION

HAZARD OF EQUIPMENT DAMAGE When mounted in a metal box, cover must be insulated as shown. **Failure to follow this instruction can result in injury or equipment damage.**	**PELIGRO DE DAÑO AL EQUIPO** Cuando instale el interruptor en una caja de metal, la cubierta deberá estar aislada como se muestra. **El incumplimiento de esta instrucción puede causar lesiones o daño al equipo.**	**RISQUE DE DOMMAGES MATÉRIELS** En cas de montage dans un boîtier en métal, le couvercle doit être isolé comme indiqué. **Si cette directive n'est pas respectée, cela peut entraîner des blessures ou des dommages matériels.**

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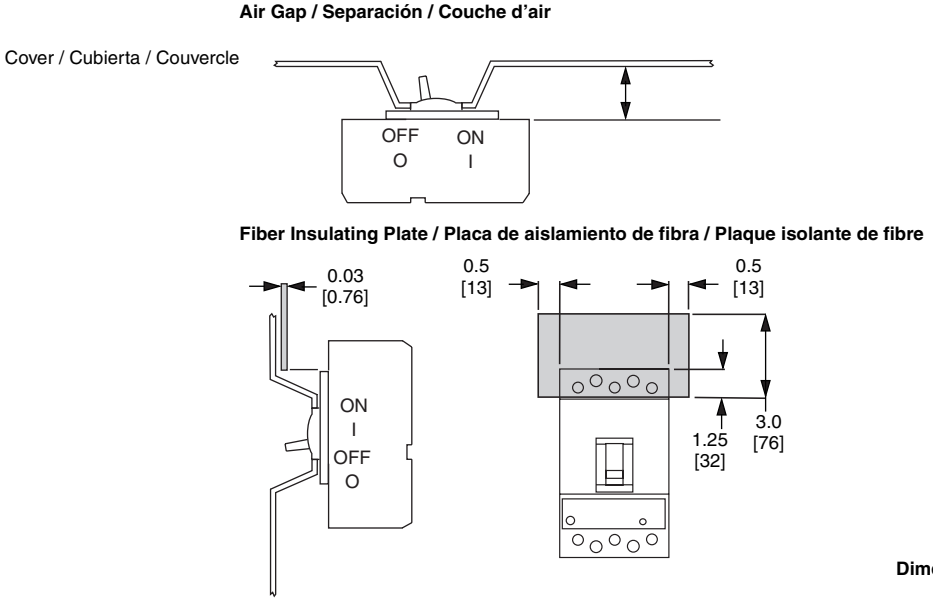


Dimensions: in. / pulg / po [mm]

Dimensions for electrical and mechanical clearances to metal or live electrical parts.

Refer to NEC table 373-6(b) for wire bending space requirements.

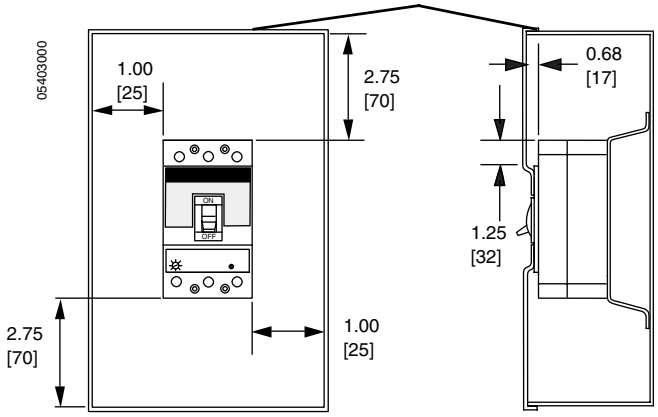
Dimensiones para espacios libres a las partes metálicas o eléctricas vivas.

Consulte la tabla 373-6(b) del código nacional eléctrico de EUA (NEC) y NOM-001-SEMP para obtener los requisitos de espacio para el doblez de cables.

Dimensions pour les espaces libres aux pièces métalliques ou aux pièces électriques sous tension.

Se reporter au tableau 373-6(b) de NEC (É.-U.) pour obtenir les exigences d'espace pour la courbure des fils.

Metal or Live Electrical Parts / Partes metálicas o vivas / Pièces métalliques ou sous tension



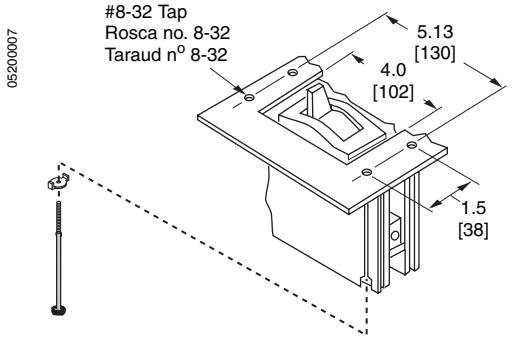
Dimensions: in. / pulg / po [mm]

One-pole FA, SFA and FH Circuit Breakers

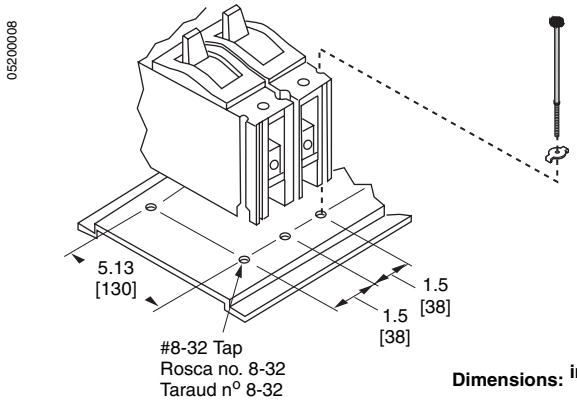
Interruptores automáticos FA, SFA y FH de un polo

Disjoncteurs FA, SFA et FH unipolaires

Front-mounted Circuit Breakers
Interruptores automáticos para montaje en la parte frontal
Disjoncteurs montés par l'avant



Pan-mounted Circuit Breakers
Interruptores automáticos para montaje en bandeja
Disjoncteurs montés sur cuve



Dimensions: in. / pulg / po [mm]

FA, FC, FH, SFA and SFH Circuit Breakers

Interruptores automáticos FA, FC, FH, SFA y SFH

Disjoncteurs FA, FC, FH, SFA et SFH

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK OR ARC FLASH

Mount circuit breaker as shown in these instructions to prevent cover separation under short-circuit conditions.

Failure to follow this instruction will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA O DESTELLO POR ARQUEO

Monte el interruptor automático tal como se indica en las instrucciones para evitar la separación de la cubierta bajo condiciones de cortocircuito.

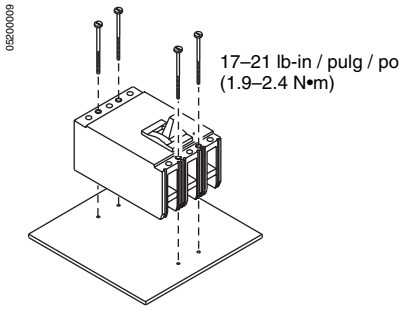
El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

RISQUE D'ÉLECTROCUTION OU D'ECLAIR D'ARC

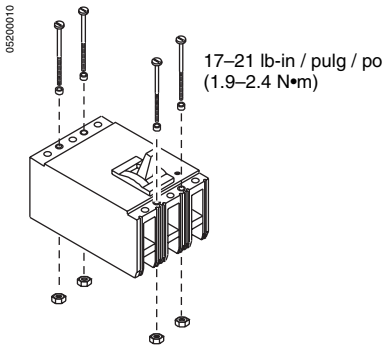
Montez le disjoncteur tel qu'indiqué dans ces directives pour empêcher la séparation du couvercle en cas de court-circuit.

Si cette directive n'est pas respectée, cela entraînera la mort ou des blessures graves.

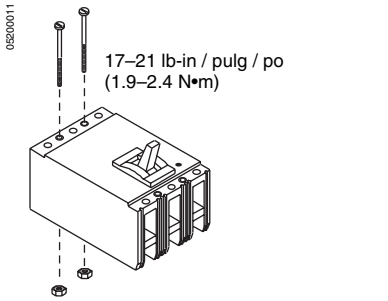
Pan-mounted FA, FC, FH, SFA and SFH Circuit Breakers
Interruptores automáticos FA, FC, FH, SFA y SFH para montaje en bandeja
Disjoncteurs FA, FC, FH, SFA et SFH montés sur cuve



Bus-mounted FC and SFH Circuit Breakers
Interruptores automáticos FC y SFH para montaje en la barra de distribución
Disjoncteurs FC et SFH montés sur bus



Bus-mounted FH and SFA Circuit Breakers
Interruptores automáticos FH y SFA para montaje en la barra de distribución
Disjoncteurs FH et SFA montés sur bus



WIRE INSTALLATION—ALL CIRCUIT BREAKERS

INSTALACIÓN DE CABLES–TODOS LOS INTERRUPTORES AUTOMÁTICOS

INSTALLATION DES CÂBLES–TOUS LES DISJONCTEURS

CAUTION / PRECAUCIÓN / ATTENTION

HAZARD OF EQUIPMENT DAMAGE

Wire strands interfering with wire binding screws can cause false torque indication. Do not allow wire strands to interfere with threads of wire binding screws.

Failure to follow this instruction can result in equipment damage.

PELIGRO DE DAÑO AL EQUIPO

Los hilos del cable que interfieren con los tornillos de sujeción de cables pueden dar una indicación falsa de par de apriete. No permita que los hilos del cable interfieran con las roscas de los tornillos de sujeción de cables.

El incumplimiento de esta instrucción puede causar daño al equipo.

RISQUE DE DOMMAGES MATÉRIELS

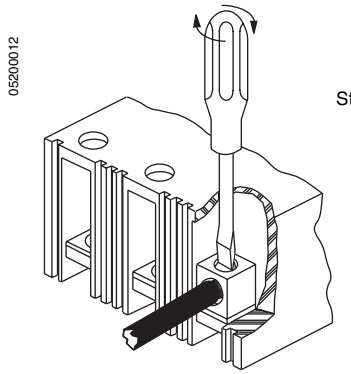
Les torons du conducteur interférant avec les vis de fixation de fils peuvent entraîner une indication erronée du couple. Ne laissez pas les torons du conducteur s'engager dans les filets des vis de fixation de fils.

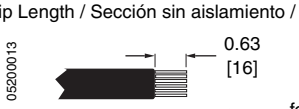
Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.

See circuit breaker faceplate label or optional lug instructions for wire size and torque.

Consulte la etiqueta de la placa frontal del interruptor automático o las instrucciones que acompañan a las zapatas opcionales para obtener el calibre del cable y el par de apriete.

Voir l'étiquette de la plaque avant du disjoncteur ou les directives fournies avec les cosses optionnelles pour obtenir le calibre des fils et le couple.





for Top Feed Lugs /
para las zapatas de alimentación superior /
pour cosses d'alimentation supérieure

Dimensions: in. / pulg / po [mm]

PADLOCK ACCESSORY

With padlock accessory installed, circuit breaker does not comply with IEC 60947-2 positive contact indication requirement for isolation.

ACCESORIO DE CANDADO

Una vez instalado el accesorio de candado, el interruptor automático no cumple con los requisitos de aislamiento establecidos en la norma IEC 60947-2 en lo relativo a la indicación de contacto seguro.

ACCESSOIRE POUR CADENAS

Lorsque l'accessoire pour cadenas est installé, le disjoncteur n'est pas conforme à l'exigence d'indication de contact positif IEC 60947-2 pour l'isolation.

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

When circuit breaker handle is padlocked off, always use a properly rated voltage sensing device to confirm power is off before working on equipment.

Failure to follow this instruction will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Cuando la palanca del interruptor automático se encuentra con candado en la posición de abierto, siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo antes de realizar cualquier trabajo.

El incumplimiento de esta precaución podrá causar la muerte o lesiones serias.

RISQUE D'ELECTROCUTION, D'EXPLOSION OU D'ECLAIR D'ARC

Lorsque la manette du disjoncteur est verrouillée en position d'arrêt, utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée avant de travailler sur l'appareil.

Si cette précaution n'est pas respectée, cela entraînera la mort ou des blessures graves.

CIRCUIT BREAKER REMOVAL

Turn off all power supplying this equipment before working on or inside equipment.

Turn off circuit breaker or trip circuit breaker before removal.

Remove circuit breaker in reverse order of installation.

DESMONTAJE DEL INTERRUPTOR AUTOMÁTICO

Desenergice el equipo antes de realizar cualquier trabajo en él.

Desconecte o dispare el interruptor automático antes de desmontarlo.

Desmonte el interruptor automático en el orden inverso al de su instalación.

DÉMONTAGE DU DISJONCTEUR

Couper l'alimentation de l'appareil avant d'y travailler.

Déclencher ou mettre le disjoncteur hors tension avant de le retirer.

Retirer le disjoncteur dans l'ordre inverse de son installation.

CIRCUIT BREAKER OPERATION

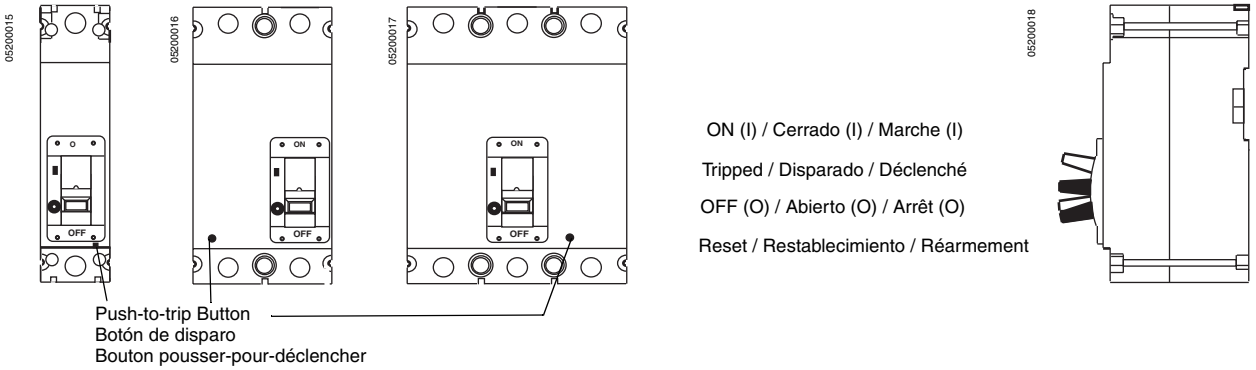
Press push-to-trip button once a year to exercise circuit breaker.

FUNCIONAMIENTO DEL INTERRUPTOR AUTOMÁTICO

Oprima el botón de disparo una vez al año para probar el interruptor automático.

FONCTIONNEMENT DU DISJONCTEUR

Appuyer sur le bouton pousser-pour-déclencher une fois par an pour faire fonctionner le disjoncteur.



TROUBLESHOOTING

If problems occur during installation, refer to the following guide. If trouble persists, contact the local Square D Field Office.

DIAGNÓSTICO DE PROBLEMAS

En caso de que suceda algún problema durante la instalación, consulte la guía a continuación. Si el problema persiste, póngase en contacto con la oficina local de Square D.

DÉPANNAGE

Si des problèmes surviennent pendant l'installation, se reporter aux consignes suivantes. Si les problèmes persistent, contacter le bureau de service local de Square D.

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must be installed and serviced only by qualified electrical personnel.
- Troubleshooting may require energizing auxiliary devices with a test power supply. Make sure that the power supply is off before connecting or disconnecting it to the auxiliary device.
- Do not touch the terminals of the device during the test.

Failure to follow these instructions will result in death or serious injury.

Turn off all power supplying this equipment before working on or inside equipment.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Solamente el personal eléctrico especializado debe instalar y prestar servicio de mantenimiento a este equipo.
- Durante el diagnóstico de problemas, tal vez sea necesario energizar los dispositivos auxiliares con una fuente de alimentación de pruebas. Asegúrese de que la fuente de alimentación esté desconectada antes de conectar o desconectar los dispositivos auxiliares a ésta.
- No toque las terminales del dispositivo durante la prueba.

El incumplimiento de estas precauciones podrá causar la muerte o lesiones serias.

Desenergice el equipo antes de realizar cualquier trabajo en él.

RISQUE D'ELECTROCUTION, D'EXPLOSION OU D'ECLAIR D'ARC

- L'installation et l'entretien de cet appareil ne doivent être effectués que par du personnel qualifié.
- Pour effecteur le dépannage, il peut être nécessaire d'alimenter les dispositifs auxiliaires à partir d'une alimentation d'essai. Assurez-vous que l'alimentation est coupée avant tout branchement ou débranchement avec le dispositif.
- Ne touchez pas aux bornes du dispositif pendant l'essai.

Si ces précautions ne sont pas respectées, cela enraînera la mort ou des blessures graves.

Couper l'alimentation de l'appareil avant d'y travailler.

CONDITION / CONDICIÓN / CONDITION	POSSIBLE CAUSES / CAUSAS POSIBLES / CAUSES POSSIBLES	SOLUTION / SOLUCIÓN / SOLUTION
Circuit breaker fails to stay closed. El interruptor automático no permanece cerrado. Le disjoncteur ne reste pas fermé.	1. Undervoltage trip not energized. 1. El disparo por baja tensión no está energizado. 1. Le déclencheur sur baisse de tension est hors tension. 2. Shunt trip energized. 2. El disparo en derivación está energizado. 2. Le déclencheur shunt est sous tension. 3. Short circuit or overload on system. 3. Existe un cortocircuito o sobrecarga en el sistema 3. Un court circuit ou une surcharge du systéme.	1. Energize undervoltage trip. 1. Energice el disparo por baja tensión. 1. Mettre le déclencheur sur baisse de tension sous tension. 2. De-energize shunt trip. 2. Desenergice el disparo en derivación. 2. Mettre le déclencheur shunt hors tension. 3. Check system for short circuit or overload. 3. Revise el sistema para ver si encuentra un cortocircuito 3. Rechercher un court-circuit ou une surcharge dans le système.o una sobrecarga. 3. Rechercher un court-circuit ou une surcharge dans le système.
Circuit breaker trips, but no short circuit or overload is evident. El interruptor automático se dispara sin evidencia de cortocircuito o sobrecarga. Le disjoncteur se déclenche, mais aucun court-circuit ou surcharge n'est évident.	System voltage below undervoltage trip setting. La tensión del sistema está por debajo de los ajustes de disparo por baja tensión. La tension du système est inférieure au réglage du déclencheur sur baisse de tension.	Check system for low voltage. Revise el sistema para ver si encuentra tensión baja. Vérifier si le système est en sous-tension.
Push-to-trip button will not trip circuit breaker. El botón de disparo no dispara el interruptor automático. Le bouton pousser-pour-déclencher ne déclenche pas le disjoncteur.	Circuit breaker already tripped or in the off (O) position. El interruptor automático ya está disparado o se encuentra en la posición de abierto (O). Le disjoncteur est déjà déclenché ou en position d'arrêt (O).	Move circuit breaker handle to reset then to on (I). Coloque la palanca del interruptor en la posición de restablecimiento, luego en la posición de cerrado (I). Amener la manette du disjoncteur à la position de réarmement, puis en position de marche (I)

DIMENSIONS

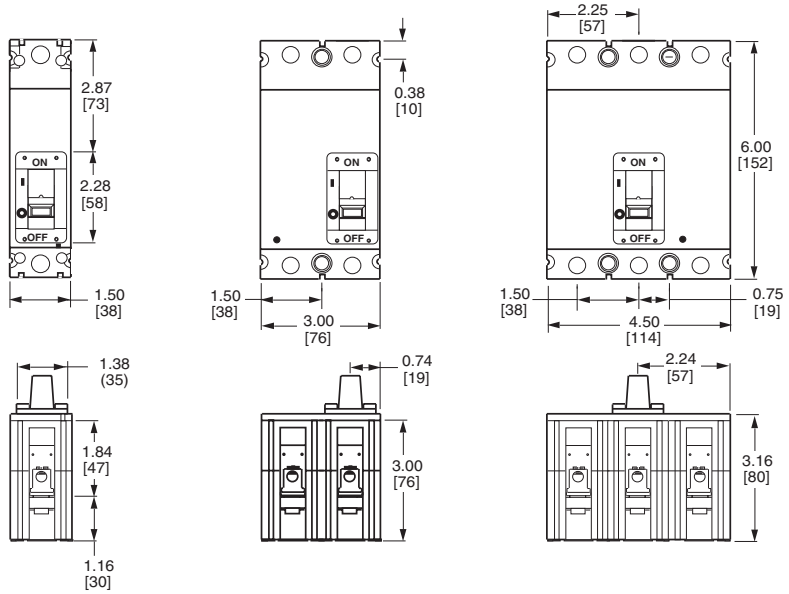
NOTE: Two-pole FC circuit breakers have the same dimensions as three-pole FC circuit breakers.

DIMENSIONES

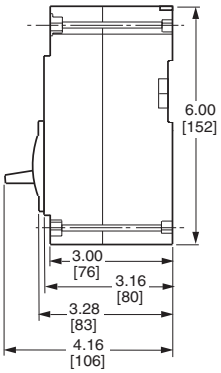
NOTA: Los interruptores automáticos FC de dos polos tienen las mismas dimensiones que los interruptores automáticos FC de tres polos.

DIMENSIONS

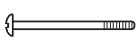
REMARQUE : Les disjoncteurs FC bipolaires ont les mêmes dimensions que les disjoncteurs FC tripolaires.



Dimensions: in. / pulg / po [mm]



(4) #8-32 x 3 in. Pan-head Mounting Screws
(4) tornillos de mtj. de cabeza fijadora de 8-32 x 3
(4) vis de montage à tête tronconique n° 8-32 x 3 po



17–21 lb-in / pulg / po
(1.9–2.4 N•m)

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Schneider Electric USA
3700 Sixth Street SW
Cedar Rapids, Iowa 52404 USA
1-888-SquareD (1-888-778-2733)
www.us.SquareD.com

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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Calz. J. Rojo Gómez 1121-A
Col. Gpe. del Moral 09300 México, D.F.
Tel. 55-5804-5000
www.schneider-electric.com.mx

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

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Toronto, Ontario
1-800-565-6699
www.schneider-electric.ca

48840-435-02
11/2003
Cedar Rapids, IA, USA

ECN N353

Two-pole QO® and QOB Qwik-Gard® Circuit Breakers with Class A Ground-fault Circuit Interrupter

Interruptor automático QO® y QOB Qwik-Gard® de dos polos con protección de falla a tierra clase A

Disjoncteur QO® et QOB Qwik-Gard® bipolaires avec fuite à la terre classe A

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Make sure wiring to load center or panelboard is correct. Qwik-Gard circuit breaker must switch both ungrounded (HOT) conductors in order to provide ground-fault protection. Incoming line must be connected to load center bus.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía (consulte la norma NFPA 70E).
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Asegúrese de que el cableado del centro de carga o tablero esté correcto. El interruptor automático Qwik-Gard deberá contar con características para conmutar los dos conductores no aterrizados (ENERGIZADOS) para proporcionar protección contra falla a tierra. La línea entrante deberá conectarse a la barra del centro de carga.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnel (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toute alimentation de cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Assurez-vous que le câblage vers le centre de distribution ou le panneau de distribution est correct. Le disjoncteur Qwik-Gard doit commuter les deux conducteurs non mis à la terre (SOUS TENSION) de façon à fournir une protection contre les défauts à la terre. La ligne d'arrivée doit être raccordée au bus du centre de distribution.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces précautions ne sont pas respectées, cela entraînera la mort ou des blessures graves.

NOTE: To minimize nuisance tripping:

- *Do not connect circuit breaker to swimming pool equipment installed before adoption of the 1965 National Electrical Code.*
- *Do not connect circuit breaker to electric ranges or clothes dryers whose frames are grounded by connection to a neutral conductor.*
- *Do not connect circuit breaker to more than 250 ft. (76 m) of load conductor for the total one-way run.*

CIRCUIT BREAKER INSTALLATION

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Turn Qwik-Gard circuit breaker off.
3. Install circuit breaker to panel mounting rail and line-side bus connections. See proper installation code for wire size. See circuit breaker for torque value.

NOTE: The panel neutral wire (A) must be connected to load center or panelboard neutral bar for circuit breaker to operate correctly. 60 A circuit breakers do not have a load neutral connection and are suitable only for supplying 240 Vac or 208 Vac two-wire (no neutral) loads.

4. For bolt-on circuit breakers, tighten screws (D).
5. Connect wiring as shown. Tighten screw in neutral bar (E) to torque specified in load center or panelboard.

NOTA: Para evitar el disparo involuntario:

- *No conecte el interruptor automático a equipo de piscina instalado antes de 1965.*
- *No conecte el interruptor automático a cocinas eléctricas o secadoras de ropa cuyos marcos estén conectados a tierra por medio de una conexión a un conductor neutro.*
- *No conecte el interruptor automático a más de 76 m (250 pies) del conductor de carga en la extensión total en una sola dirección.*

INSTALACION DEL INTERRUPTOR AUTOMATICO

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Desconecte el interruptor automático Qwik-Gard.
3. Instale el interruptor automático en los rieles de montaje del panel y a las conexiones de la barra en el lado de línea. Consulte el código de instalación correcto para obtener el calibre del cable. Consulte el interruptor automático para obtener el par de apriete.

NOTA: El conductor neutro del tablero (A) debe conectarse al centro de carga o a la barra del neutro del tablero para que el interruptor automático funcione correctamente. Los interruptores automáticos de 60 A no tienen conexión para neutro de carga y son adecuados sólo para suministrar cargas de dos hilos (sin neutro) de 240 V ~ o 208 V ~.

4. Apriete los tornillos (D) de los interruptores automáticos atornillables.
5. Conecte el cableado tal como se muestra abajo. Apriete el tornillo en la barra del neutro (E) según el valor de par de apriete especificado en el centro de carga o tablero.

REMARQUE : Pour éviter le déclenchement intempestif :

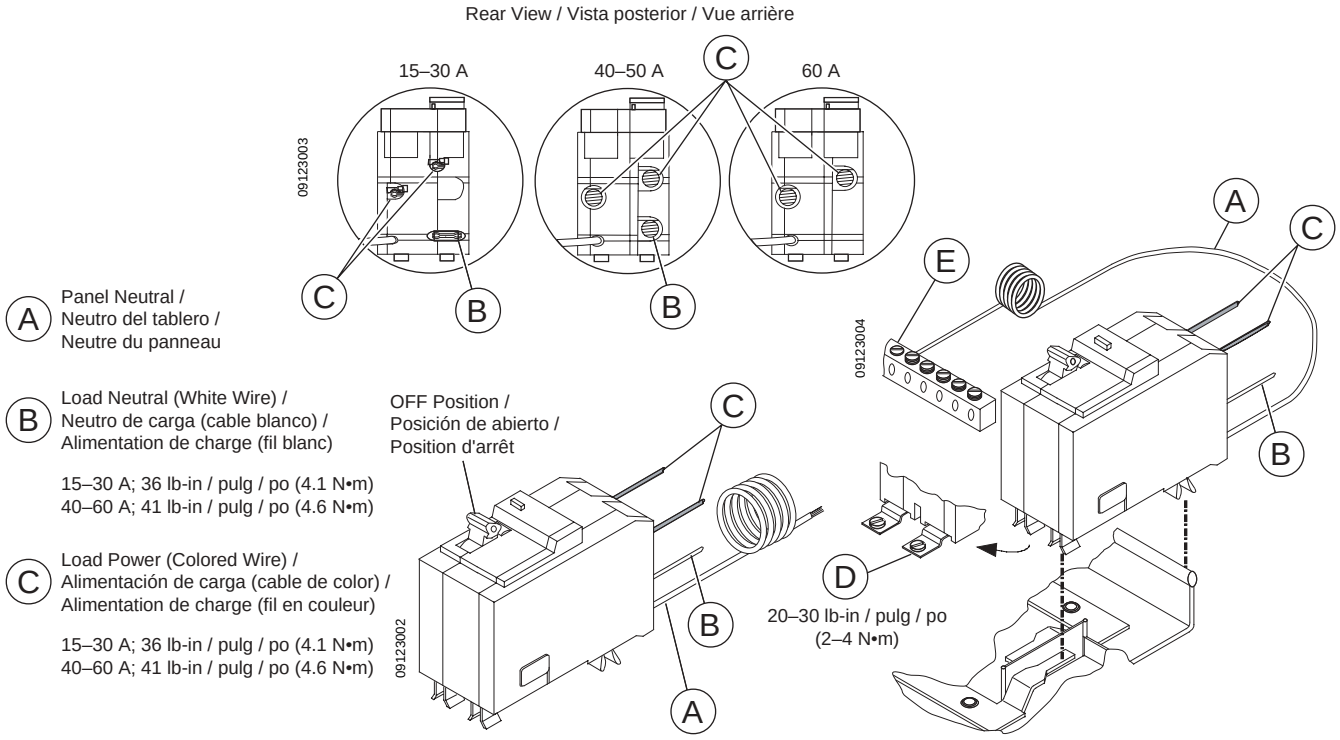
- *Ne pas raccorder le disjoncteur à des appareils de piscine installés avant de 1965.*
- *Ne pas raccorder le disjoncteur à des cuisinières électriques ou à des séchoirs dont les cadres sont mis à la terre au moyen d'une connexion à un conducteur neutre.*
- *Ne pas raccorder le disjoncteur à un conducteur de charge de plus de 76 m (250 pieds) pour la course parcourue dans une seule direction.*

INSTALLATION DU DISJONCTEUR

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Mettre en arrêt le disjoncteur Qwik-Gard.
3. Se reporter au code d'installation approprié pour obtenir le calibre du fil et au disjoncteur pour obtenir le couple. Installer le disjoncteur sur les rails de montage du panneau et aux connexions de la barre-bus du côté du secteur.

REMARQUE : Le fil du neutre du panneau (A) doit être raccordé au centre de distribution ou à la barre du neutre du panneau de distribution pour que le disjoncteur fonctionne correctement. Les disjoncteurs de 60 A n'ont pas de connexion pour le neutre de charge e ils conviennent seulement à l'alimentation des charges à deux fils (sans neutre) à 240 VCA ou à 208 VCA.

4. Serrer les vis (D) des disjoncteurs boulonnés.
5. Raccorder le câblage de la façon indiquée ci-dessous. Serrer la vis de la barre du neutre (E) au couple spécifié sur le centre de distribution ou sur le panneau de distribution.



6. Remove appropriate twist-out panels in load center or panelboard trim.
7. Install trim.
8. Install panel label and Building Occupant's Test Reminder card supplied with the circuit breaker.

6. Retire las placas removibles apropiadas en el marco del centro de carga o tablero.
7. Instale el marco.
8. Coloque la etiqueta del panel y la tarjeta de aviso de prueba para los ocupantes del edificio, provistas con el interruptor automático.

6. Retirer les plaquettes à tordre appropriées de la garniture du centre de distribution ou du panneau de distribution.
7. Installer la garniture.
8. Installer l'étiquette du panneau et la carte d'avis de rappel de vérification pour les occupants de l'édifice, fournies avec le disjoncteur.

Figure / Figura / Figure 1 : Two-wire 240 V or 208 V Circuits / Circuitos de 2 hilos de 240 V~ o 208 V~ / Circuits à 2 fils de 240 V ou 208 V

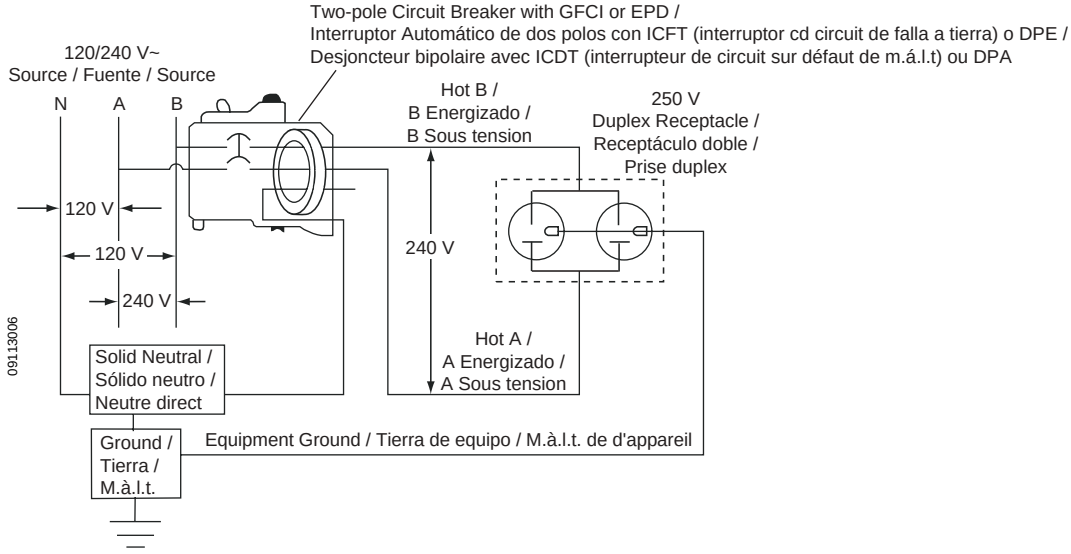


Figure / Figura / Figure 2 : Three-wire 120/240 V or 208/120 V Circuits / Circuitos de 3 hilos de 120/240 V~ o 208Y/120 V~ / Circuits à 3 fils de 120/240 V ou 208Y/120 V

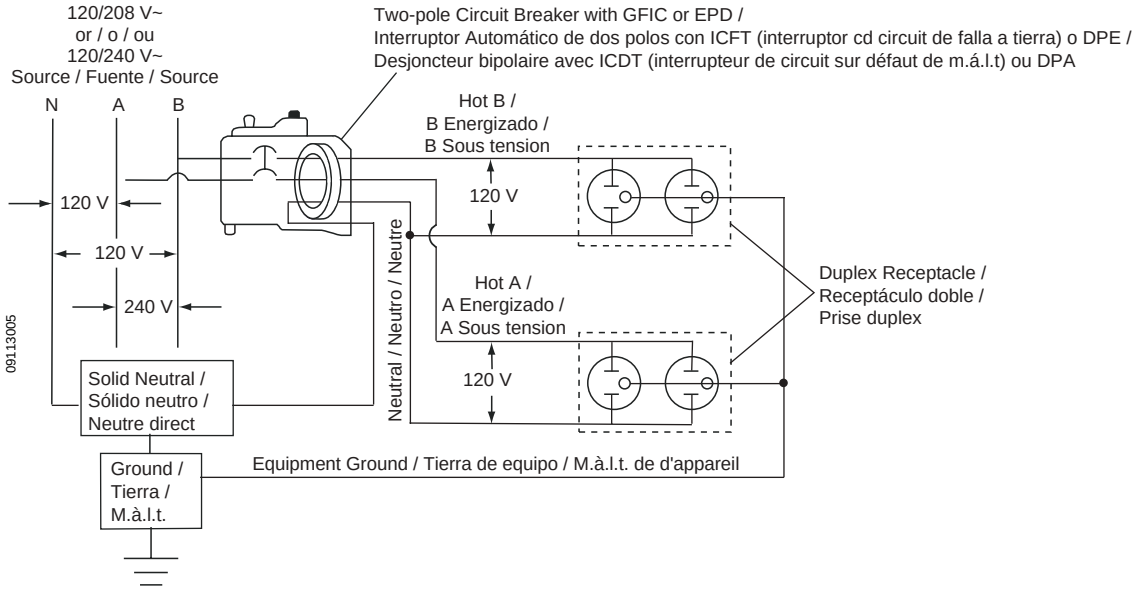
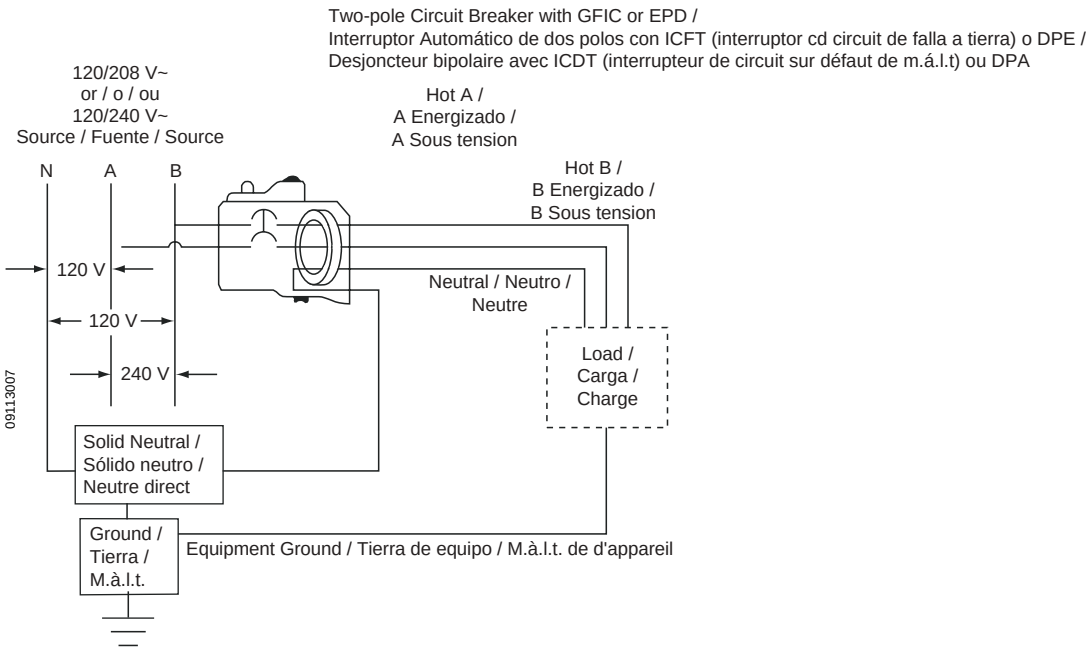


Figure / Figura / Figure 3 : 120 V Multi-wire Circuits / Circuitos de múltiples hilos de 120 V~ / Circuits multifilaires de 120 V



TEST CIRCUIT BREAKER

Test circuit breaker after installation following procedure below. Test monthly thereafter following the procedure on the Building Occupant's Test Reminder.

PRUEBA DEL INTERRUPTOR AUTOMATICO

Pruebe el interruptor automático después de la instalación de acuerdo con el procedimiento que se indica. Luego, pruebe el interruptor automático mensualmente siguiendo el procedimiento indicado en el aviso de prueba para los ocupantes del edificio.

ESSAI DU DISJONCTEUR

Vérifier le disjoncteur après l'instalation selon les directives ci-dessous. Ensuite, vérifier le disjoncteur mensuellement en suivant les directives indiquées sur l'avis de rappel de vérification pour les occupants de l'édifice.

⚠ CAUTION / PRECAUCIÓN / ATTENTION

HAZARD OF EQUIPMENT DAMAGE

Megger, high-voltage, or hi-pot tests will damage circuit breaker. Turn off all power supplying the equipment and isolate the Qwik-Gard circuit breaker before testing.

Failure to follow this instruction can result in damage to the circuit breaker electronic module.

PELIGRO DE DAÑO AL EQUIPO

La utilización de megóhmetros, la alta tensión o las pruebas de rigidez dieléctrica producirán daño al interruptor automático. Desenergice el equipo y aísle el interruptor automático Qwik-Gard antes de realizar cualquier prueba.

El incumplimiento de esta precaución puede producir daño al módulo electrónico del interruptor automático.

RISQUE DE DOMMAGES MATÉRIELS

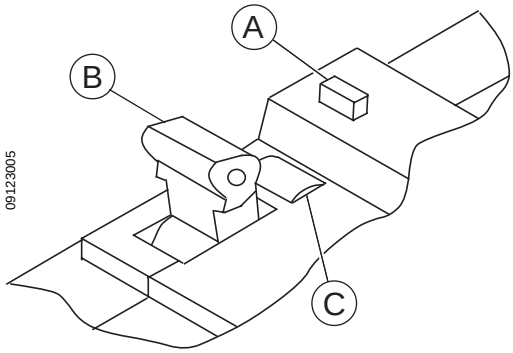
Les essais au mégohmètre, à haute tension ou de rupture diélectrique endommageront le disjoncteur. Coupez toute alimentation de cet appareil et isolez le disjoncteur Qwik-Gard avant de procéder à l'essai.

Si cette précaution n'est pas respectée, cela peut entraîner des dommages matériels au module électronique du disjoncteur.

1. Turn off all loads downstream of circuit breaker. Turn on power to load center or panelboard. Turn Qwik-Gard circuit breaker on (I ON).
2. Press TEST button (A). If circuit breaker is operating correctly:
   - — power will be disconnected,
   - — handle (B) will move to the center (tripped) position and
   - — red trip indicator (C) will appear.
3. If circuit breaker is not operating correctly, recheck wiring and installation.
4. To reset circuit breaker, push handle (B) to off (O OFF) and then to on (I ON).

1. Desconecte todas las cargas derivadas del interruptor automático. Energice el centro de carga o tablero. Energice (I ON) el interruptor automático Qwik-Gard**.**
2. Oprima el botón TEST (prueba) (A). Si el interruptor automático funciona correctamente:
   - — se desconectará la alimentación,
   - — se desplazará la palanca (B) a la posición intermedia (de disparo) y
   - — se mostrará el indicador rojo de disparo (C).
3. Si el interruptor automático no funciona correctamente, vuelva a revisar el cableado y la instalación.
4. Para restablecer el interruptor automático, mueva la palanca (B) a la posición de abierto (O OFF) y luego a la posición de acerrado (I ON).

1. Mettre hors tension toutes les charges en aval du disjoncteur. Mettre sous tension le centre ou le panneau de distribution. Mettre le disjoncteur Qwik-Gard en marche (I ON).
2. Appuyer sur le bouton TEST (essai) (A). Si le disjoncteur fonctionne correctement :
   - — l'alimentation se coupera,
   - — la manette (B) se placera en position centrale (déclenchée) et
   - — le voyant de déclenchement rouge (C) apparaîtra.
3. Si le disjoncteur ne fonctionne pas correctement, revérifier le câblage et l'installation.
4. Pour réarmer le disjoncteur, amener la manette (B) sur la position d'arrêt (O OFF), puis sur la position de marche (I ON).



CIRCUIT BREAKER REMOVAL

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Remove circuit breaker in reverse order of installation.
3. If circuit breaker is not replaced, install two QOFP filler plates (not provided) to fill opening in load center or panelboard trim.

DESMONTAJE DEL INTERRUPTOR AUTOMATICO

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Desmonte el interruptor automático en el orden inverso al de la instalación.
3. Si no se reemplaza el interruptor automático, instale dos placas de relleno QOFP (no provistas) para llenar el espacio en el centro de carga o en el marco del tablero.

DÉMONTAGE DU DISJONCTEUR

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Démonter le disjoncteur dans l'ordre inverse de l'installation.
3. Si le disjoncteur n'est pas remplacé, installer deux plaques de remplissage QOFP (non fournies) pour remplir l'espace dans le centre de distribution ou dans la garniture du panneau de distribution.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Schneider Electric
3700 Sixth Street SW
Cedar Rapids, IA 52404 USA
1-888-SquareD (1-888-778-2733)
www.SquareD.com

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

Importado en México por:
Schneider Electric México, S.A. de C.V.
Calz. J. Rojo Gómez 1121-A
Col. Gpe. del Moral 09300 México, D.F.
Tel. 55-5804-5000
www.schneider-electric.com.mx

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

Schneider Canada Inc.
19 Waterman Avenue, M4B 1 Y2
Toronto, Ontario
1-800-565-6699
www.schneider-electric.ca

48840-088-01
08/2003
Cedar Rapids, IA, USA

ECN N339

One-pole QO® and QOB Qwik-Gard® Circuit Breakers with Class A Ground-fault Circuit Interrupter

Interruptores automáticos QO® y QOB Qwik-Gard® de un polo con protección de falla a tierra clase A

Disjoncteurs QO® et QOB Qwik-Gard® unipolaires avec interrupteur de circuit de défaut à la terre de classe A

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Make sure wiring to load center or panelboard is correct. Qwik-Gard circuit breaker must switch the ungrounded (HOT) conductor in order to provide ground-fault protection. Incoming line must be connected to load center bus.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía (consulte la norma NFPA 70E).
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Asegúrese de que el cableado del centro de carga o tablero esté correcto. El interruptor automático Qwik-Gard deberá contar con características para conmutar el conductor no aterrizado (ENERGIZADO) para proporcionar protección contra falla a tierra. La línea entrante deberá conectarse a la barra del centro de carga.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnel (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toute alimentation de cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Assurez-vous que le câblage vers le centre de distribution ou le panneau de distribution est correct. Le disjoncteur Qwik-Gard doit commuter le conducteur non mis à la terre (SOUS TENSION) de façon à fournir une protection contre les défauts à la terre. La ligne d'arrivée doit être raccordée au bus du centre de distribution.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces précautions ne sont pas respectées, cela entraînera la mort ou des blessures graves.

NOTE: To minimize nuisance tripping:

- *Do not connect circuit breaker to swimming pool equipment installed before adoption of the 1965 National Electrical Code.*
- *Do not connect circuit breaker to electric ranges or clothes dryers whose frames are grounded by connection to a neutral conductor.*
- *Do not connect circuit breaker to more than 250 ft. (76 m) of load conductor for the total one-way run.*

CIRCUIT BREAKER INSTALLATION

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Turn Qwik-Gard circuit breaker off.
3. Install circuit breaker to panel mounting rail and line-side bus connection. See proper installation code for wire size. See circuit breaker for torque value.

NOTE: The panel neutral wire (A) must be connected to load center or panelboard neutral bar for circuit breaker to operate correctly.

4. For bolt-on circuit breakers, tighten screw (D).
5. Connect wiring as shown below. Tighten screw in neutral bar (E) to torque specified in load center or panelboard.

NOTA: Para evitar el disparo involuntario:

- *No conecte el interruptor automático a equipo de piscina instalado antes de 1965.*
- *No conecte el interruptor automático a cocinas eléctricas o secadoras de ropa cuyos marcos estén conectados a tierra por medio de una conexión a un conductor neutro.*
- *No conecte el interruptor automático a más de 76 m (250 pies) del conductor de carga en la extensión total en una sola dirección.*

INSTALACIÓN DEL INTERUPTOR AUTOMÁTICO

1. Desenergice el équipo antes de realizar cualquier trabajo en él.
2. Desconecte el interruptor automático Qwik-Gard.
3. Instale el interruptor automático al riel de montaje del tablero y en la conexión del lado de línea de la barra. Consulte el código de instalación correcto para obtener el calibre del cable y consulte el interruptor automático para obtener el valor de par de apriete.

NOTA: El conductor neutro del tablero (A) debe conectarse al centro de carga o a la barra del neutro del tablero para que el interruptor automático funcione correctamente.

4. Apriete el tornillo (D) de los interruptores automáticos atornillables.
5. Conecte el cableado tal como se muestra abajo. Apriete el tornillo en la barra del neutro (E) según el valor de par de apriete especificado en el centro de carga o tablero.

REMARQUE : Pour éviter le déclenchement intempestif:

- *Ne pas raccorder le disjoncteur à des appareils de piscine installés avant de 1965.*
- *Ne pas raccorder le disjoncteur à des cuisinières électriques ou à des séchoirs dont les cadres sont mis à la terre au moyen d'une connexion à un conducteur neutre.*
- *Ne pas raccorder le disjoncteur à un conducteur de charge de plus de 76 m (250 pieds) pour la course parcourue dans une seule direction.*

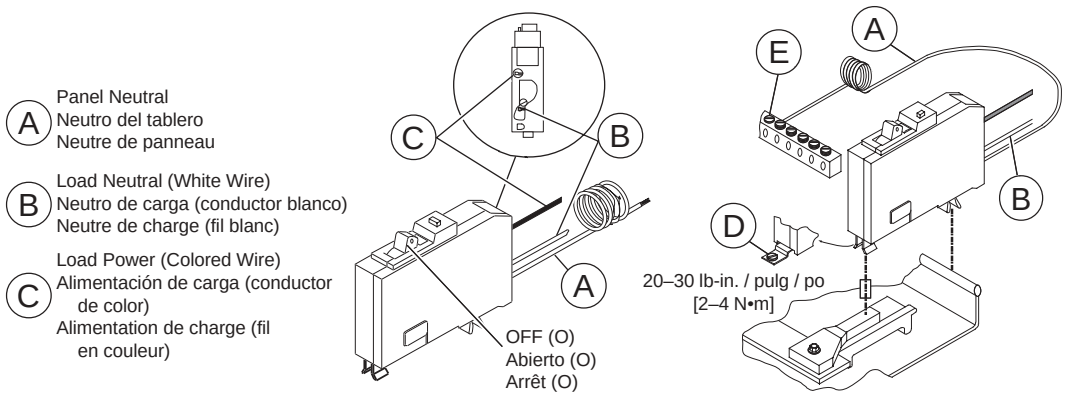
INSTALLATION DU DISJONCTEUR

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Mettre en arrêt le disjoncteur Qwik-Gard.
3. Installer le disjoncteur sur le rail de montage du panneau et à la connexion du bus de côté ligne. Se reporter au code d'installation approprié pour obtenir le calibre du fil et au disjoncteur pour obtenir le couple.

REMARQUE : Le fil du neutre du panneau (A) doit être raccordé au centre de distribution ou à la barre du neutre du panneau de distribution pour que le disjoncteur fonctionne correctement.

4. Serrer la vis (D) des disjoncteurs boulonne.
5. Raccorder le câblage de la façon indiquée ci-dessous. Serrer la vis de la barre du neutre (E) au couple spécifié sur le centre de distribution ou sur le panneau de distribution.

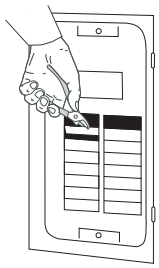
07303029 07303030



6. Remove appropriate twist-out panel in load center or panelboard trim.
7. Install trim.

6. Retire la placa removible apropiada en el marco del centro de carga o tablero.
7. Instale el marco.

6. Retirer la plaquette à tordre appropriée de la garniture du centre ou du panneau de distribution.
7. Installer la garniture.



8. Install panel label and Building Occupant's Test Reminder card supplied with the circuit breaker.

TEST CIRCUIT BREAKER

Test circuit breaker after installation following procedure below. Test monthly thereafter following the procedure on the Building Occupant's Test Reminder card.

8. Coloque la etiqueta del tablero y la tarjeta de aviso de prueba para los ocupantes del edificio, provistas con el interruptor automático.

PRUEBA DEL INTERRUPTOR AUTOMÁTICO

Pruebe el interruptor automático después de la instalación de acuerdo con el procedimiento que se indica. Luego, pruebe el interruptor automático mensualmente siguiendo el procedimiento indicado en la tarjeta de aviso de prueba para los ocupantes del edificio.

8. Installer l'étiquette du panneau et la carte d'avis de rappel de vérification pour les occupants de l'édifice, fournies avec le disjoncteur.

ESSAI DU DISJONCTEUR

Vérifier le disjoncteur après l'instalation selon les directives ci-dessous. Ensuite, vérifier le disjoncteur mensuellement en suivant les directives indiquées sur la carte d'avis de rappel de vérification pour les occupants de l'édifice.

CAUTION / PRECAUCIÓN / ATTENTION

HAZARD OF EQUIPMENT DAMAGE

Megger, high-voltage or hi-pot tests will damage circuit breaker. Turn off all power supplying the equipment and isolate the ground-fault circuit breaker before testing.

Failure to do so can result in damage to the circuit breaker electronic module.

PELIGRO DE DAÑO AL EQUIPO

La utilización de megóhmetros, la alta tensión o las pruebas de rigidez dieléctrica producirán daño al interruptor automático. Desenergice el equipo y aísle el interruptor automático de falla a tierra antes de realizar cualquier prueba.

El incumplimiento de esta precaución puede producir daño al módulo electrónico del interruptor automático.

RISQUE DE DOMMAGES MATÉRIELS

Les essais au mégohmètre, à haute tension ou de rupture diélectrique endommageront le disjoncteur. Coupez toute alimentation de cet appareil et isolez le disjoncteur de défaut à la terre avant de procéder à l'essai.

Si cette précaution n'est pas respectée, cela peut entraîner des dommages matériels au module électronique du disjoncteur.

1. Turn off all loads downstream of circuit breaker. Turn on power to load center or panelboard. Turn Qwik-Gard circuit breaker ON (I).

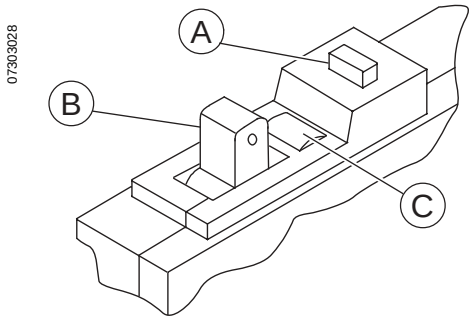
1. Desconecte todas las cargas derivadas del interruptor automático. Energice el centro de carga o tablero. Energice (I) el interruptor automático Qwik-Gard.

1. Mettre hors tension toutes les charges en aval du disjoncteur. Mettre sous tension le centre ou le panneau de distribution. Mettre le disjoncteur Qwik-Gard en marche (I).

2. Press TEST button (A). If circuit breaker is operating correctly:
   - — power will be disconnected,
   - — handle (B) will move to the center (tripped) position and
   - — red indicator (C) will appear.
3. If circuit breaker is not operating correctly, recheck wiring and installation.
4. To reset circuit breaker, push handle (B) to OFF (O) and then to ON (I).

2. Oprima el botón TEST (prueba) (A). Si el interruptor automático funciona correctemente:
   - — se desonectará la alimentación,
   - — se desplazará la palanca (B) a la posición intermedia (de disparo) y
   - — se mostrará el indicador rojo de disparo (C).
3. Si el interruptor automático no funciona correctemente, vuelva a revisar el cableado y la instalación.
4. Para restablecer el interruptor automático, mueva la palanca (B) a la posición de abierto (O) y luego a la posición de cerrado (I).

2. Appuyer sur le bouton TEST (essai) (A). Si le disjoncteur fonctionne correctement:
   - — l'alimentation se coupera,
   - — la manette (B) se placera en position centrale (déclenchée) et
   - — le voyant de déclenchement rouge (C) apparaîtra.
3. Si le disjoncteur ne fonctionne pas correctement, revérifier le câblage et l'installation.
4. Pour réarmer le disjoncteur, amener la manette (B) sur la position d'arrêt (O), puis sur la position de marche (I).



CIRCUIT BREAKER REMOVAL

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Remove circuit breaker in reverse order of installation.
3. If circuit breaker is not replaced, install a QOFP filler plate (not provided) to fill opening in load center or panelboard trim.

DESMONTAJE DEL INTERRUPTOR AUTOMÁTICO

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Desmonte el interruptor automático en el orden inverso al de la instalación.
3. Si no se vuelve a colocar el interruptor automático, instale una placa de relleno QOFP (no provistas) para llenar el espacio en el centro de carga o en el marco del tablero.

DÉMONTAGE DU DISJONCTEUR

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Démonter le disjoncteur dans l'ordre inverse de l'installation.
3. Si le disjoncteur n'est pas remplacé, installer un plaque de remplissage QOFP (non fournies) pour remplir l'espace dans le centre de distribution ou dans la garniture du panneau de distribution.

Schneider Electric
3700 Sixth St. SW
Cedar Rapids, IA 52404 USA
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www.SquareD.com

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19 Waterman Avenue, M4B 1 Y2
Toronto, Ontario
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www.schneider-electric.ca

DRAWINGS

Equipment Drawings List

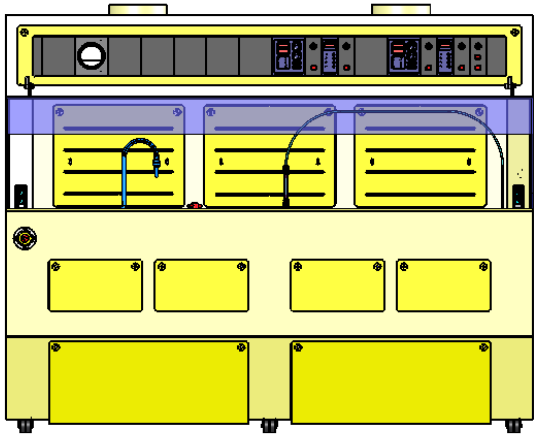
Station #1974

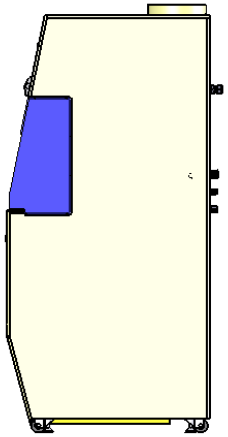
The following pages contain drawings relevant to the design, installation and maintenance of this equipment and are ordered as indicated in the following table.

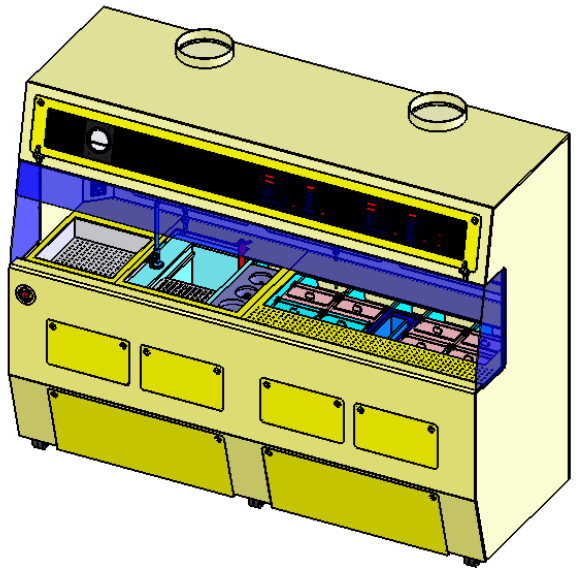
DRAWING #	DRAWING NAME	REV	DRAWN BY	RELEASE DATE
1974 BC	MANUAL DIFUSSION CLEAN STATION 150 DS 1 MFB (9 sheets)	D	K. MORTENSEN	2-27-08
E-1974-01	LOAD CENTER	-	K. MORTENSEN	10-17-06
E-1974-02	208/120 V DISTRIBUTION	-	B. MASON	5-23-07
E-1974-03	EPO SYSTEM		K. MORTENSEN	10-17-06
E-1974-04	BLOCKED MAIN DRAIN SYSTEM, +24 VDC	-	M. WALKER	11-6-96
E-1974-05	24 VDC, 24 VAC POWER SUPPLIES	-	B. MASON	3-27-08
E-1974-06	HAND HELD ASPIRATOR SYSTEM	-	M. WALKER	5-2-96
E-1974-07	DI WATER GOOSENECK	-	M. WALKER	5-2-96
E-1974-08	625TM PROCESS TIMERS	A	B. MASON	5-23-07
E-1974-09	625C TEMP. CONTROLLER, VERSION 3, 24 VAC	A	K. MORTENSEN	4-21-06
E-1974-10	DECK LIGHT		K. MORTENSEN	10-17-06
E-1974-11	AUTOMATIC GLOVE WASH	-	M. WALKER	5-2-96
E-1974-12	NUETRALIZATION ALARM	-	K. MORTENSEN	4-22-08
E-1974-13	MAGNETIC STIRRER	-	K. MORTENSEN	4-22-08
P-1974-01	1974 CDA SCHEMATIC	-	K. MORTENSEN	5-12-2008
P-1974-02	1974 N2 SCHEMATIC	-	K. MORTENSEN	5-12-2008
P-1974-03	1971 DI WATER SCHEMATIC	-	K. MORTENSEN	5-12-2008

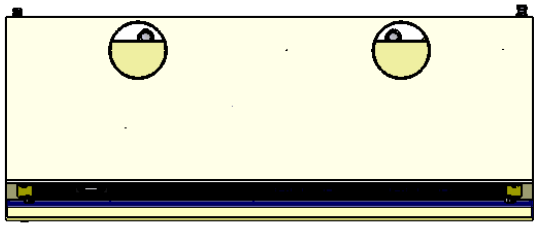
REVISIONS

REV.	DESCRIPTION	DATE	APPROVAL
B	REMOVED TANK, MOVED SPIKET & WORK SURFACE	02/05/08	
C	CHANGED TANK ORIENTATION, REDUCED SINK	02/21/08	
D	INCREASED DRAWER SIZE, REMOVED SLOTS	02/27/08	









APPROVAL SIGNATURE: _____ DATE:_____

AS IS:____

WITH CHANGES:____

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS + DECIMALS ± .03 ANGLES + 1

MATERIAL: WPP

FINISH: ----------

DO NOT SCALE DRAWING

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN K MORTENSEN	02/27/08
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG	

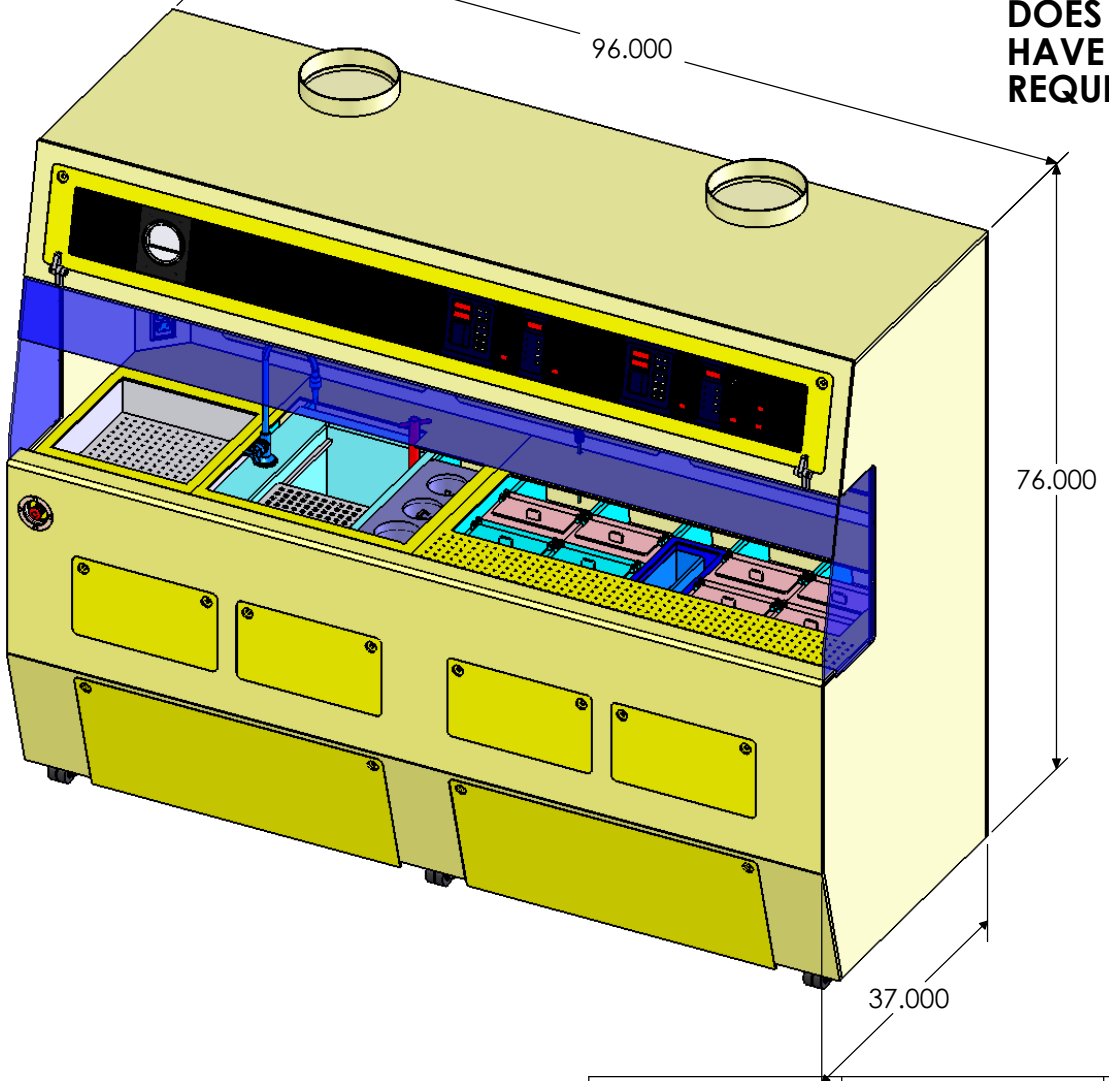
Bold Technologies, Inc.
1455 W. 8120 S.
West Jordan, UT 84088

150 DS 1F MFB

SIZE A | DWG. NO. 1974 BC | REV. D

SCALE 1:35 | CAD FILE: 1SW BCS | SHEET 1 OF 9

NOTE:
DOES NOT HAVE SIDE OR BACK PANELS REQUIRING ACCESS



1) POWER : 110/208 V 3 ∅ 60 AMP SERVICE -- EST. 50/60 Hz
2)EXHAUST : 1390 CFM MAX , 1/2 WATER COLUMN ,2X10" COLLAR .
3)DI WATER INLET : 1 X 3/4 FLARETEK CONNECTIONS. 7 GPM MAX.
4)DI OUTLET : 1 X 3/4 FLARETEK CONNECTIONS.
5)CDA INLET : 1 X 1/2 FLARETEK CONNECTIONS.
6)N-2 INLET : 1 X 3/8 FLARETEK CONNECTIONS.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
+ ± .03 + 1

MATERIAL: WPP

FINISH: ----------

DO NOT SCALE DRAWING

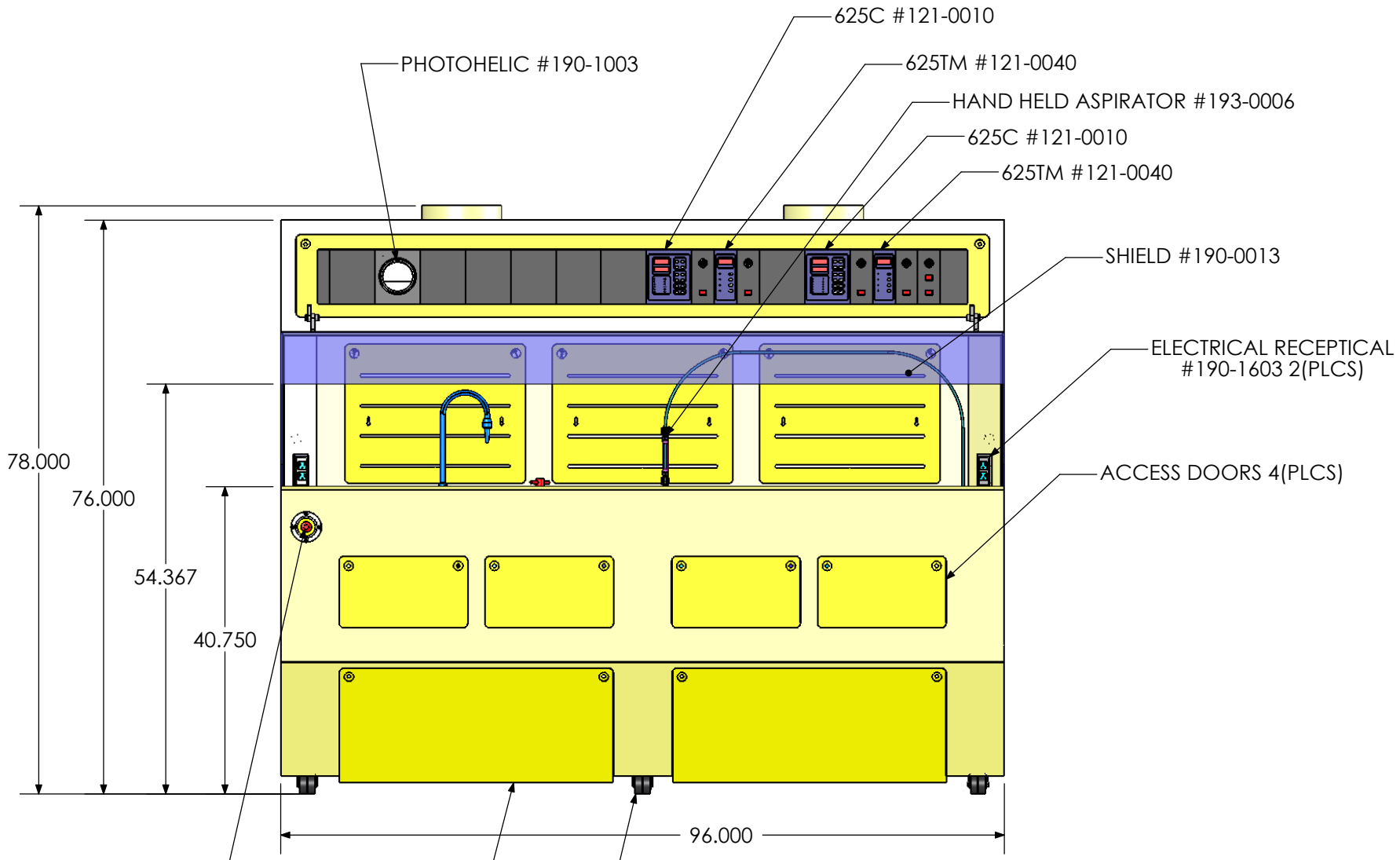
CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN K MORTENSEN	02/21/08
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG	

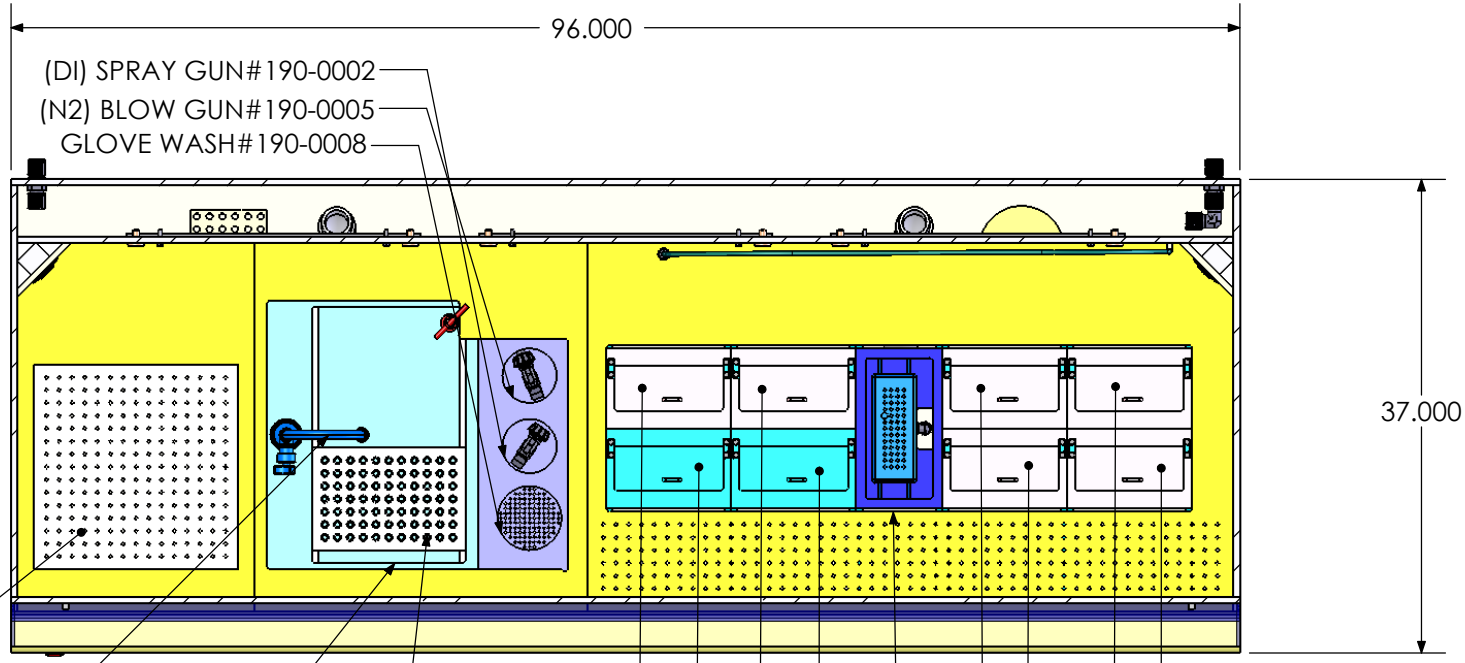
Bold Technologies, Inc.
1455 W. 8120 S.
West Jordan, UT 84088

150 DS 1F MFD

SIZE A | DWG. NO. 1974 BC | REV. D
SCALE 1:20 | CAD FILE: 1SW BCS | SHEET 2 OF 9



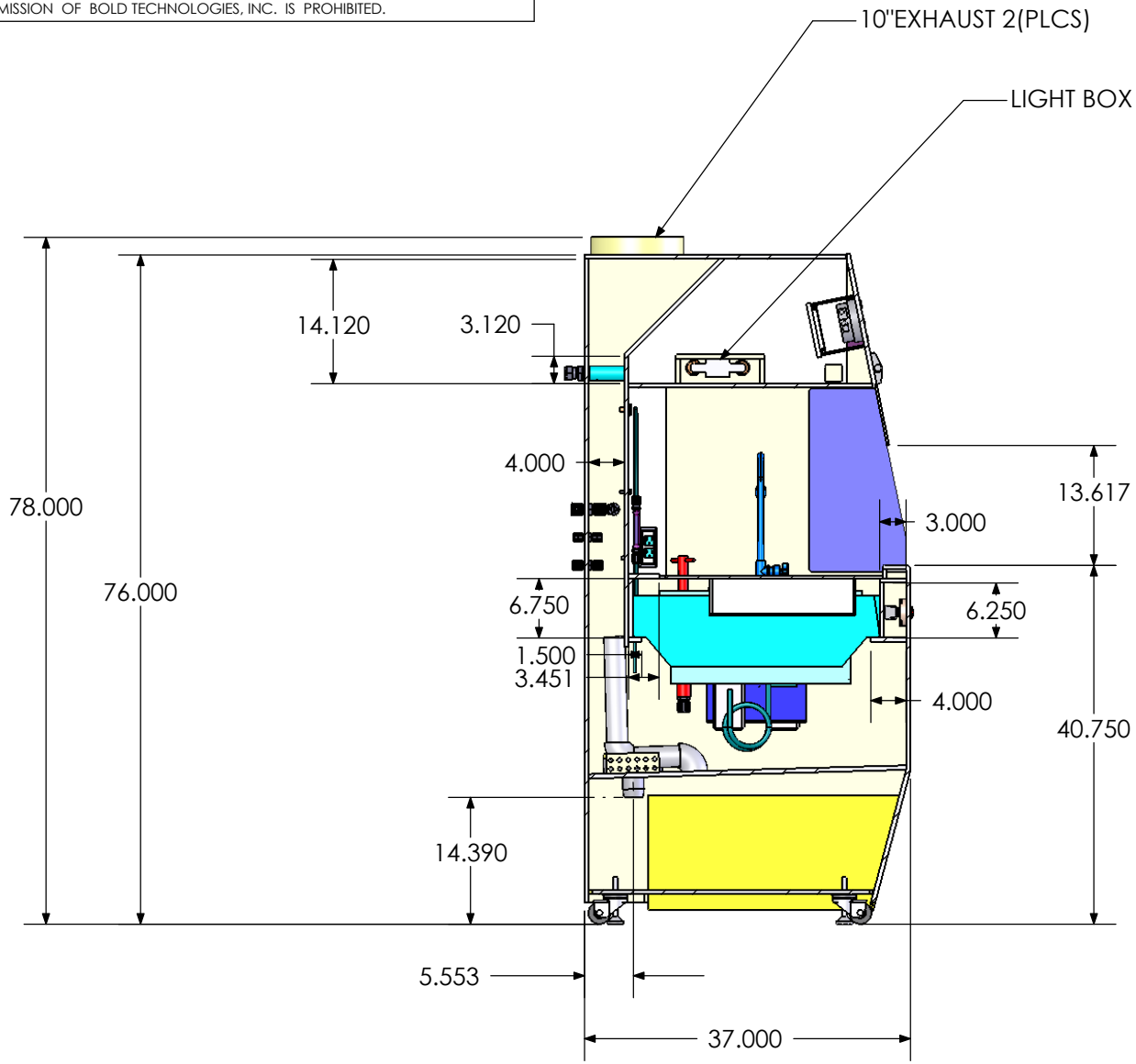
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES + ± .03 + 1	CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE	Bold Technologies, Inc. 1455 W. 8120 S. West Jordan, UT 84088
MATERIAL WPP	APPROVALS / DATE DRAWN K MORTENSEN 02/21/08 CHECKED RESP ENG MFG ENG QUAL ENG	150 DS 1F MFD
FINISH DO NOT SCALE DRAWING		SIZE A · DWG. NO. 1974 BC · REV. D SCALE 1:15 · CAD FILE: 1SW BCS · SHEET 3 OF 9



SECTION A-A
SCALE 1 : 15

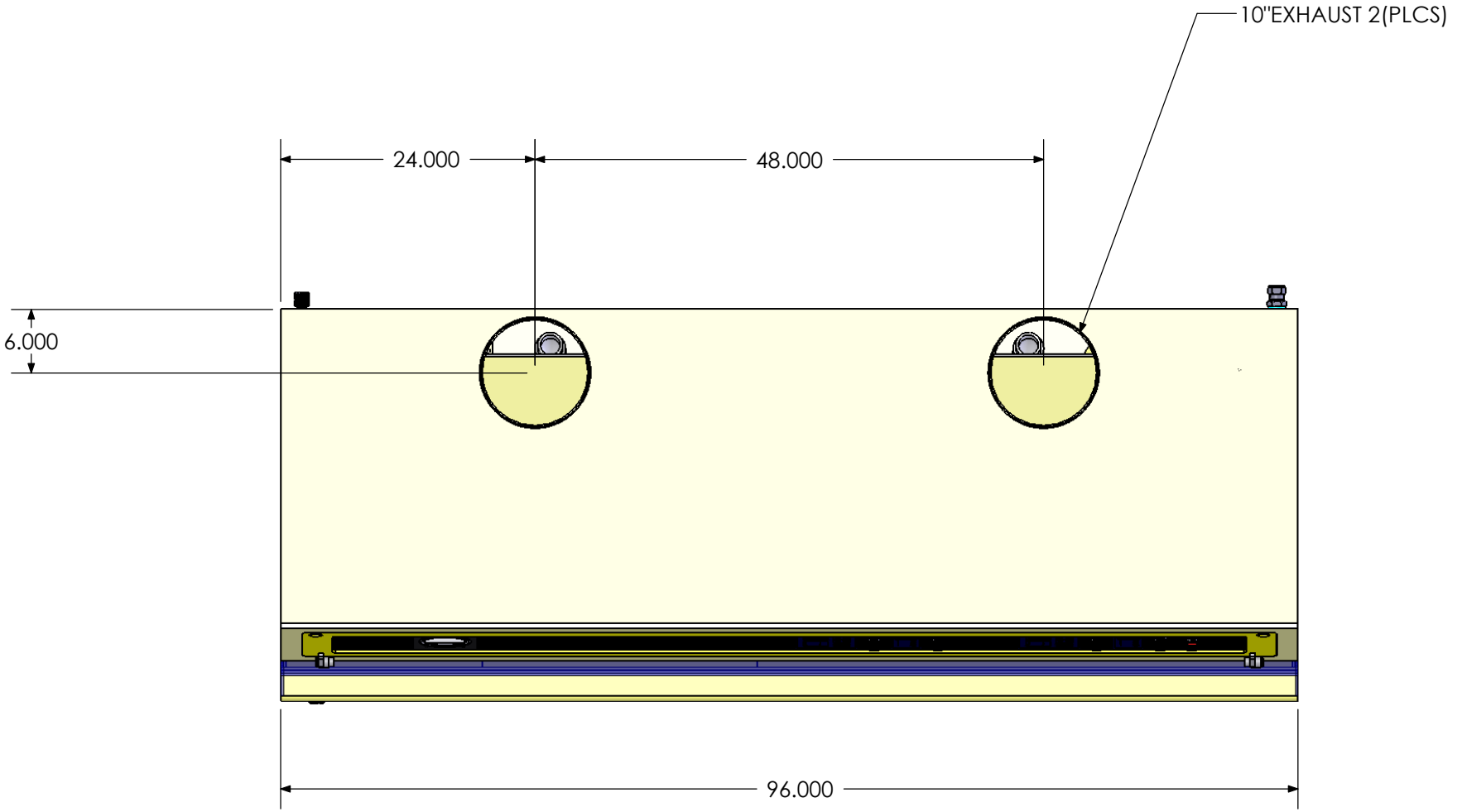
NOTE,
1) SUBMERGIBLE HEATERS
NOT SHOWN FOR TANKS#1 AND#6 #192-1102
2)STIR BAR
NOT SHOWN IN TANK #8 #193-0071

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS + DECIMALS ± .03 ANGLES + 1	CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE	Bold Technologies, Inc. 1455 W. 8120 S. West Jordan, UT 84088
	APPROVALS / DATE	
	DRAWN K MORTENSEN 02/21/08	
	CHECKED	150 DS 1F MFD
MATERIAL WPP	RESP ENG	
FINISH ----------	MFG ENG	SIZE A / DWG. NO. 1974 BC / REV. D
DO NOT SCALE DRAWING	QUAL ENG	SCALE 1:15 / CAD FILE: 1SW BCS / SHEET 4 OF 9



SECTION B-B
SCALE 1 : 20

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES + ± .03 + 1	CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE	Bold Technologies, Inc. 1455 W. 8120 S. West Jordan, UT 84088
	APPROVALS / DATE	
	DRAWN K MORTENSEN 02/21/08	
	CHECKED	150 DS 1F MFD
MATERIAL WPP	RESP ENG	
FINISH ----------	MFG ENG	SIZE A · DWG. NO. 1974 BC · REV. D
DO NOT SCALE DRAWING	QUAL ENG	SCALE 1:20 · CAD FILE: 1SW BCS · SHEET 5 OF 9



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS + DECIMALS ± .03 ANGLES + 1

MATERIAL WPP

FINISH ----------

DO NOT SCALE DRAWING

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

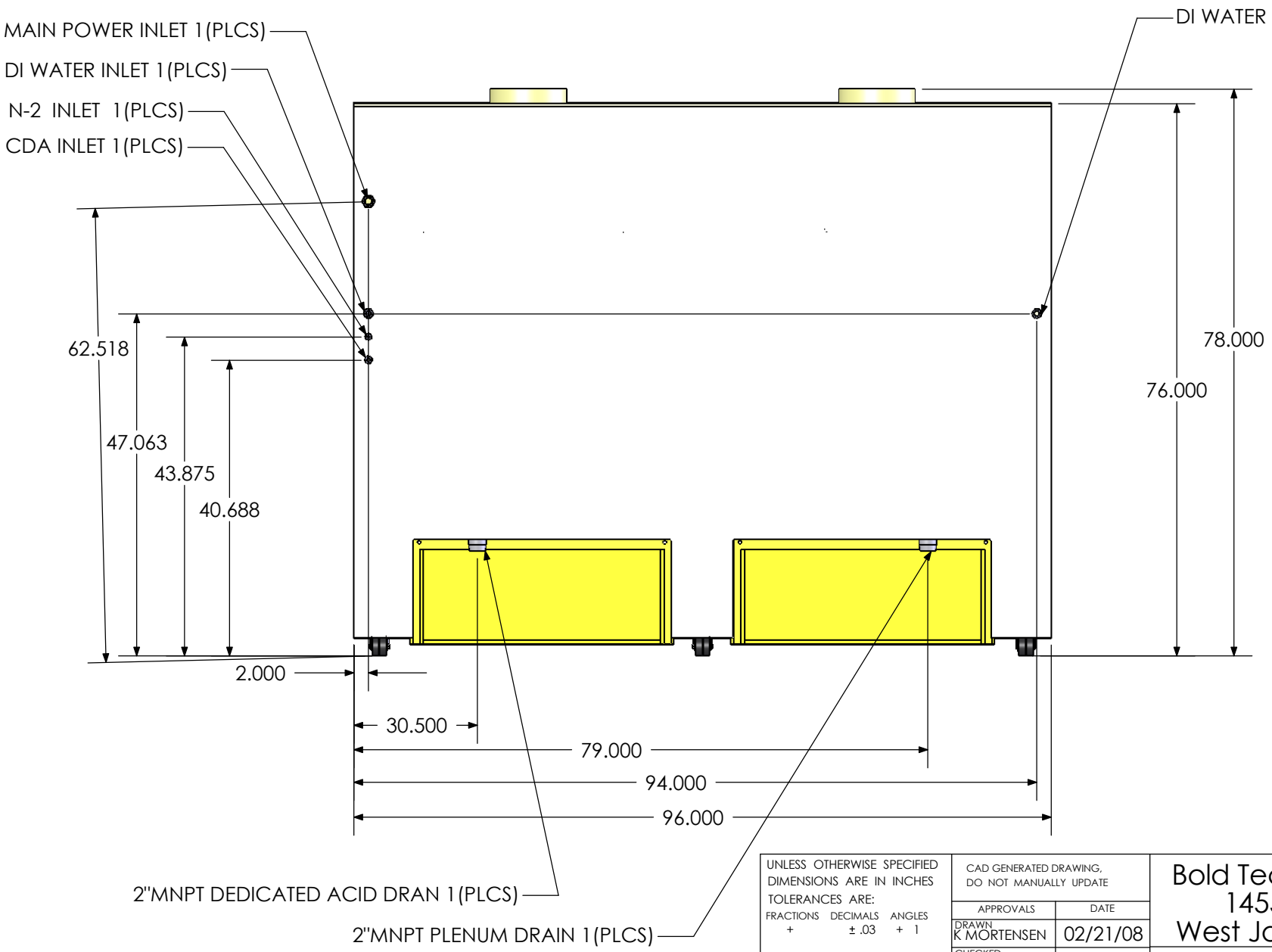
APPROVALS	DATE
DRAWN K MORTENSEN	02/21/08
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG	

Bold Technologies, Inc.
1455 W. 8120 S.
West Jordan, UT 84088

150 DS 1F MFD

SIZE A | DWG. NO. 1974 BC | REV. D

SCALE 1:15 | CAD FILE: 1SW BCS | SHEET 6 OF 9



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
+ ± .03 + 1

MATERIAL WPP

FINISH ----------

DO NOT SCALE DRAWING

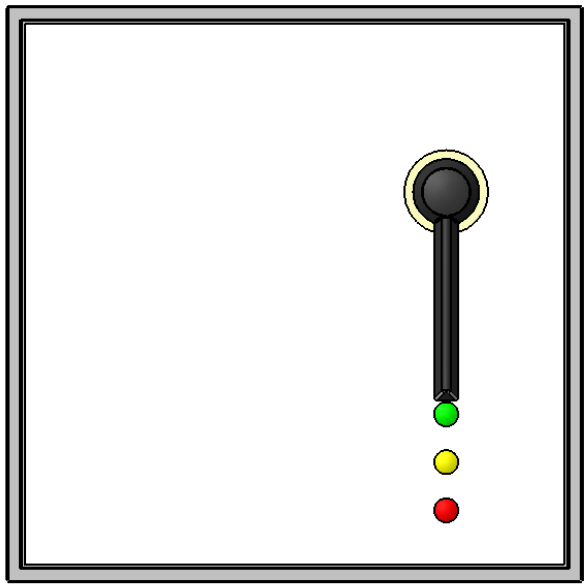
CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

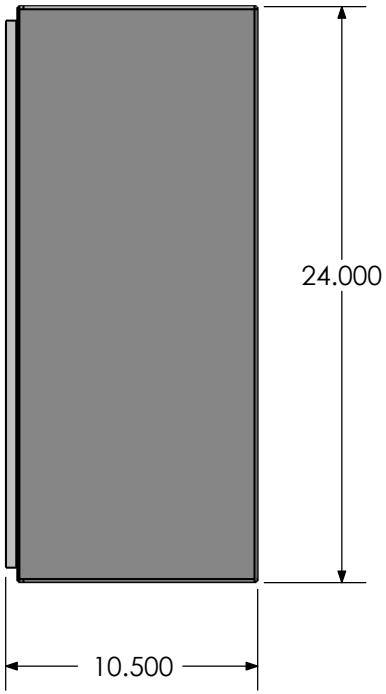
APPROVALS	DATE
DRAWN K MORTENSEN	02/21/08
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG	

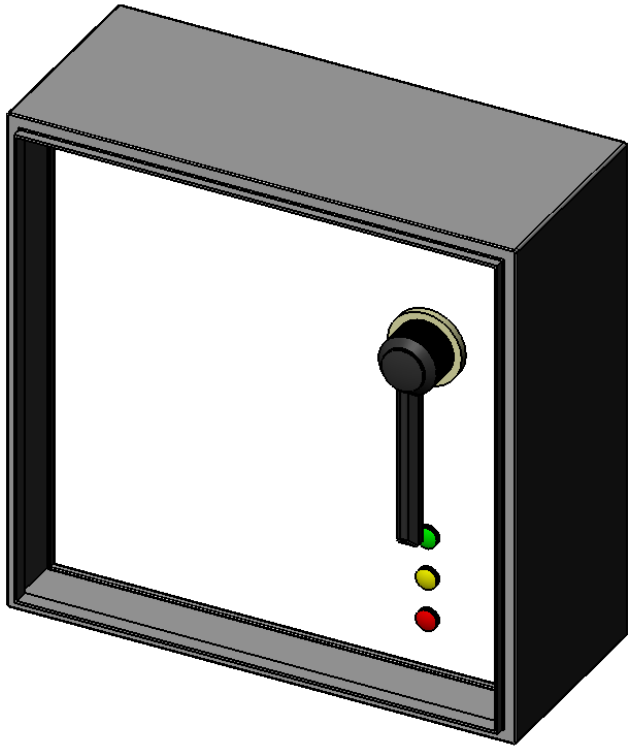
Bold Technologies, Inc.
1455 W. 8120 S.
West Jordan, UT 84088

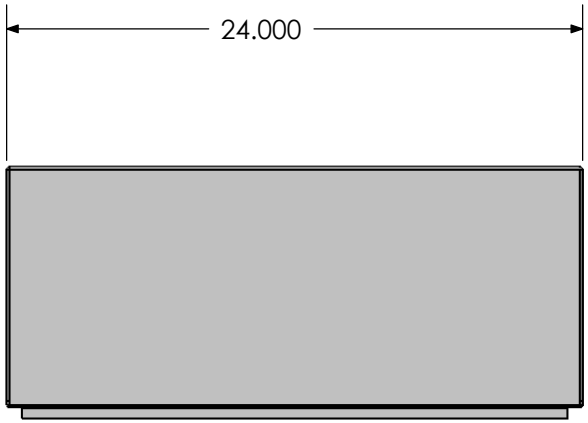
150 DS 1F MFD

SIZE A | DWG. NO. 1974 BC | REV. D
SCALE 1:20 | CAD FILE: 1SW BCS | SHEET 7 OF 9









NOTE: DOOR NOT SHOWN

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
+ ± .03 + 1

MATERIAL
Steel

FINISH

DO NOT SCALE DRAWING

CAD GENERATED DRAWING,
DO NOT MANUALLY UPDATE

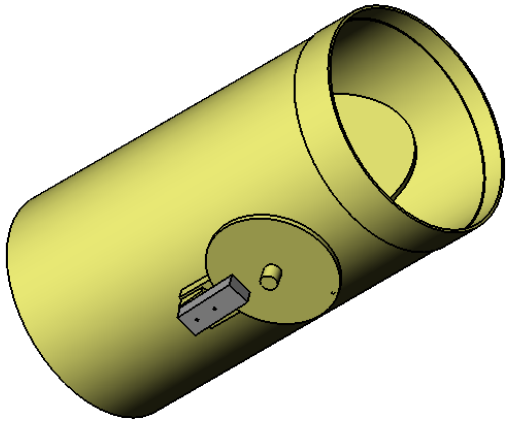
APPROVALS	DATE
DRAWN K MORTENSEN	02/21/08
CHECKED	
RESP ENG	
MFG ENG	
QUAL ENG	

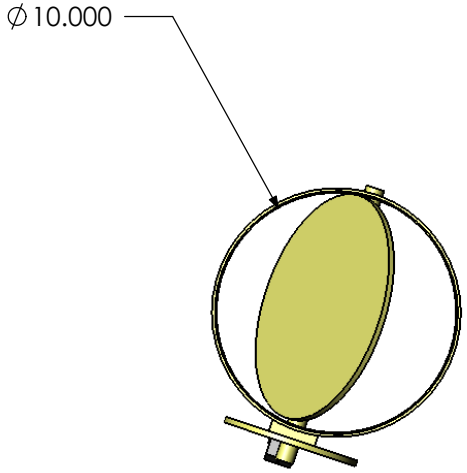
Bold Technologies, Inc.
1455 W. 8120 S.
West Jordan, UT 84088

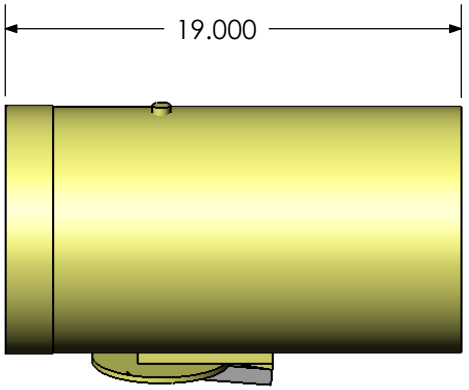
150 DS 1F MFD
Breaker Box

SIZE	DWG. NO.	REV.
A	1974 BC	D

SCALE 1:8	CAD FILE: 1SW BCS	SHEET 8 OF 9

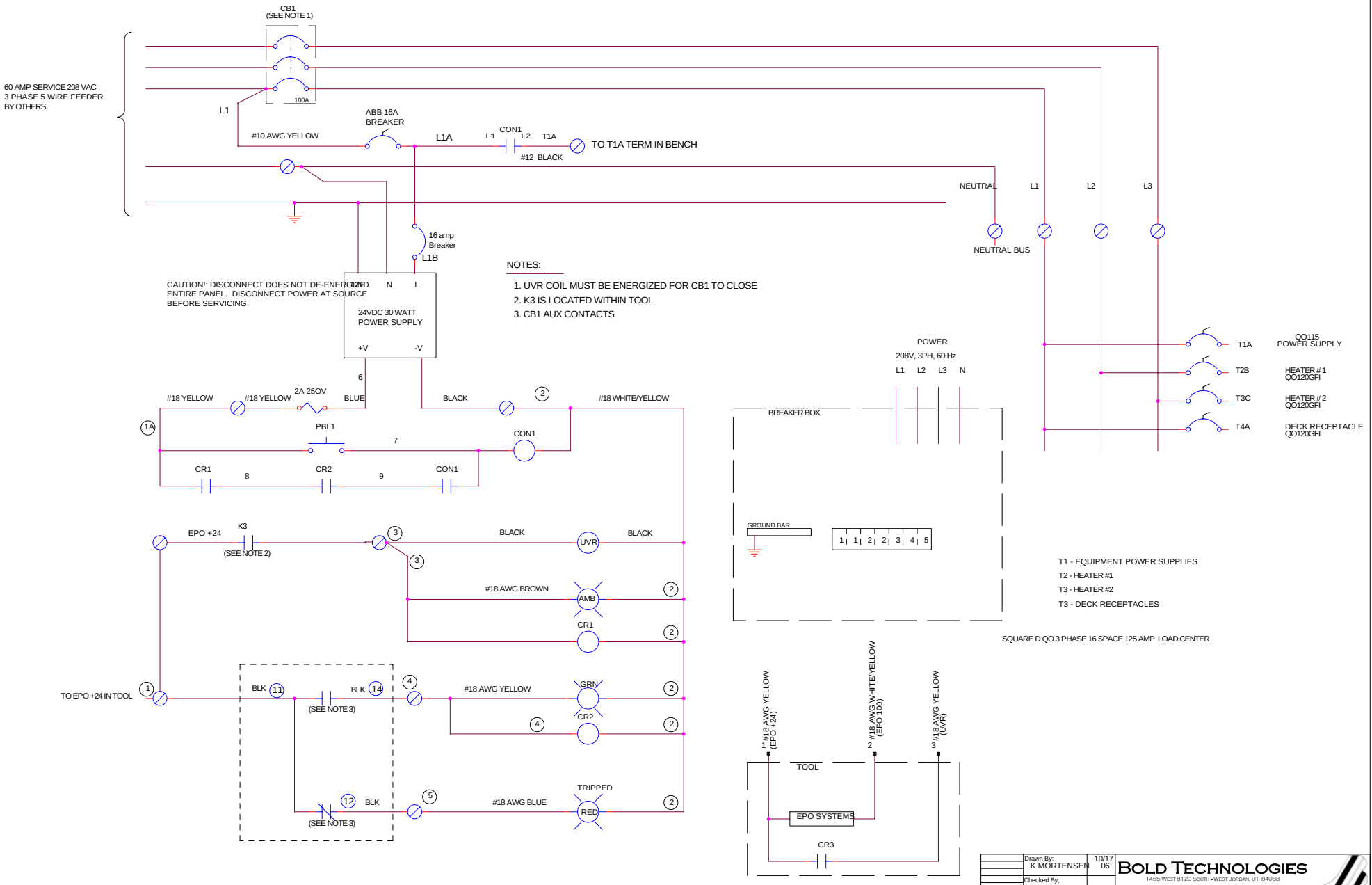






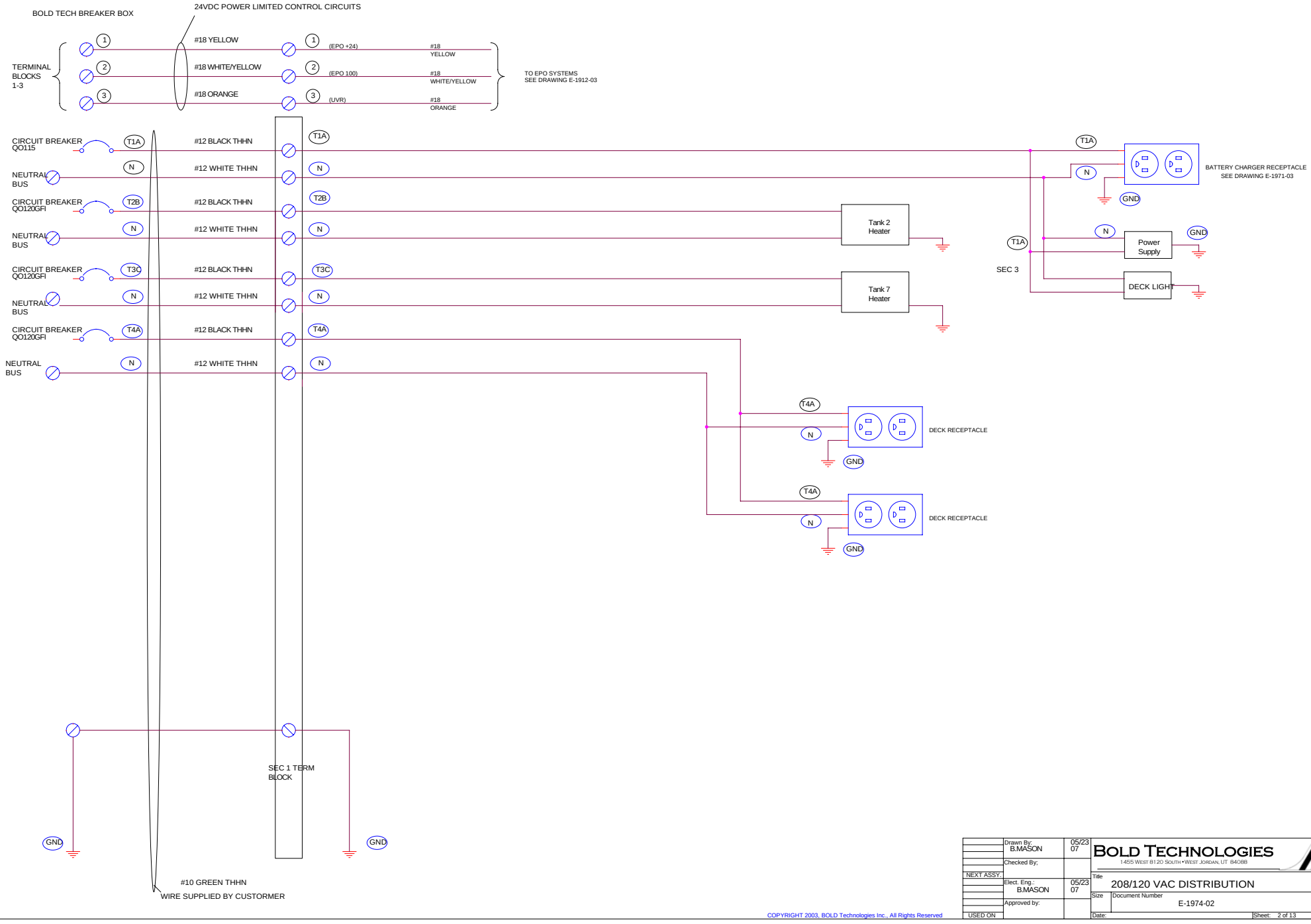
MANUAL DAMPER #190-1775 2(PLCS)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS + DECIMALS ± .03 ANGLES + 1	CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE	Bold Technologies, Inc. 1455 W. 8120 S. West Jordan, UT 84088
MATERIAL WPP	APPROVALS / DATE	150 DS 1F MFD
FINISH ----------	DRAWN K MORTENSEN 02/21/08	SIZE A · DWG. NO. 1974 BC · REV. D
DO NOT SCALE DRAWING	CHECKED · RESP ENG · MFG ENG · QUAL ENG	SCALE 1:8 · CAD FILE: 1SW BCS · SHEET 9 OF 9

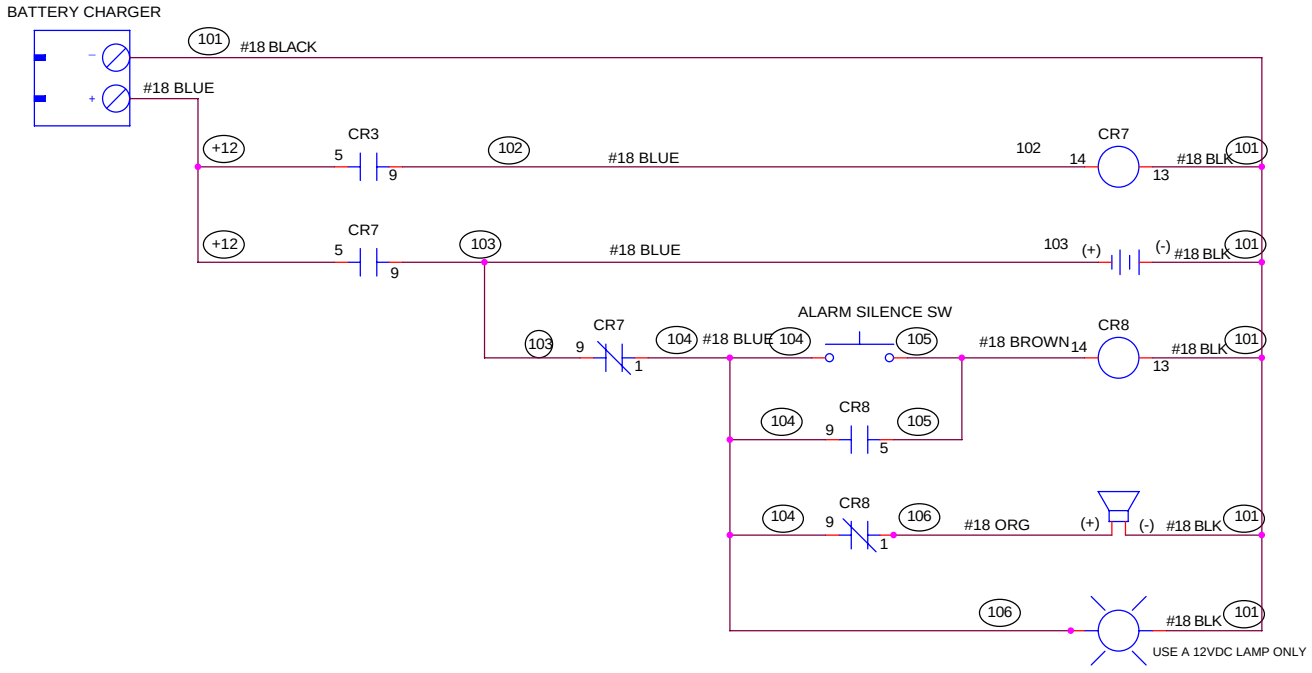


Drawn By: K MORTENSEN	10/17 06	BOLD TECHNOLOGIES
Checked By;		1455 West 8120 South • West Jordan, UT 84088
NEXT ASSY:		Title: LOAD CENTER
Elect. Eng.: K MORTENSEN	10/17 06	Size: - Document Number: E-1974-01 Rev: -
Approved by:		Date: Thursday, June 19, 2008 Sheet: 1 of 13
USED ON		

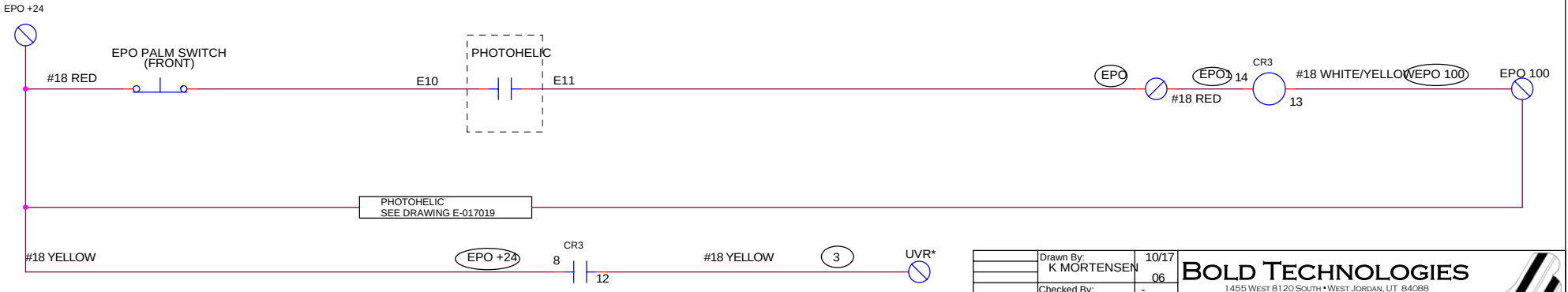
NOTE: REMEMBER TO PULL 3 - 18 AWG WIRES FROM POWER BOX TO BENCH FOR EPO SYSTEM (1 - #18 YELOW 1- #18 WHITE/YELLOW 1- #18 ORANGE)



Drawn By: B.MASON	05/23 07	BOLD TECHNOLOGIES 1455 West 8120 South • West Jordan, UT 84088
Checked By;		
NEXT ASSY:		
Elect. Eng.: B.MASON	05/23 07	Title: 208/120 VAC DISTRIBUTION
Approved by:		Size: Document Number: E-1974-02 Rev: -
USED ON		Date: Sheet: 2 of 13



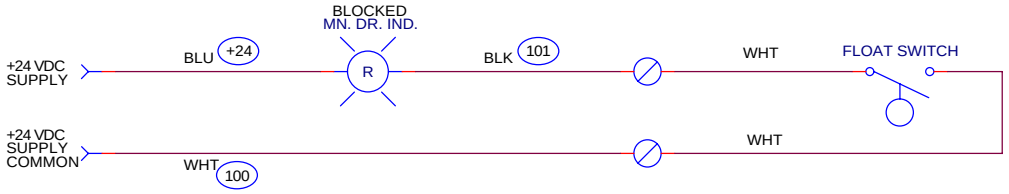
DESIGNATION	DESCRIPTION	BOLD PART#
CR1	2 POLE CONTROL RELAY (12VDC)	66-2210
CR2	2 POLE CONTROL RELAY (12VDC)	66-2210
CR3	2 POLE CONTROL RELAY (24VDC)	66-2310



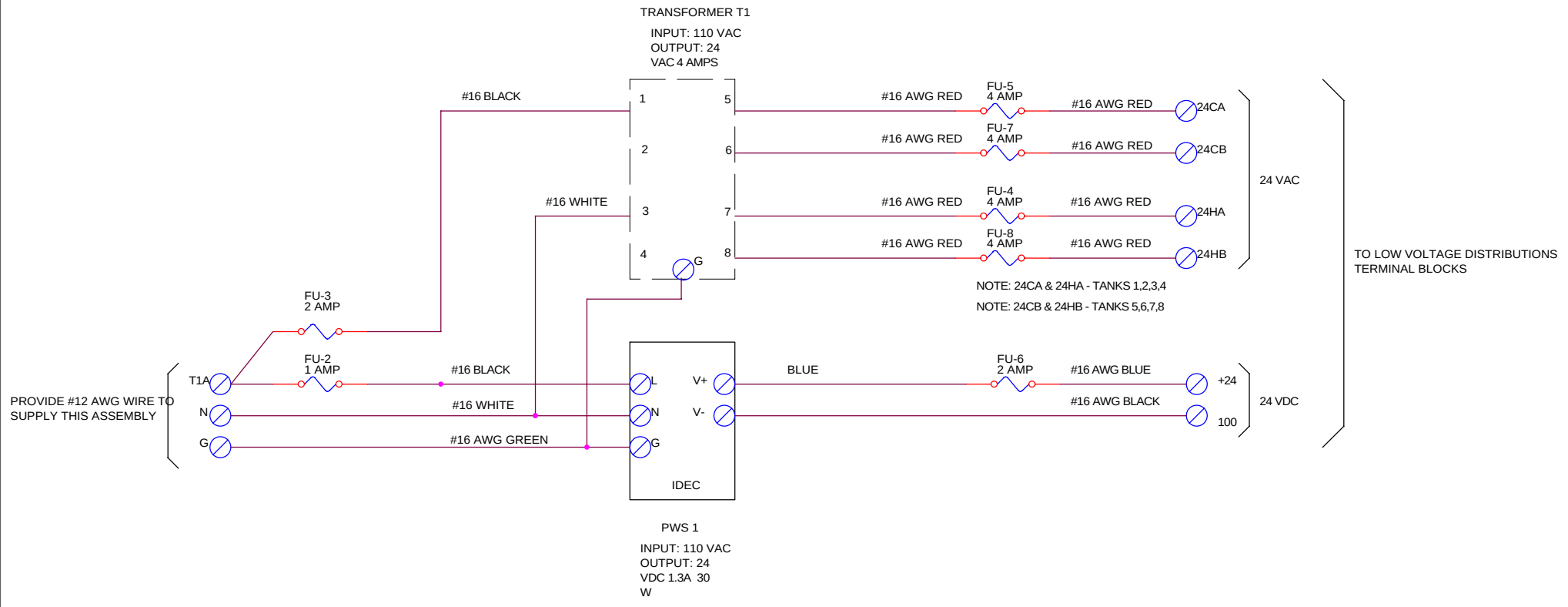
SEE DRAWING E-1974-02

*UVR: UNDER VOLTAGE RELAY IN LOAD CENTER (BREAKER BOX)

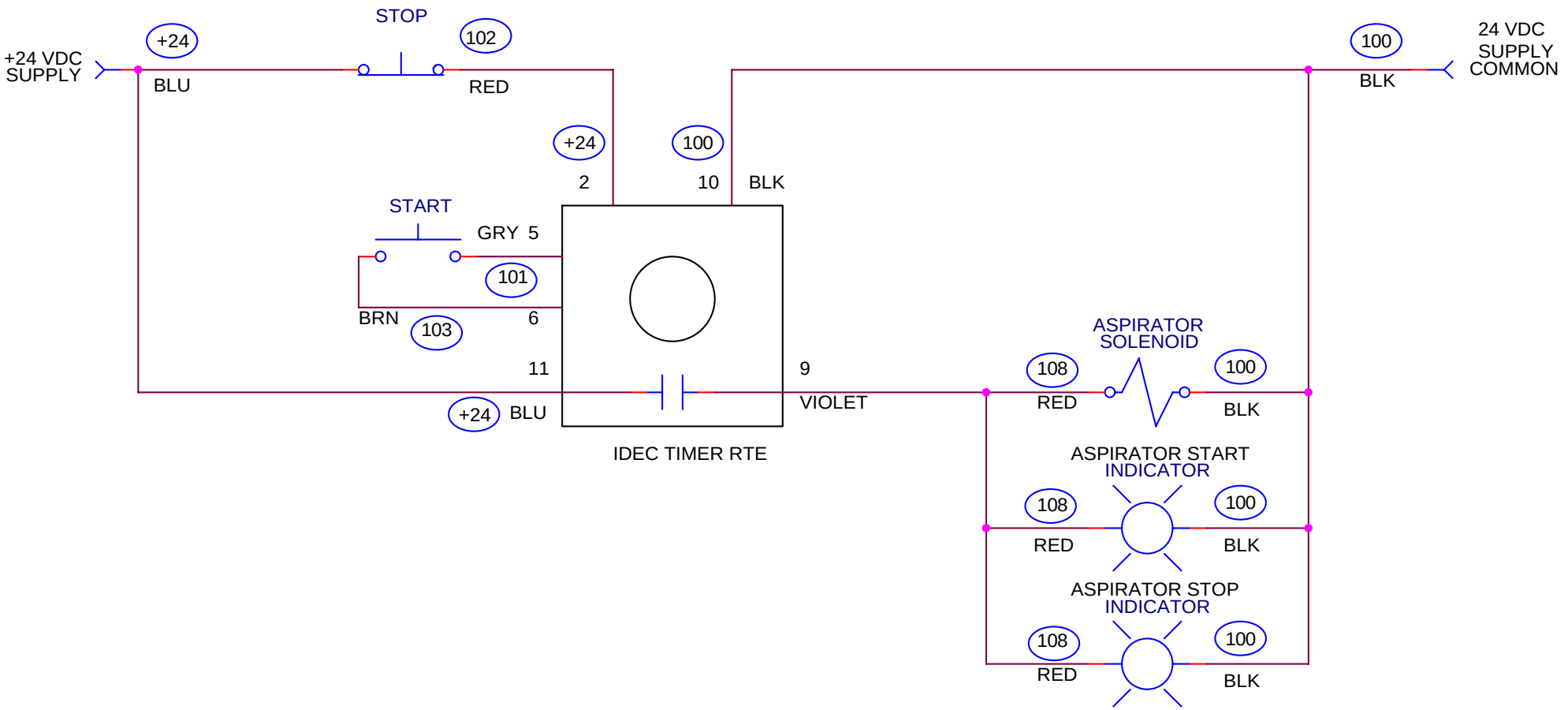
	Drawn By: K MORTENSEN	10/17 06	BOLD TECHNOLOGIES 1455 West 8120 South • West Jordan, UT 84088
	Checked By; -	- -	
NEXT ASSY.	Elect. Eng.: K MORTENSEN	10/17 06	Title: EPO SYSTEM
	Approved by:		Size	Document Number: E-1974-03	Rev: -
USED ON			Date:	Sheet: 3 of 13



	DRAWN BY M. WALKER	11/6 96	BOLD TECHNOLOGIES, INC. 1455 West 8120 South West Jordan, UT 84088
- NEXT ASSY.	CHECKED BY S. ANDREWS	11-6 96	Title: BLOCKED MAIN DRAIN SYSTEM, +24 VDC
	ELECT. ENG. M. WALKER	11-6 96	Size: B; Document Number: E-012004 (E-1974-04); Rev: -
USED ON	APPROVED BY		Date: Thursday, June 19, 2008; Sheet 4 of 13



	DRAWN BY B.MASON	03-17 08	BOLD TECHNOLOGIES, INC. 1455 West 8120 South West Jordan, UT 84088
	CHECKED BY		
NEXT ASSY.	ELECT. ENG. B.MASON	03-17 08	Title: 24 VDC, 24 VAC POWER SUPPLIES
	APPROVED BY		Size: B; Document Number: E-1974-05; Rev: -
USED ON			Date: Thursday, June 19, 2008; Sheet 6 of 13



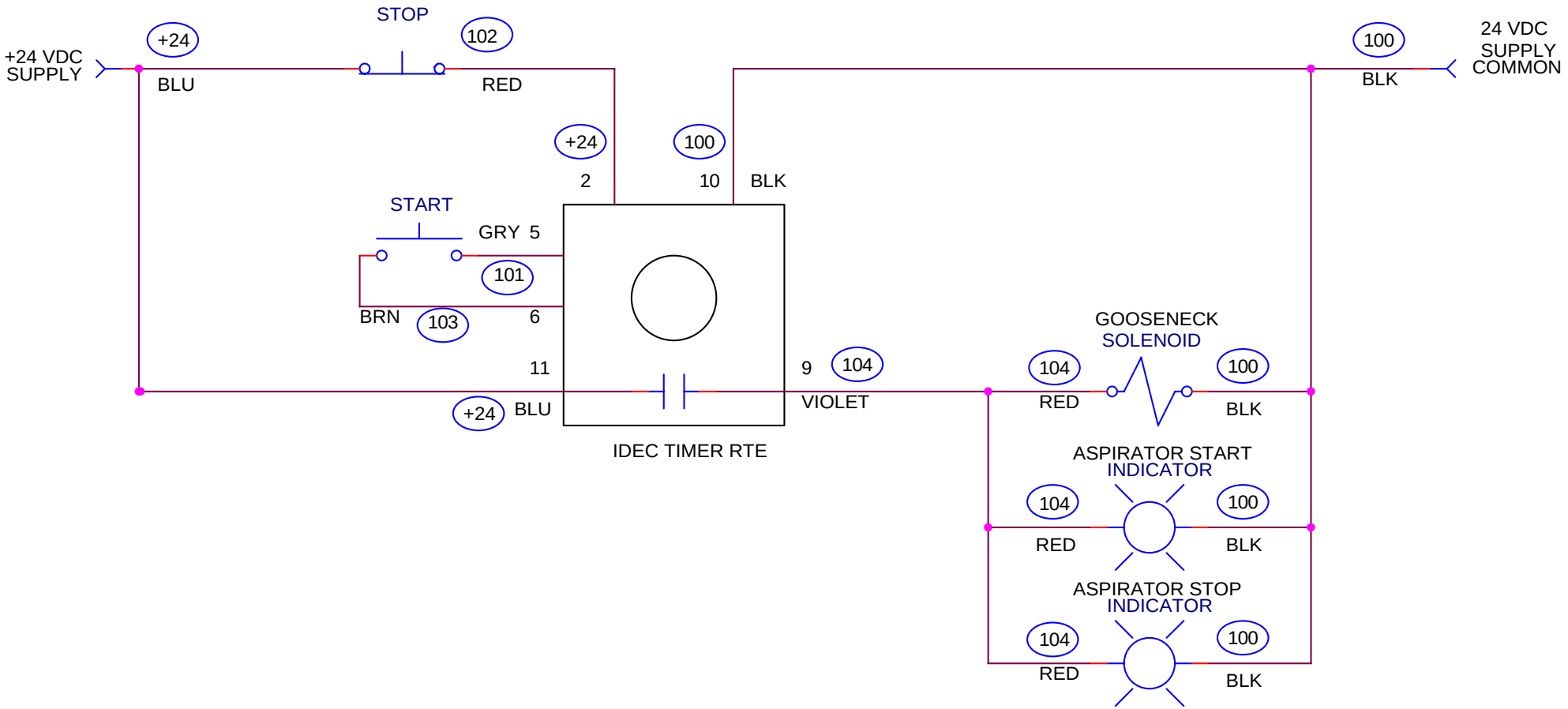
	DRAWN BY J. STEWART	6-18 08
	CHECKED BY K MORTENSEN	6-18 08
(COMMON) NEXT ASSY.	ELECT. ENG.	
	APPROVED BY	
USED ON		

BOLD TECHNOLOGIES, INC.
1455 West 8120 South
West Jordan, UT 84088

Title: HAND-HELD ASPIRATOR DRAIN SYSTEM, TIMED

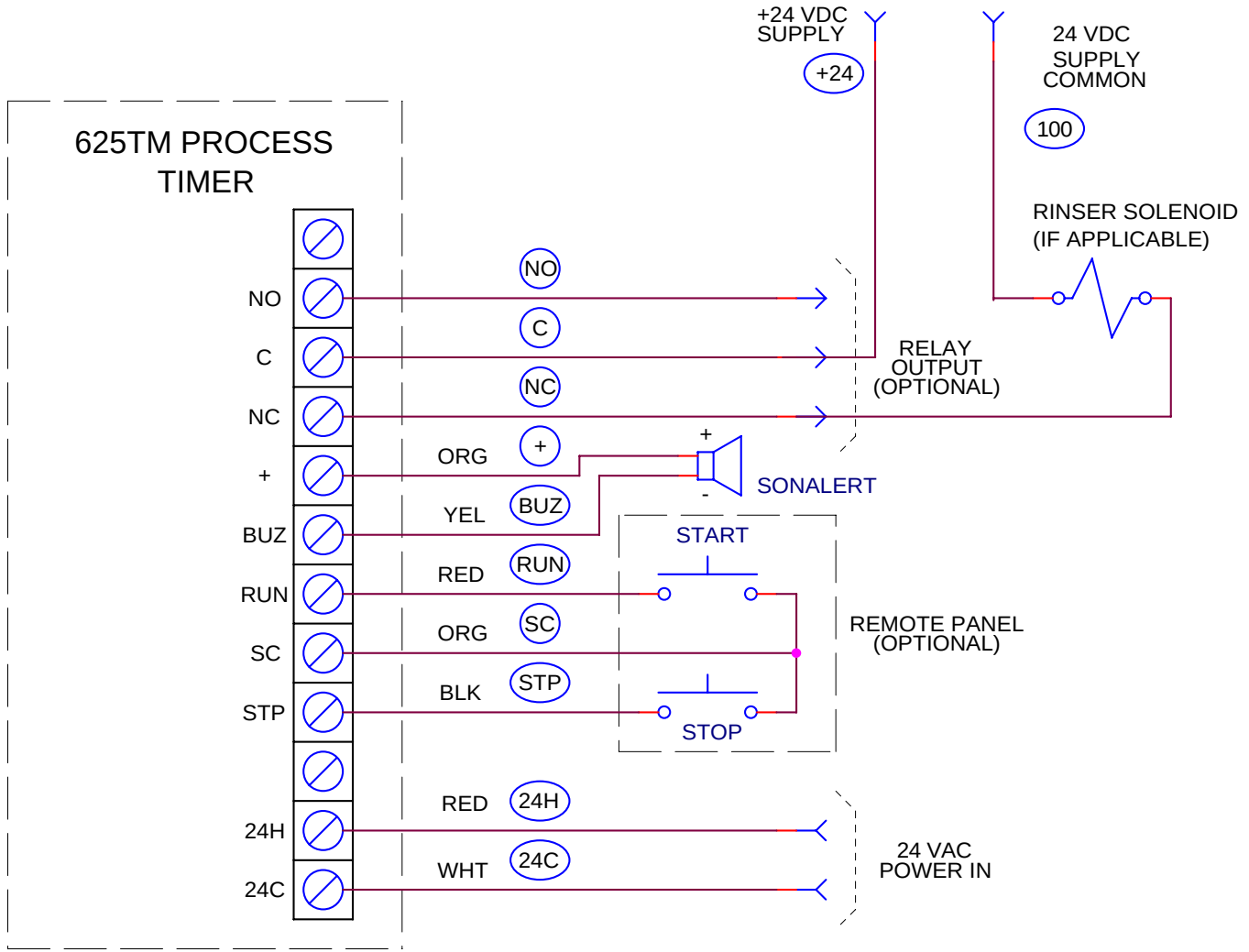
Size	Document Number	Rev
A	E-1974-06	-

Date: Thursday, June 19, 2008 Sheet 6 of 13



	DRAWN BY J. STEWART	6-18 08	BOLD TECHNOLOGIES, INC. 1455 West 8120 South West Jordan, UT 84088
(COMMON) NEXT ASSY.	CHECKED BY K. MORTENSEN	6-18 08	Title: DI WATER GOOSENECK SYSTEM, TIMED
	ELECT. ENG.		Size: A; Document Number: E-1974-07; Rev: -
USED ON	APPROVED BY		Date: Thursday, June 19, 2008; Sheet 7 of 13

REV	DESCRIPTION	DATE
A	CORRECTED NO CONTACT LABEL	4-8-98



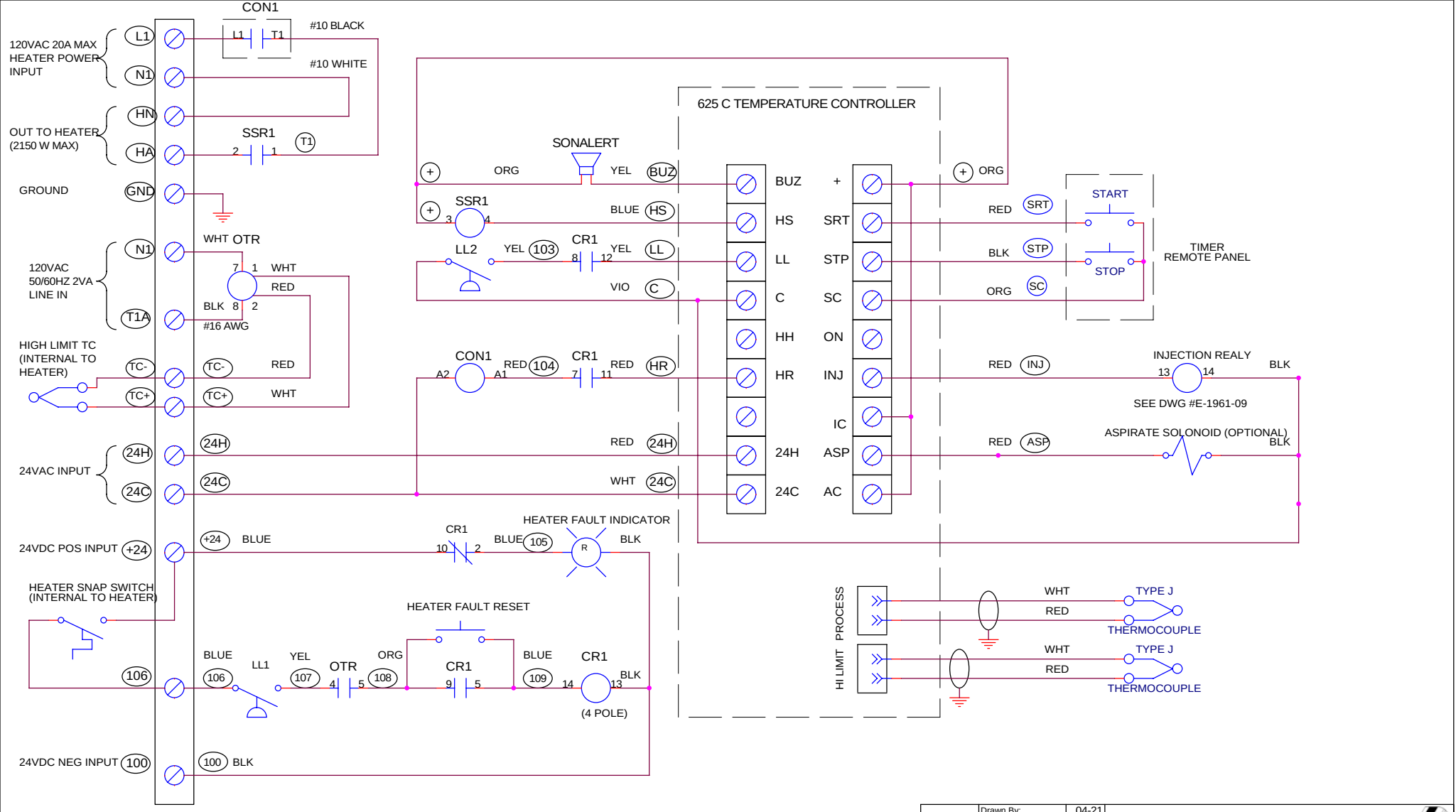
	DRAWN BY M. WALKER	2-28 97
	CHECKED BY R. DRENNAN	2-28 97
(COMMON) NEXT ASSY. 1797 1796 1786 1785 1783 USED ON	ELECT. ENG. M. WALKER	2-28 97
	APPROVED BY	

BOLD TECHNOLOGIES, INC.
1455 West 8120 South
West Jordan, UT 84088

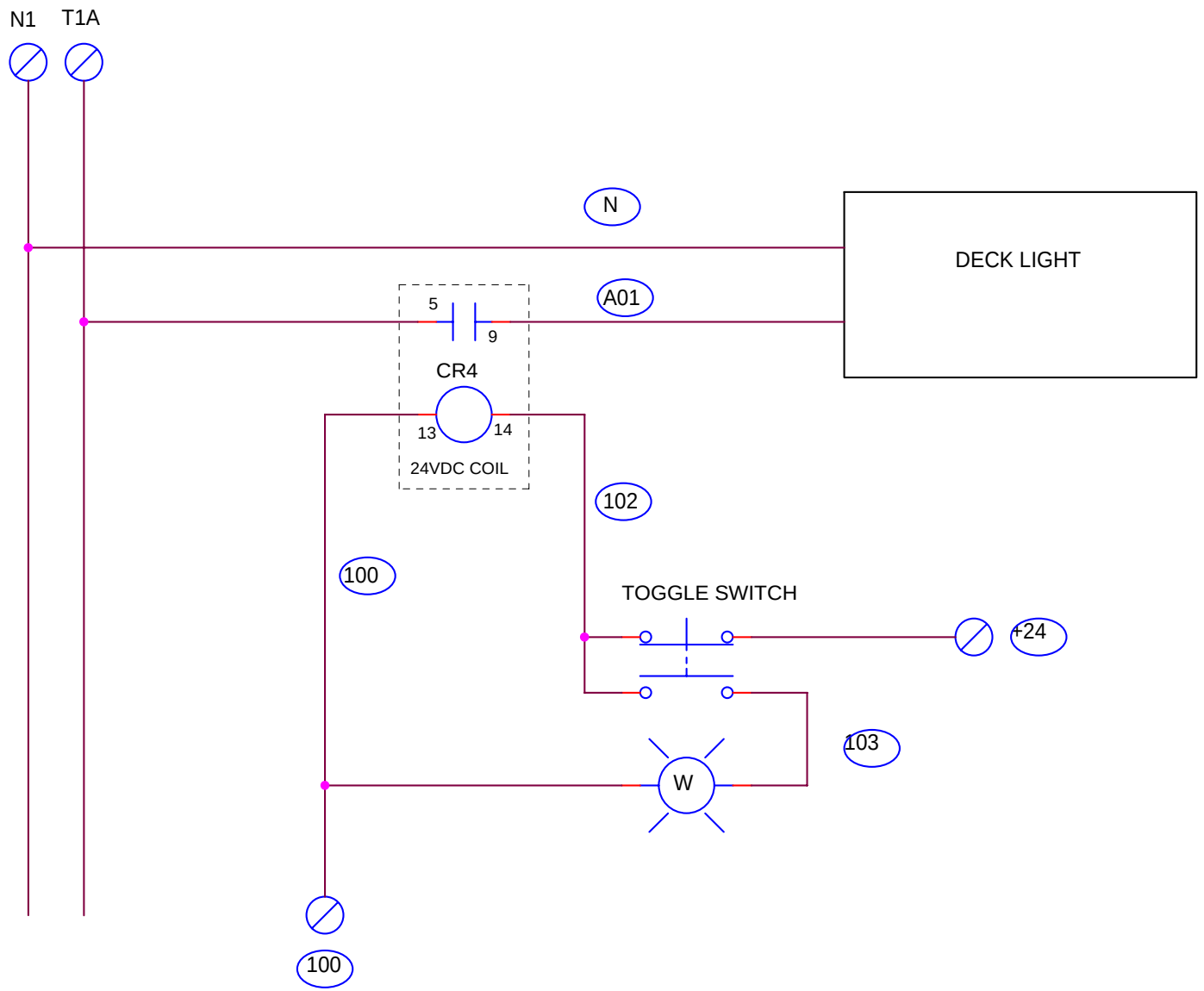
Title: 625TM PROCESS TIMER, 24 VAC

Size	Document Number	Rev
A	0417CA (E-1974-08)	A

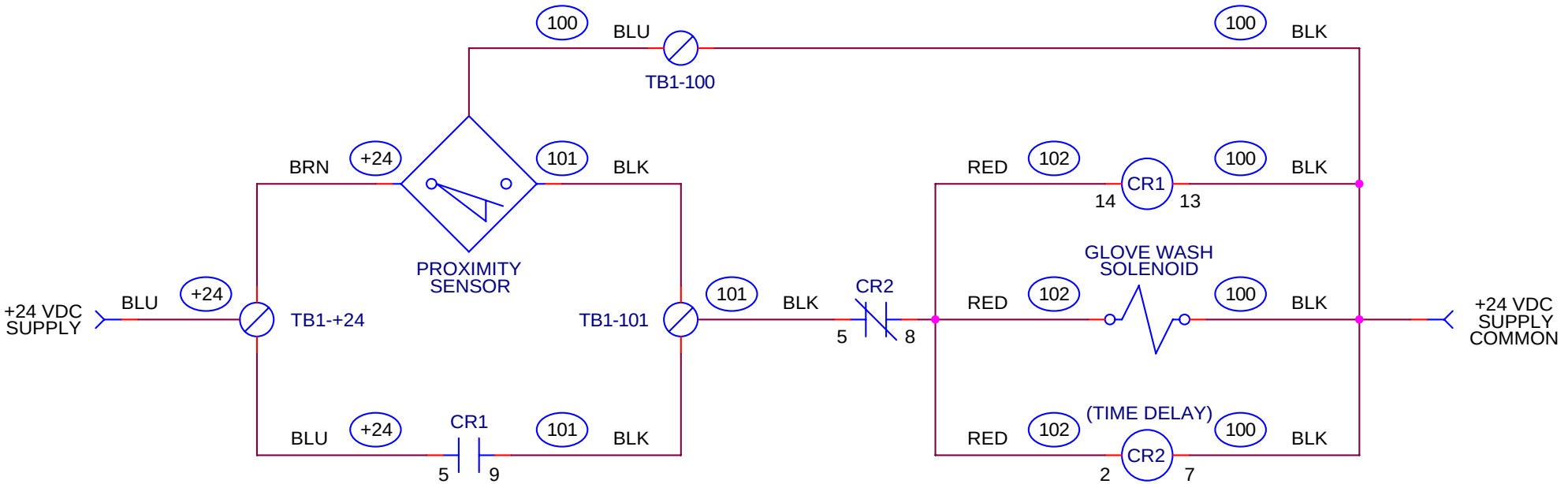
Date: Thursday, June 19, 2008 Sheet 8 of 13



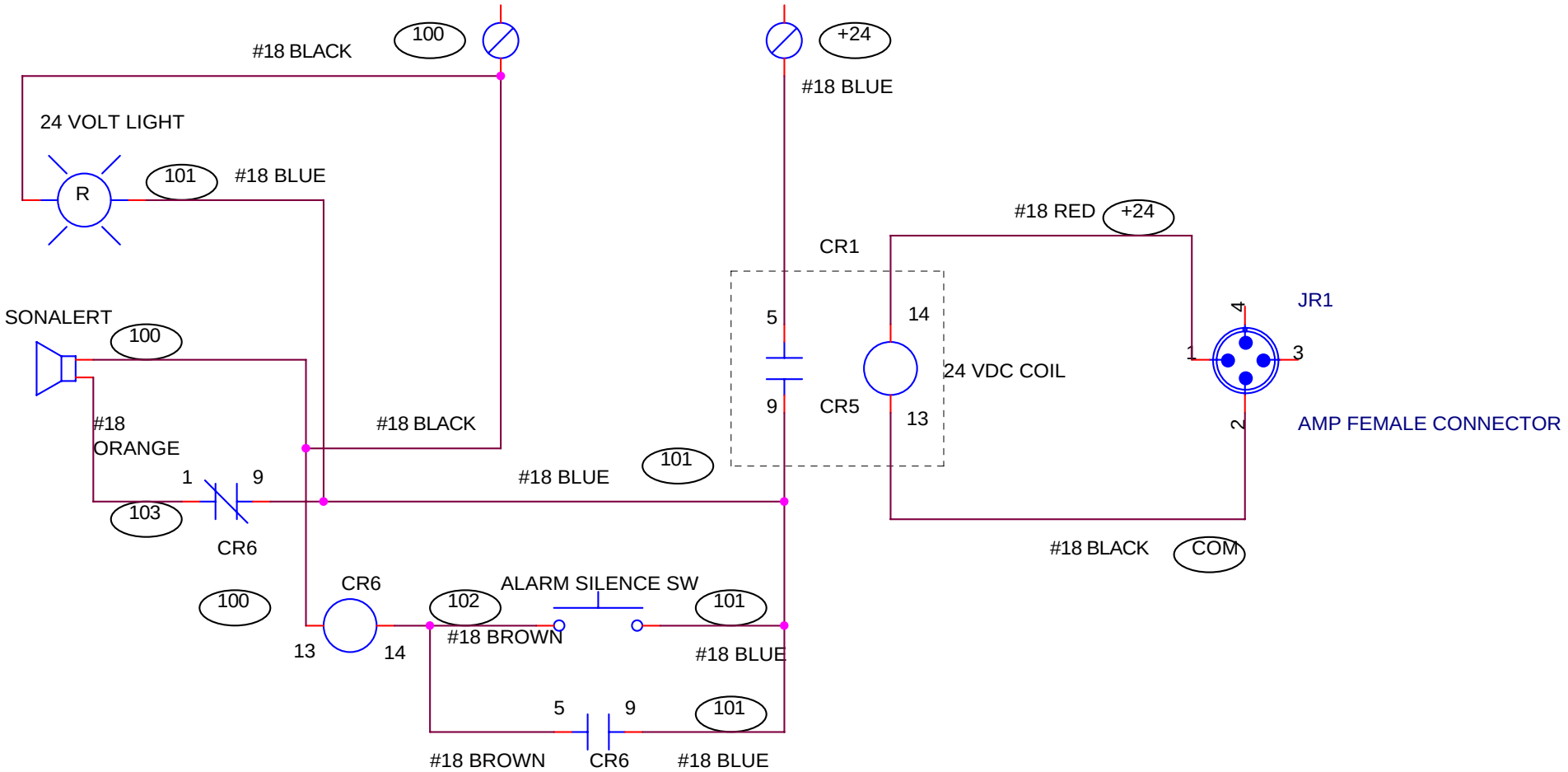
	Drawn By: K MORTENSEN	04-21 08	BOLD TECHNOLOGIES 1455 West 8120 South • West Jordan, UT 84088	
	Checked By; S SORENSON	09-09 02		
NEXT ASSY.	Elect. Eng.: R DRENNAN	09-09 02	Title: 625C TEMP. CONTROLLER (110V HEATER)	
	Approved by:		Size	Document Number: E-013022 (E-1974-09) Rev: A
USED ON			Date:	Sheet: 9 of 13



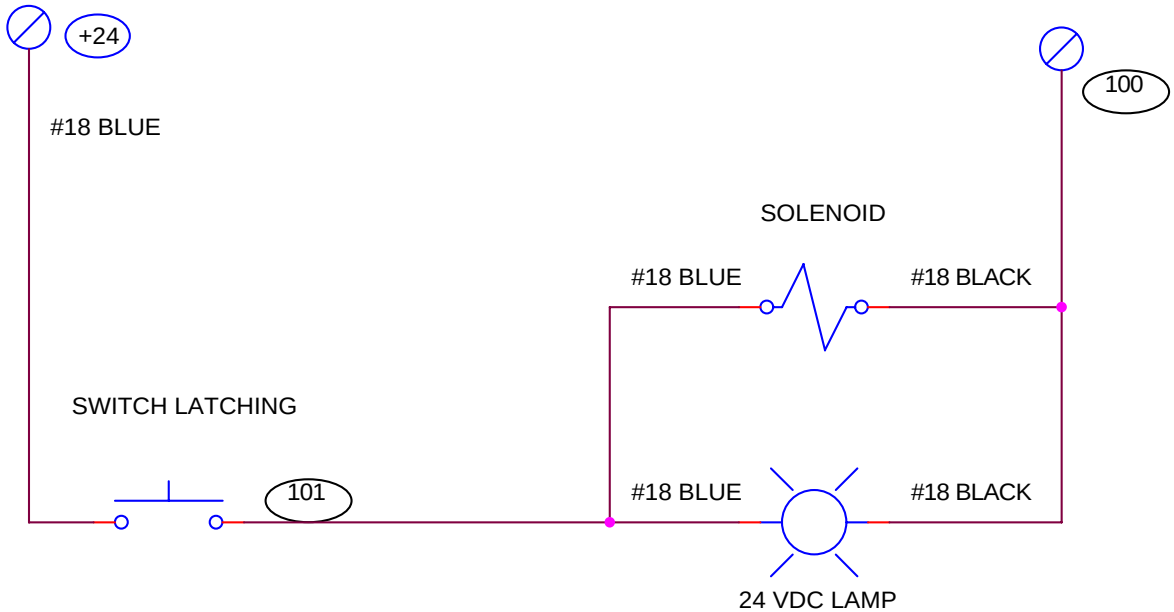
	Drawn By: K MORTENSEN	10/17 06	BOLD TECHNOLOGIES 1455 WEST 8120 SOUTH • WEST JORDAN, UT 84088
	Checked By; S SORENSON	10/17 06	
NEXT ASSY.	Elect. Eng.: K MORTENSEN	10/17 06	Title: DECK LIGHT
	Approved by:		Size: — Document Number: E-1974-10 — Rev: A
USED ON			Date: — Sheet: 10 of 13



	DRAWN BY M. WALKER	5-2 96	BOLD TECHNOLOGIES, INC. 1455 West 8120 South West Jordan, UT 84088
NEXT ASSY.	CHECKED BY S. ANDREWS	5-2 96	Title: AUTOMATIC GLOVE WASH
	ELECT. ENG. M. WALKER	5-2 96	Size: A; Document Number: 0176CA (E-1974-11); Rev: -
USED ON	APPROVED BY		Date: Thursday, June 19, 2008; Sheet 11 of 13

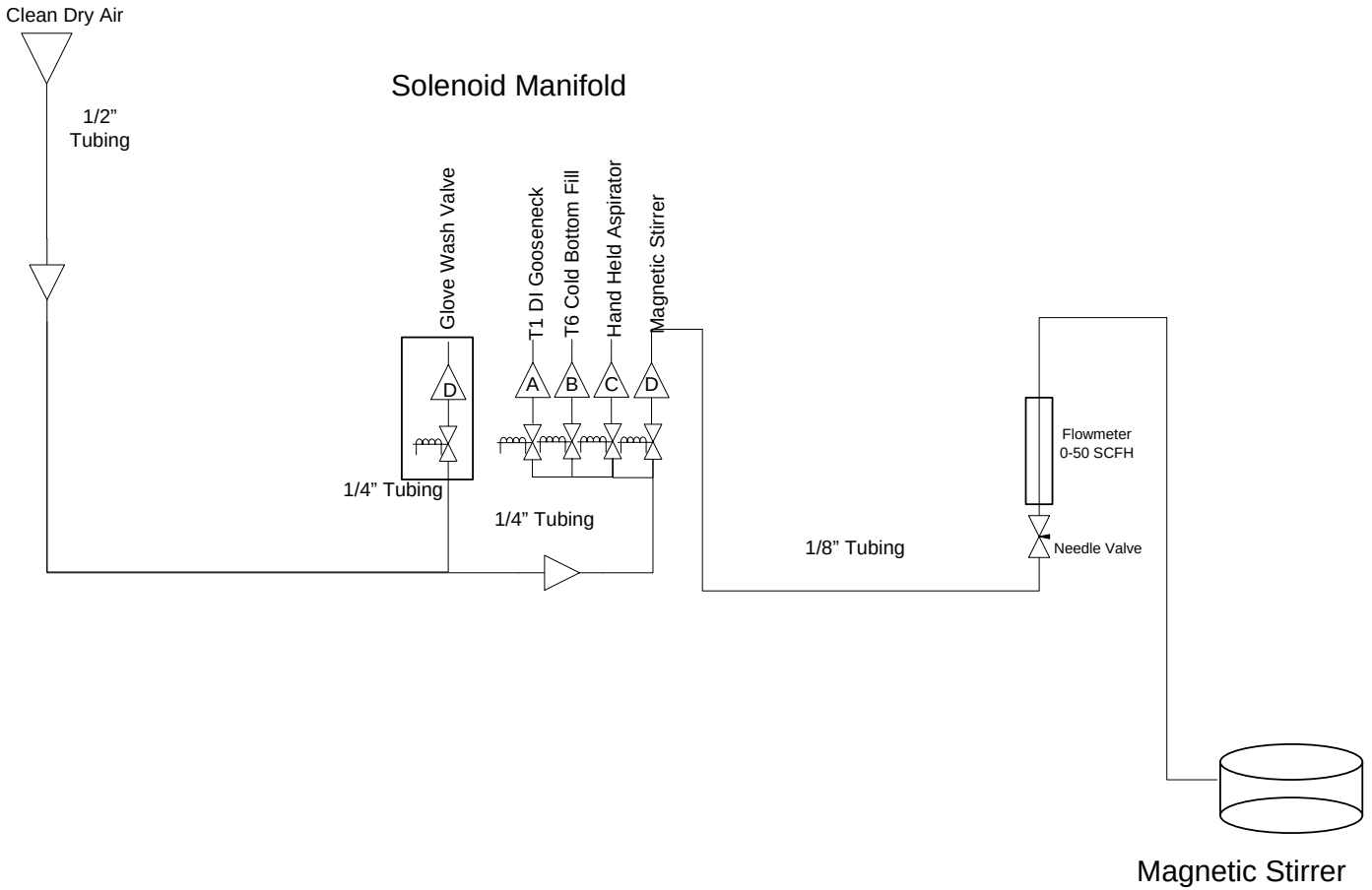


	DRAWN BY K MORTENSEN	4-22 08	BOLD TECHNOLOGIES, INC. 1455 West 8120 South West Jordan, UT 84088
NEXT ASSY.	CHECKED BY J STEWART	4-22 08	Title: NEUTRALIZATION ALARM INTERFACE
	ELECT. ENG.		Size: A — Document Number: E-1974-12 — Rev: -
USED ON	APPROVED BY		Date: Thursday, June 19, 2008 — Sheet 12 of 13

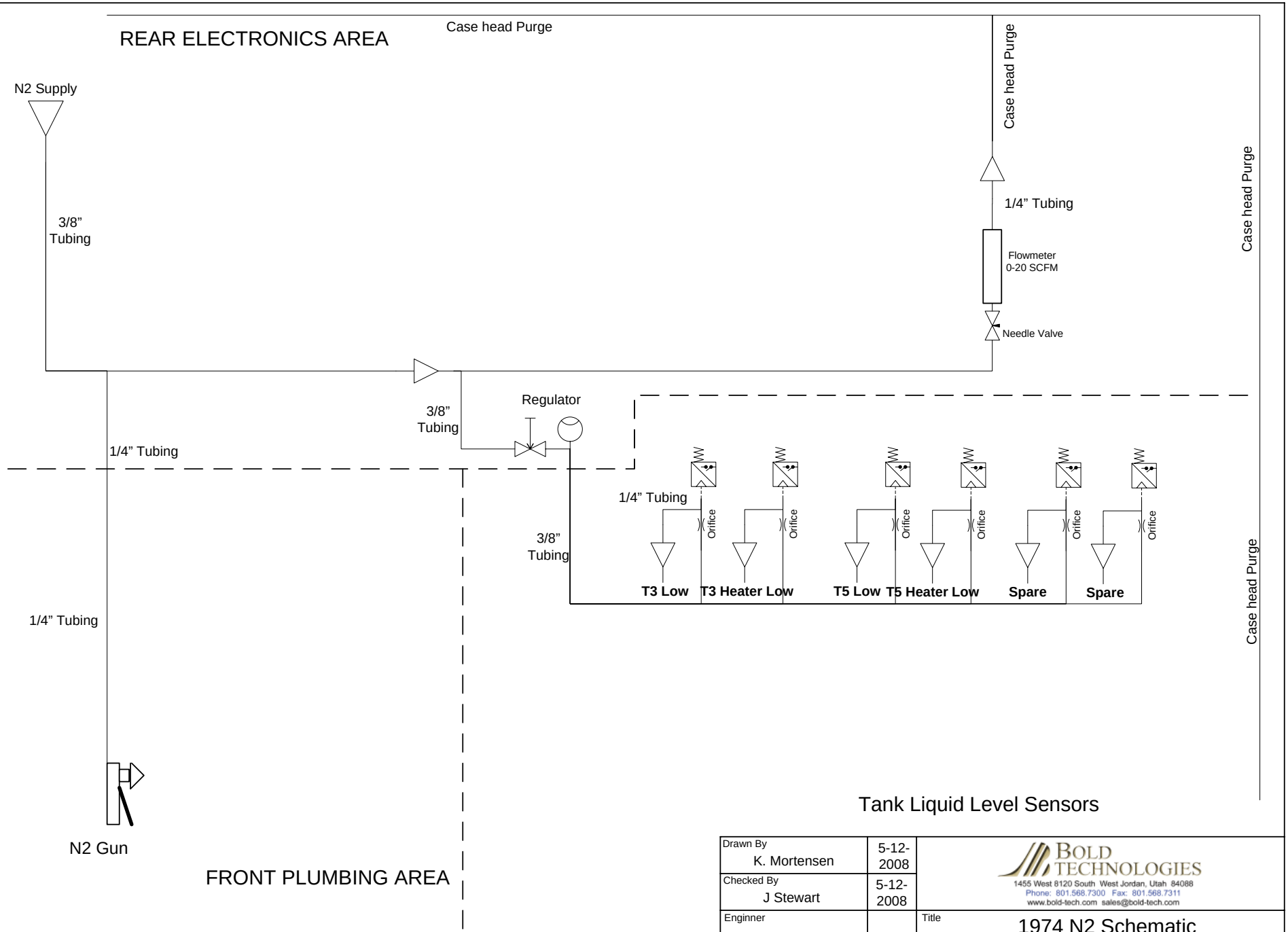


	DRAWN BY K MORTENSEN	4-22 08	BOLD TECHNOLOGIES, INC. 1455 West 8120 South West Jordan, UT 84088
NEXT ASSY.	CHECKED BY J STEWART	4-22 08	Title: MAGNETIC STIRRER
	ELECT. ENG.		Size: A; Document Number: E-1974-13; Rev: -
USED ON	APPROVED BY		Date: Thursday, June 19, 2008; Sheet 13 of 13

FRONT CASEHEAD AREA



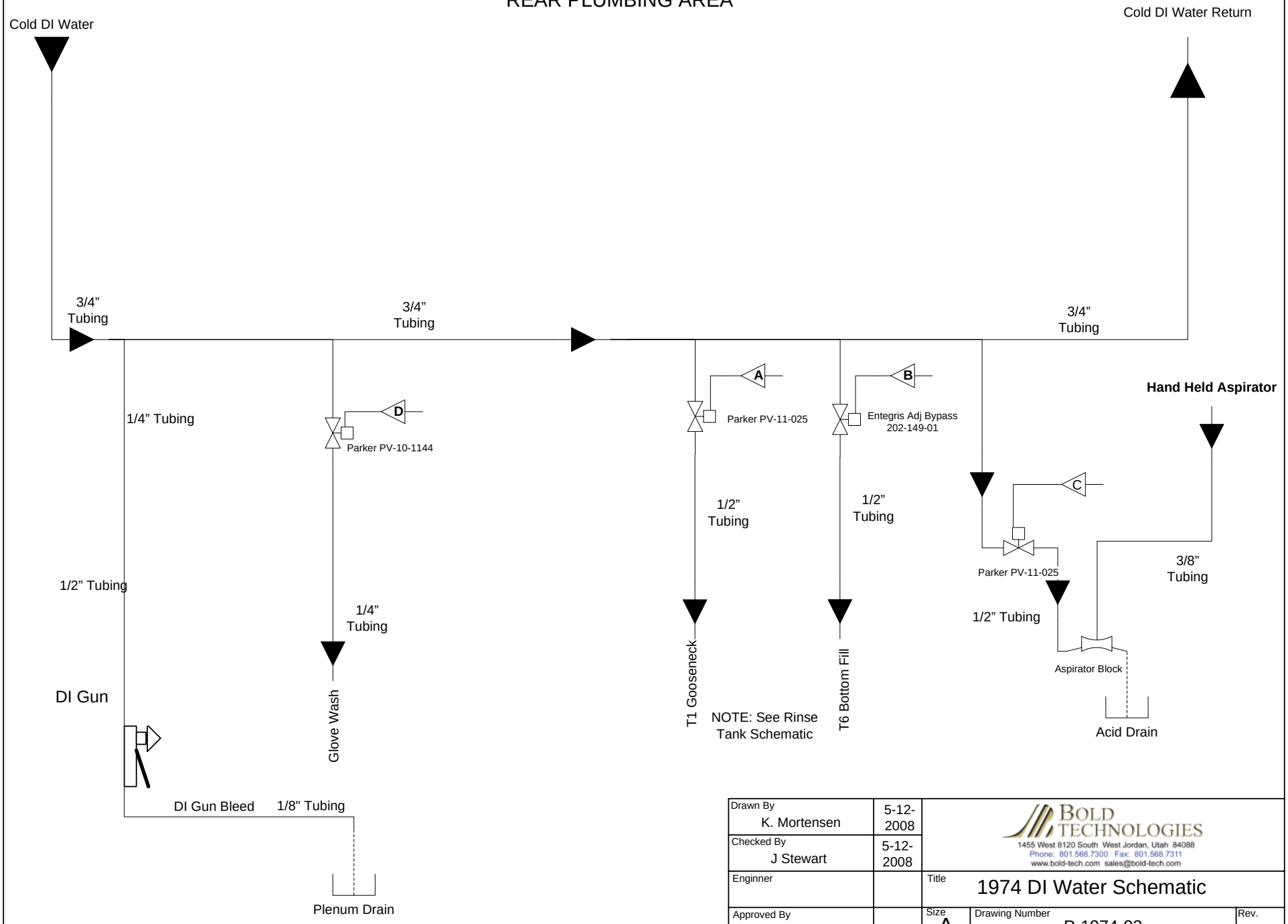
Drawn By: K. Mortensen	5-12-2008	BOLD TECHNOLOGIES 1455 West 8120 South West Jordan, Utah 84088 Phone: 801.568.7300 Fax: 801.568.7311 www.bold-tech.com sales@bold-tech.com		
Checked By: J. Stewart	5-12-2008			
Enginner		Title: 1974 CDA Schematic		
Approved By		Size: A	Drawing Number: P-1974-01	Rev.



Tank Liquid Level Sensors

Drawn By: K. Mortensen	5-12-2008	BOLD TECHNOLOGIES 1455 West 8120 South West Jordan, Utah 84088 Phone: 801.568.7300 Fax: 801.568.7311 www.bold-tech.com sales@bold-tech.com	
Checked By: J Stewart	5-12-2008		
Enginner		Title: 1974 N2 Schematic	
Approved By		Size: A	Drawing Number: P-1974-02 / Rev.

REAR PLUMBING AREA



Drawn By: K. Mortensen	5-12-2008	BOLD TECHNOLOGIES 1455 West 8120 South West Jordan, Utah 84088 Phone: 801.568.7300 Fax: 801.568.7311 www.bold-tech.com sales@bold-tech.com	
Checked By: J Stewart	5-12-2008		
Enginner		Title: 1974 DI Water Schematic	
Approved By		Size: A	Drawing Number: P-1974-03 / Rev.

DEFINITION OF TERMS

Glossary

A

ADR: Automatic Dump Rinser. Wafer processing bath; also QDR

Auto Lid: Tank lid that automatically closes over a process

Auto Window: Foot activated window

Automated System: Computer Controlled

B

Barcode Scanner: Used to input lot numbers into computer controlled systems

Bottom Fill: Fills from bottom of tank

Bulk Fill System: System used for supplying a wet bench with bulk chemistry

C

Carrier: Transfers wafers from process to process

Casehead Purge: Nitrogen based purge contained in the electrical compartment for a fume barrier.

CDA: Compressed Dry Air

CE Compliant: Communaute Europeenne. CE marking indicates conformance to all applicable safety directives at the time of entry to the European Union. The mark is a self-declaration by the manufacturer that the product is in compliance with applicable Directives.

Chemical Life (Cycles): This is the length of time, measured in process cycles, that the chemical can be used before it requires changing. When the counter reaches the set point, a full drain sequence is required to clear the fault. The operator will be prompted when it is time to change chemicals.

Chemical Life (Hours): This is the length of time, measured in hours, that the chemical can be used before it requires changing. When this counter reaches the set point, a full drain sequence is required to clear the fault. The operator will be prompted when it is time to change chemicals.

Corzan CPVC: Chlorinated Polyvinyl Chloride. High temp resistant plastic that is Factory Mutual Approved.

CP-5: Fire Retardant Polypropylene

CPVC: Chlorinated Polyvinyl Chloride. High temp resistant plastic

D

DI Water: Deionized water

Drip Pan: Double Containment

E

EMO: Emergency Machine Off

EPO: Emergency Power Off

F

Fill Backup Timer: This timer will backup the chemical fill liquid level sensors. If they fail the chemical will not fill beyond this set point.

FM: Factory Mutual

Full Drain Time Period: This full drain time period is the actual time it takes to completely drain the chem tank. The time may vary slightly from tank to tank. The only way to determine the proper time is to fill the tank, and time how long it actually takes to drain the tank. Remember that after the tank is empty, there may still be chemical in the connected plumbing. To completely drain the tank, you may want to let the drain open for an extended time after the tank is empty.

G

Glove Wash: Basin for rinsing off gloved hands

H

HDPE, PE: High-Density Polyethylene

Heater/Chiller: Temperature control system

HEPA: AIRVELOPE® 57 air filter, manufactured by Flanders Filters., Washington NC. Filter efficiency is 99.9995% on 0.12 micron particles, exceeding the requirements of IES-RP-1 for Type D filters.

High Temperature Abort Set Point: If the temperature goes above this set point, the process will abort. When a process is aborted, the chemical tanks have to be unloaded before another process can begin. When a high temperature abort occurs, the heater and pump will automatically shut off. The chem tank pump and heater will have to be manually turned on to begin a new process once the problem is resolved and the temperature gets back to normal operating range. Maintenance personnel should be contacted to determine the cause of the high temperature. This value should be above the “High temperature alarm set point”.

High Temperature Alarm Set Point: This is the set point that the bath temperature should not go above. If the bath temperature goes above this set point, an alarm will occur warning the operator of the high temperature. If the temperature goes above this set point during a process, it will **not** stop the current process, but a new process cannot start until the bath temperature goes below the alarm set point.

Hot Drain Cool Down: Device attached to the drain of a heated vessel to allow instantaneous draining of hot chemistry.

HPF Clear PVC:

I

J

K

L

LED: Light Emitter Device, indicator light

Low Temperature Abort Set Point : This is the set point below the "Low Temperature Alarm Set point". If during a process the bath temperature goes below the low temperature abort set point, the process will abort. When a process is aborted, the chemical tanks have to be unloaded before another process can begin. Maintenance personnel should be contacted to determine the cause of the low temperature.

Low Temperature Alarm Set Point: This is the set point that the bath temperature should not go below. If the bath temperature goes below the low temperature alarm set point, an alarm will occur warning the operator of the low temperature. If this alarm occurs during a process, it will **not** stop the current process, but a new process cannot start until the bath temperature goes above the alarm set point.

M

Manual System: Operator Controlled

Maximum Temperature to Drain: Before a chemical tank can be drained, the bath temperature must be at or below the maximum temperature to drain set point. This setting is used to prevent hot chemical s from being drained. The process engineer at your facility should determine this temperature.

N

N_2 Gun:

N_2: Nitrogen

O

P

Partial Dump:

PFA: Perfluoroalkoxy. PFA is a fluoropolymer resin. More specifically, PFA is a fluorocarbon. Fluorocarbons are those in which the carbon atoms of the polymer are fully bonded to only fluorine atoms or virtually only fluorine. Typical fluoropolymers, on the other hand, may have a significant portion of the fluorine atoms replaced with another halogen and/or hydrogen. This can adversely affect the resin's thermal properties, chemical resistance and purity.

Photohelic: Exhaust pressure gauge

Plenum: Bottom of a bench

PP: Polypropylene, heat-stabilized

PTFE: Polytetrafluoroethylene

PVC: Polyvinyl Chloride

PVDF: Polyvinylidene Fluoride

Q

QDR: Quick Dump Rinser. Wafer process rinsing bath; also ADR.

R

Resistivity: A measure of ion concentration. A high Resistivity corresponds to a low ion concentration.

S

Safety Light: Prevents window from raising and keeps process from starting when beam is broken.

Secs II: Computer Software

Surfactant: Chemical agent that reduces a liquids surface tension.

T

Tank Temperature Set Point: The Bath temperature set point is the actual temperature the chemical tank should maintain.

Temperature Calibration Offset: This is used to calibrate system thermocouples.

TFE:

Thermocouple: (Type J) Temp probe

Throw: Distance the arm travels

Timed Tub Flush: Timed plenum rinser

U

UL: Underwriters Laboratories

UPS: Uninterrupted Power Supply

V

W

X

Y

Z