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Tension Indicator
SC-PM Series

Operating Manual

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NOTE

The ID plate with the CE mark and the serial number as well as the calibration label (optional) are provided on the surface of the instrument.

WARNING

The device must not be operated in potentially explosive areas and must not come into contact with aggressive substances.

1.0 INTRODUCTION

The SC-PM Panel Mount Digital Tension Indicator can be used together with any of the tension sensors that provide a 0-1V DC output including the TE-Series, TF-Series, TS2-Series and TSC-Series. The SC-PM has the capability to store three (3) separate calibrations making it convenient to change quickly to alternate setup without have to do a new calibration. The SC-PM is supplied with user-set hi/lo limits with alarm contacts as well as an analog output 0-10V DC, standard or 4-20mA, optional.

The SC-PM can also be supplied with a digital communication output for connection to a PC. RS-232 and RS-422 communication protocols are available as a factory-configured option.

1.1 Delivery

- SC-PM Tension Indicator
- Mounting clips (2) for use when panel-mounting the SC-PM|
- Connectors for connection of DC-Power, Sensor and Alarms
- Operating Instructions

1.2 Unpacking

Unpack the instrument and inspect it for any shipping damage. Notices of defect must be filed immediately, in writing, at the latest within 10 days on receipt of the goods.

1.3 Maintenance and cleaning

The display unit is maintenance-free. When cleaning the unit, do not use any aggressive solvents, such as trichloroethylene or similar chemicals.

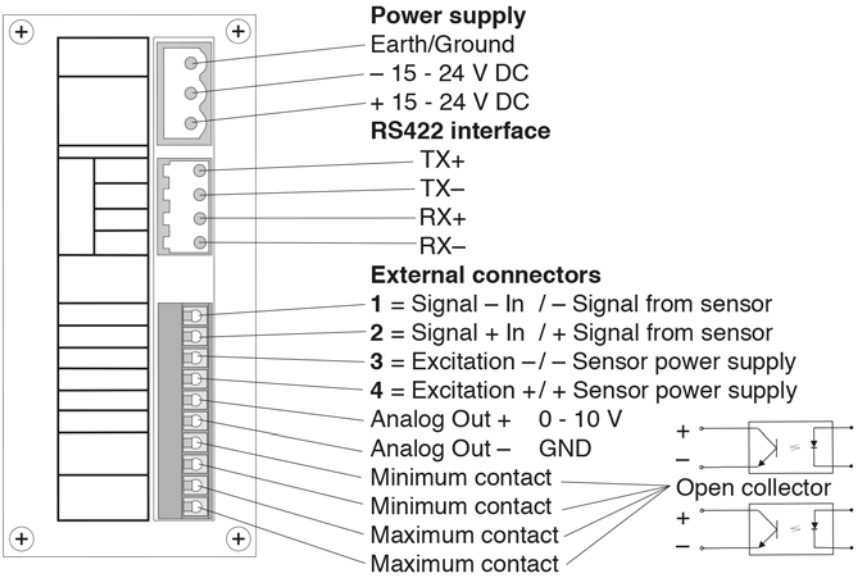
2.0 CONNECTING SC-PM SENSOR AND DISPLAY UNIT

IMPORTANT

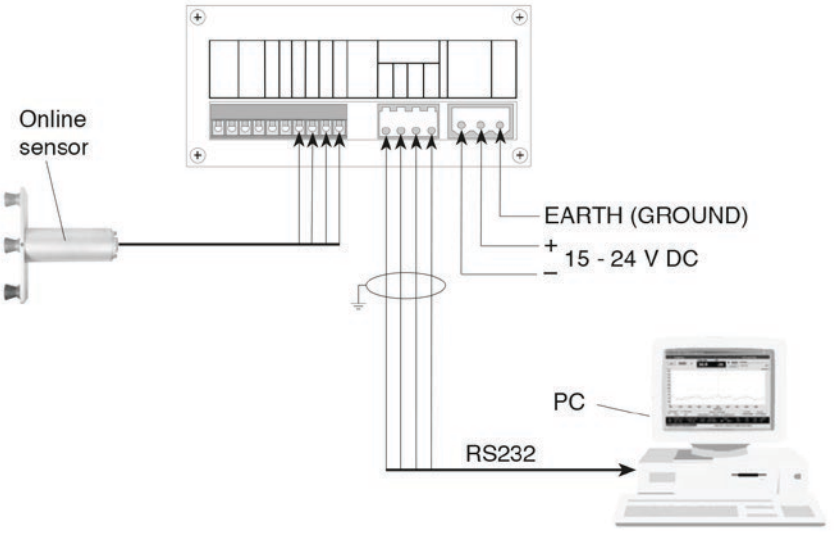
The cable connecting the sensor with the display unit must be shielded. The shield of the connecting cable must be connected to the metal housing of the connecting plug. Connect only sensors which comply with the specifications in Section 8.0.

To avoid random noise and malfunctions, make sure the cable connecting the SC-PM with the sensor does not run parallel to power lines or highly loaded signal lines, regardless of the type of voltage.

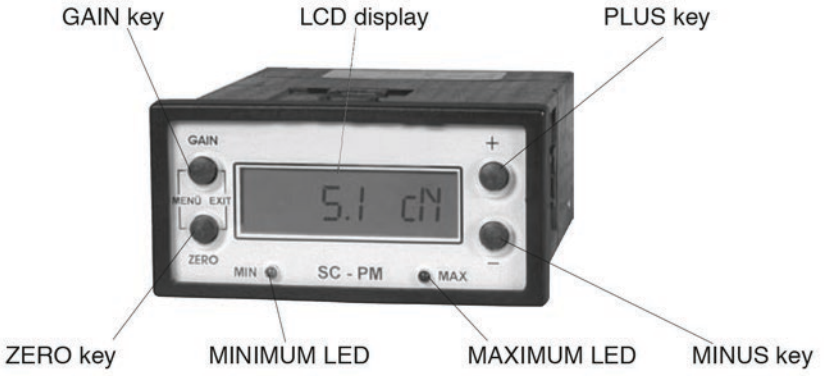
2.1 Pin Assignments of connectors and cable.



		TE/TF	TS2	TSC
Signal - in	[1]	white	blue	grey
Signal + in	[2]	grey	grey	yellow
Excitation -	[3]	rose	brown/black	brown
Excitation +	[4]	yellow	white	white


Online
sensor
EARTH (GROUND)
+
–
15 - 24 V DC
PC
RS232

3.0 POWERING THE SC-PM ON AND OFF



3.1 Powering on the SC-PM Tension Indicator

1. Install the sensor at the desired measuring location.
2. Connect the external power supply.
3. Connect the SC-PM to the supplied sensor.

If a longer connecting cable is required to connect the sensor with the SC-PM, you will find the assignment of the connecting terminals in Section 2.1 and the assignment of the 8-pin connector in the operating instructions for the supplied sensor.

To switch on the SC-PM

1. Switch on the external power supply.
   The LCD successively shows:

SC-PM v1	the version number,
RG 200.0	the set tension range,
DAMP: 04	the set damping factor, and
CAL: 1	the set calibration curve.

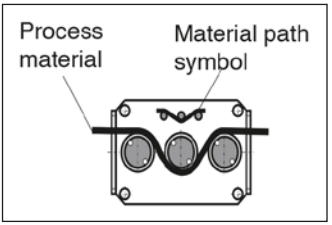
It then changes to the measuring mode and the LCD shows **0.0 cN**.

3.2 Powering off the SC-PM Tension Indicator

1. Switch off the external power supply.

4.0 OPERATING PROCEDURES

1. Switch on the instrument as described in Section 3.0.
2. Select the desired tension range as described in Section 3.0.
   (Only necessary when using the unit for the first time or after a sensor change.)
3. Allow approx. 10 minutes for thermal stabilization of the instrument.
4. If the material path is other than vertical or if the process material deviates significantly from the factory calibration material, you need to carry out **ZERO** and **GAIN** adjustment as described in Section .5.0 before starting measurement.
5. Thread the process material through the measuring and guide rollers, following the red material path symbol on the front of the sensor.



The LCD now shows **39.5 cN** the measured line tension.

If the line tension drops below the low alarm limit set according to Section 4.4, the MINIMUM LED is lit. If the line tension exceeds the high alarm limit set, the MAXIMUM LED is lit.

4.1 Settings

The defaults for the display unit have been set to match the supplied sensor. The following default settings will apply for a sensor with a tension range up to 200.0 cN:

1.	Damping	**DAMP: 04**
2.	Calibration curve	**CAL: 1**
3.	Alarm function	**ALARM OFF**
4.	High alarm limit	**Max 180.0**
5.	Low alarm limit	**Max 20.0**
6.	Tension range	**Rg 200.0**
7.	Unit of measure	**Unit cN**
8.	Analog ZERO	**Anl. ZERO**
9.	Analog GAIN	**Anl GAIN**
10.	Channel Selection	**CHAN: 00**

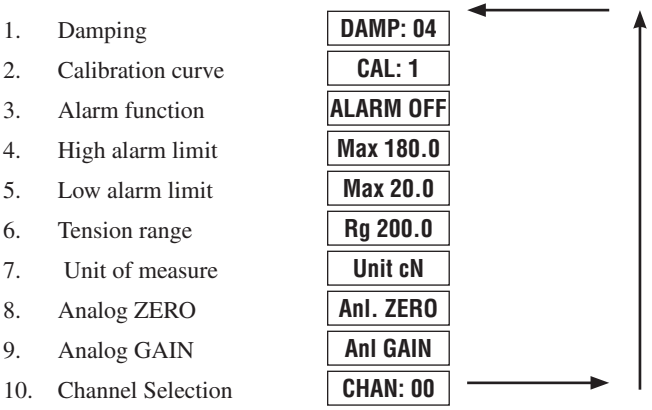
The settings you make remain stored in the SC-PM memory even after the instrument is switched off.

You can adapt these settings to your specific requirements

To change the settings, simultaineously press and then release the GAIN and ZERO keys.

The LCD shows **MENU** and then **DAMP: 04**

By pressing the **GAIN** or **ZERO** key, you can now go to the individual settings for:



The CHAN (channel selection) setting must always be 00. Do not change this setting.

Press the **GAIN** or **ZERO** key to go to a different setting.

Press the **+** or **–** key to set the desired value for the selected setting
OR simultaneously press and then release the **GAIN** and **ZERO** keys.

The display shows **EXIT** and the settings are saved.

The instrument then changes back to measuring mode.

The display shows **0.0 cN**.

4.2 Changing the Settings

1. To change the settings, simultaneoulsy press and then release the **GAIN** and **ZERO** keys.

The LCD shows **MENU** and then **DAMP: 04**.

Calculation of the damping factor:

The instrument is factory-set to a damping factor of **DAMP: 04**. The tension values are thereby averaged in the following way for display on the LCD:

$$\frac{\text{4 old values + 5 new values}}{9}$$

The damping factor can be modified in 9 steps from 01 = low damping:

$$\frac{\text{1 old value + 8 new values}}{9}$$

to 09 = high damping:

$$\frac{\text{8 old values + 1 new value}}{9}$$

Press the **+** or **–** key to set the desired damping factor.

The settings you make remain stored in the SC-PM memory even after the instrument is switched off.

For example: **DAMP: 08**

1. Simultaneously press and then release the **GAIN** and **ZERO** keys.

The display shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.

The display shows **0.0 cN**.

4.3 Changing the setting for Calibration

1. Press the **ZERO** key to change the setting for the Calibration.

Should the process material differ significantly from the factory calibration material in size, rigidity or shape, we recommend special calibration using customer supplied material. If a different material path (e.g. horizontal) or special calibration using customer supplied material is required, you need to carry out static **ZERO** and **GAIN** adjustment as described in Section 5.0.

The instrument is factory-set to **CAL: 1**.

To change the setting:

The LCD shows **CAL: 1**.

1. Press the **+** or **–** key to select the desired calibration.
   (How to set the calibration is described in Section 4.1.)

   For example: **CAL: 2**

2. Simultaneously press and then release the **GAIN** and **ZERO** keys.

3. The display shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.

4.4 Changing the setting for Alarm Function

1. Press the **ZERO** key to change the setting for the Alarm Function. The instrument is factory-set to **ALARM OFF**.

To change the setting

The LCD shows **ALARM OFF**.

1. Press the **+** or **–** key to enable or disable the alarm function.

   For example: **ALARM ON**

2. Simultaneously press and then release the **GAIN** and **ZERO** keys.
3. The display shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.
4. The display shows **0.0 cN**.

Change the setting for High Alarm Limit

1. Press the **ZERO** key to set the **High Alarm Limit**. The high alarm limit is factory-set to 90% of the tension range of the supplied sensor,

   for example **MAX 180.0**

2. Simultaneously press and then release the **GAIN** and **ZERO** keys.
3. The display shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.
4. The display shows **0.0 cN**.

Change the setting for Low Alarm Limit

1. Press the **ZERO** key to set the Low Alarm Limit

   The low alarm limit is factory-set to 10% of the tension range of the supplied sensor,

   for example **Min 20.0** .

   When you change the tension range, the low alarm limit is automatically set to 10% of the newly selected tension range.

To change the setting:

The LCD shows **Min 20.0** .

1. Press the **+** or **–** key to set the desired low alarm limit.

   For example **Min 32.00**:

2. Simultaneously press and then release the **GAIN** and **ZERO** keys. The display

shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.

3. The display shows **0.0 cN**.

4.5 Change the setting for Tension Range

1. Press the **ZERO** key to change the setting for the Tension Range.

   The tension range is factory-set for the supplied sensor. You can also set the tension range for any other sensor that complies with the specifications in Section 8.0.

To change the setting:

The LCD shows **Rg 200**.

1. Press the **+** or **–** key to set the desired low alarm limit.

   For example **Rg 50**:

2. Simultaneously press and then release the **GAIN** and **ZERO** keys.

   The display shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.

3. The display shows **0.0 cN**.

4.6 Change the setting for Unit of Measure

1. Press the **ZERO** key to change the setting for the Unit of Measure.

   The unit of measure is factory-set to **Unit cN**. You can also select daN, g or kg for the unit of measure.

To change the setting:

The LCD shows **Unit cN**.

1. Press the **+** or **–** key to set the desired low alarm limit.

   For example: **Unit kgs**

2. Simultaneously press and then release the **GAIN** and **ZERO** keys.

4.7 Change the setting for Analog ZERO signal

1. Press the **ZERO** key to change the setting for the Analog ZERO signal

   The analog interface is provided for customer signal processing or for connecting a line recorder which conforms to the current industrial standard. Please refer to Section 7.0 for the specifications.

The LCD shows **AnI.ZERO**. You can now set the analog ZERO signal as described inSection 5.0.

1. Simultaneously press and then release the **GAIN** and **ZERO** keys.
2. The display shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.
3. The display shows **0.0 cN** .

4.8 Change the setting for Analog GAIN signal

1. Press the **GAIN** key to change the setting for the Analog **GAIN** signal

   The analog interface is provided for customer signal processing or for connecting a line recorder which conforms to the current industrial standard. Please refer to Section 7.0 for the specifications.

The LCD shows **AnI.GAIN** . You can now set the analog GAIN signal as described in Chapter 4.1.1.

1. Simultaneously press and then release the **GAIN** and **ZERO** keys.
2. The display shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.
3. The display shows **0.0 cN** .

4.9 Change the setting for Channel Selection

The LCD shows **CHAN:00** .

The CHAN (channel selection) setting must always be 00. Do not change this setting.

1. Simultaneously press and then release the **GAIN** and **ZERO** keys.
2. The display shows **EXIT** and the settings are saved. The instrument then changes back to measuring mode.
3. The display shows **0.0 cN** .

5.0 SENSOR CALIBRATION

All tension meters are calibrated with standard materials - such as polyamide monofilament (PA)—according to the factory procedure; the material path is vertical. Any difference in process material size and rigidity from the standard material may cause a deviation of the accuracy. In 95% of all industrial applications, the factory calibration has been proven to provide the best results and is used for comparative purposes. If required you can also operate the sensor with a material path other than vertical. Should the process material differ significantly from the factory calibration material in size, rigidity or shape, we recommend special calibration using customer supplied material. If a different material path (e.g. horizontal) or special calibration using customer supplied material is required, you need to carry out static **ZERO** and **GAIN** adjustment as described below.

Since **ZERO** and **GAIN** adjustments are always performed statically, the readings may differ under dynamic load.

5.1 ZERO and GAIN Adjustment

The instrument is factory set to **CAL: 1**. This is the factory calibration, which should not be overwritten.

Requirements:

1. Two weights, one corresponding to 10% and one to 90% of the selected tension range, must be provided. Pay attention to the selected unit of measure (cN or kg).
2. Sensor installed at measuring location.
3. Instrument switched on as described in Section 3.0.
4. Allow approx. 10 minutes for thermal stabilization of the instrument.

Selection of the material curve (calibration setting):

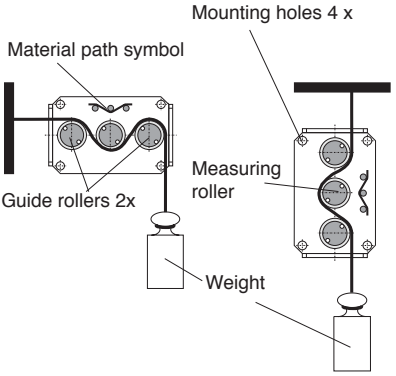
1. Simultaneously press and then release the **GAIN** and **ZERO** keys.

   The LCD shows **MENU** and then **DAMP: 04**. Press the **ZERO** key.

   The LCD shows **CAL: 1** the currently active calibration setting. Press the **+** or **–** key to select the desired calibration.

   For example: **CAL: 2** . Simultaneously press and then release the **GAIN** and **ZERO** keys.

The display shows **EXIT** tand the settings are saved. The instrument then changs back to mesuring mode.



Zero Adjustment

1. Thread the process material through the measuring and guide rollers, following the red material path symbol on the front of the sensor.
2. Hang a weight that corresponds to e.g. 10% of the tension range (pay attention to the correct unit of measure) from the process material, vertically, as shown in the diagram. (Always use a fresh portion of the material to be measured.)
3. Press and hold the **ZERO** key.
4. Press the **+** or **–** key repeatedly until the tension value on the LCD is equal to the value of the suspended weight.

For example:

Sensor model TS2 - 200

Weight 20 G = **20.0 G** LCD display

Release the **ZERO** key. The set value is saved to the calibration curve **CAL: 2** after approx. 10 sec. and the instrument changes back to measuring mode.

The ZERO and GAIN adjustment values are only saved permanently in the SC-PM memory after approx. 10 seconds. Therefore the unit must not be separated from the power supply until the save operation is completed.

GAIN Adjustment

Note: A **ZERO** adjustment must be carried out before beginning the **GAIN** adjustment.

1. Thread the process material through the measuring and guide rollers, following the red material path symbol on the front of the sensor.
2. Hang a weight that corresponds to e.g. 90% of the tension range (pay attention to the correct unit of measure) from the process material, vertically, as shown in the diagram. (Always use a fresh portion of the material to be measured.)
3. Press and hold the **GAIN** key.
4. Press the **+** or **–** key repeatedly until the tension value on the LCD is equal to the value of the suspended weight.

For example:

Sensor model TS2 - 200

Weight 180 G = **180.0 G** LCD display

Release the **GAIN** key. The set value is saved to the calibration curve **CAL: 2** after approx. 10 sec. and the instrument changes back to measuring mode.

The ZERO and GAIN adjustment values are only saved permanently in the SC-PM memory after approx. 10 seconds. Therefore the unit must not be separated from the power supply until the save operation is completed.

Check the adjustments with a fresh portion of the process material and repeat the procedure if necessary.

6.0 INTERFACES

6.1 Analog Interface

The analog interface is provided for customer signal processing or for connecting a line recorder which conforms to the current industrial standard.

Please refer to Section 7.0 for the specifications.

CAUTION: The analog interface must be calibrated only by qualified electrical personnel.

The analog interface is provided for customer signal processing or for connecting a line recorder which conforms to the current industrial standard.

ZERO and GAIN Adjustment setup

1. Connect a volt meter to the ANALOG interface.
2. Switch on the instrument as described in Section 3.0.
3. Allow approx. 10 minutes for thermal stabilization of the instrument.

ZERO Adjustment

1. Thread the process material through the measuring and guide rollers.
2. Select the Analog **ZERO** setting.
3. Simultaneously press and then release the **GAIN** and **ZERO** keys.

   The LCD shows **MENU**
4. Press the **ZERO** key repeatedly until **Anl.Zero** is shown in the display. Now the analog output can be zeroed.
5. Press the + or – key repeatedly until the display of the voltmeter connected to the ANALOG interface reads 0.0 volt.
6. The LCD shows **Anl.ZER+** or **Anl.ZER–**. Check the settings and repeat the procedure if necessary.
7. The display shows **EXIT** and the settings are saved. The instrument changes back to measuring mode.

   OR press **ZERO** to adjust the GAIN.

GAIN Adjustment (perform ZERO adjustment first)

1. Press the + or – key repeatedly until the display of the voltmeter connected to the ANALOG interface reads 10.0 volts.
2. The LCD shows **AnI.GAI+** or **AnI.GAI–**. Check the setting and repeat if necessary.
3. Simultaneously press and release the **ZERO** and **GAIN** keys.

   The display shows **EXIT** and the settings are saved.

   The instrument then changes back to measuring mode.

6.2 Digital Interface (Tension Inspect 3 Program)

The Tension Inspect 3 software is available from Electromatic and is described in a separate manual.

6.3 Windows Terminal Program

The measured values and the memory contents can be transmitted over the RS232 interface to a personal computer. You can connect the computer to the INTERFACE of the SC-PM by using the EK0649 special cable which is available as an accessory. The pin assignment of the INTERFACE is described in Section 2.1.

ASCII Code	Function	Description
d	Send	Transmit current reading to PC once

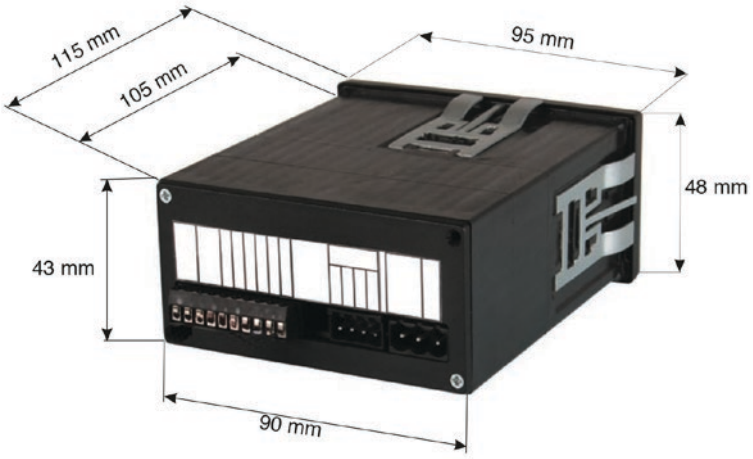
Requirement:

A communication program, such as Terminal or HyperTerminal (provided on MS Windows Version 3.0 or later), must be installed and configured on the computer.

7.0 GENERAL SPECIFICATIONS

Digital Display:	Dot matrix LCD, height of digit 12 mm with backlight
Units of Measure:	cN, daN, g, kg or lb (selectable)
Damping (fg):	9-step adjustable
Output Signal:	Analog signal: 0 - 10 V DC (RLoad > 5K Ohm)
Alarm Limits:	High / Low (selectable), with output signal open collector max. 30 V DC, 10 mA
Digital Output Signal:	Optional RS232 (19200, 8, N, 1) (approx 100 readings per sec.)
Calibration	3 characteristic curves can be saved
Voltage Output for Sensor:	Yes
Power Supply:	15 – 24 V DC, regulated
Current Consumption:	100 mA
Temperature Range:	50 to 113° F *(10 – 45° C)*
Air Humidity:	85% RH, max.
Housing:	Plastic
Dimensions:	4.53" x 3.74" x 1.89" *(115 x 95 x 48 mm)*
Required Cutout:	3.64" x 1.78" *(92 x 45 mm)*
Weight, net (gross):	Approx .66 lbs. (2.2 lbs) | *300 g (1000 g)*

SC-PM Dimensions



10.0 WARRANTY

ELECTROMATIC Equipment Co., Inc. (ELECTROMATIC) warrants to the original purchaser that this product is of merchantable quality and confirms in kind and quality with the descriptions and specifications thereof. Product failure or malfunction arising out of any defect in workmanship or material in the product existing at the time of delivery thereof which manifests itself within one year from the sale of such product, shall be remedied by repair or replacement of such product, at ELECTROMATIC's option, except where unauthorized repair, disassembly, tampering, abuse or misapplication has taken place, as determined by ELECTROMATIC. All returns for warranty or non-warranty repairs and/ or replacement must be authorized by ELECTROMATIC, in advance, with all repacking and shipping expenses to the address below to be borne by the purchaser.

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