



Australian Government  
Department of Industry, Science,  
Energy and Resources

## National Measurement Institute

36 Bradfield Road, West Lindfield NSW 2070

### Certificate of Approval NMI 14/2/72

Issued by the Chief Metrologist under Regulation 60  
of the  
*National Measurement Regulations 1999*

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

Satec Model EM133 Class 0.5 Electricity Meter

submitted by Satec (Australia) Pty Ltd  
12 Marsh Road  
Silverdale NSW 2752

**NOTE:** This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval has been granted with reference to document NMI M 6-1 *Electricity Meters. Part 1: Metrological and Technical Requirements*, July 2012.

This approval is subject to review at the decision of the Chief Metrologist in accordance with the conditions specified in the document NMI P 106.

#### DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern approved – interim certificate issued	14/04/14
1	Pattern amended (validity) – interim certificate issued	10/10/14
2	Pattern amended (validity) – variant 1 approved – interim certificate issued	04/12/14
3	Pattern & variant 1 approved – certificate issued	13/05/15
4	Pattern amended (bi-directional flow) - variant 2 & 3 approved – certificate issued	09/11/18

Rev	Reason/Details	Date
5	Variant 4,5 & 6 approved – certificate issued	01/05/20
6	Variant 7 to 15 approved – certificate issued	13/04/21

## CONDITIONS OF APPROVAL

### General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 14/2/72' and only by persons authorised by the submittor.

It is the submittor's responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificate No S1/0B.

Signed by a person authorised by the Chief Metrologist  
to exercise their powers under Regulation 60 of the  
*National Measurement Regulations 1999*.



**Darryl Hines**  
Manager  
Policy and Regulatory Services

## TECHNICAL SCHEDULE No 14/2/72

### 1. Description of Pattern

approved on 14/04/14

A Satec model EM133 class 0.5 electronic polyphase direct connect static watt hour meter (Figure 1) used to measure electrical energy.

#### 1.1 Field of Operation

The field of operation of the measuring system is determined by the following characteristics:

•	Number of phases	3
•	Number of wires	4
•	Reference frequency	50 Hz
•	Reference ambient temperature ranges:	
	specified range of operation	-20 to 60°C
	limit range of operation	-25 to 60°C
•	Rated voltage	3 × 230/400 V AC
•	Rated currents:	
	Basic current, $I_b$	50 A
	Maximum current, $I_{max}$	100 A
•	Meter constant	100 imp/kWh
•	Accuracy class	0.5

#### 1.2 Features/Functions

- Three (3) elements
- Electronic (LCD) digital indicator
- Din rail mounted
- Time of Use (TOU tariff functions)
- Data Logging
- Event Logging
- Three (3) × single phase configuration
- Internal crystal clock
- RS485 Communication module
- 8MB Memory
- Measurement in both positive and negative directions (export and import)
- Measurement of single phase loads in both positive and negative directions (export and import)
- Power quality measurements

#### 1.3 Verification Provision

Provision is made for the application of a verification mark.

#### 1.4 Sealing Provision

Provision is made for the instrument to be sealed by the application of one or more mechanical seals (Figure 1).

## 1.5 Descriptive Markings

Instruments are marked with the following data, together in one location, in the form shown at right:

Manufacturer's name or mark	...
Model designation	...
Serial number	...
Pattern approval mark	NMI 14/2/72
Number of phases	...
Number of wires	...
Reference frequency	... Hz
Meter constant	...
Rated voltage	... AC
Rated currents:	$I_b$ ... A
	$I_{max}$ ... A
Accuracy index	Class 0.5

## 1.6 Expansion Modules (Figure 2)

- Communication: Ethernet module (tcp/ip)  
Ethernet module with 12 digital inputs/4 relay output  
RS485 module with 12 digital inputs/4 relay output  
RS232/422/485
- Input/Output: 4 digital inputs/2 relay output  
12 digital inputs/4 relay output
- Analogue: 4 analogue outputs

## 1.7 Remote Display (Figure 3)

Remote touch screen display (TFT) for use with multiple model EM133 meters via serial or Ethernet communications, for panel mounted option.

## 2. Description of Variant 1

approved on 4/12/14

A Satec model EM133 class 0.5 electronic polyphase current transformer (CT) operated static watt hour meter used to measure electrical energy.

This variant has the same features/functions as described for the pattern.

### 2.1 Field of Operation

The field of operation of the measuring system is determined by the following characteristics:

- Number of phases 3
- Number of wires 4
- Reference frequency 50 Hz
- Reference ambient temperature ranges:
  - specified range of operation -20 to 60°C
  - limit range of operation -25 to 60°C
- Rated voltage 3×230/400 V AC
- Rated currents:
  - Rated current,  $I_n$  5 A
  - Maximum current,  $I_{max}$  10 A
- Meter constant 1000 imp/kWh
- Accuracy class 0.5

## 3. Description of Variant 2

approved on 9/11/18

A Satec model EM133-XM-100A class 0.5 electronic polyphase direct connect static watt hour meter (Figure 4) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Three (3) × single phase configuration

## 4. Description of Variant 3

approved on 9/11/18

A Satec model EM133-XM-5A class 0.5 electronic polyphase current transformer (CT) operated static watt hour meter (Figure 5) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:
  - Rated current,  $I_n$  5 A
  - Maximum current,  $I_{max}$  10 A
- Three (3) × single phase configuration

## 5. Description of Variant 4

approved on 01/05/20

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS1 (Figure 6) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       50 A  
                                 Maximum current,  $I_{max}$                       100 A
- Accuracy class:      1
- The HACS CS1 is solid core.
- Three (3) × single phase configuration

## 6. Description of Variant 5

**approved on 01/05/20**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS1L (Figure 7) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       50 A  
                                 Maximum current,  $I_{max}$                       100 A
- Accuracy class:      1
- The HACS CS1L is solid core.
- Three (3) × single phase configuration

## 7. Description of Variant 6

**approved on 01/05/20**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer CS1S (Figure 8) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       50 A  
                                 Maximum current,  $I_{max}$                       100 A
- Accuracy class:      1
- The HACS CS1S is split core.
- Three (3) × single phase configuration

## 8. Description of Variant 7

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS2 (Figure 9) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       100 A  
                                 Maximum current,  $I_{max}$                       200 A
- Accuracy class:      1
- The HACS CS2 is solid core.

- Three (3) x single phase configuration

## **9. Description of Variant 8**

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS2S (Figure 10) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       100 A  
   Maximum current,  $I_{max}$       200 A
- Accuracy class:      1
- The HACS CS2S is split core.
- Three (3) x single phase configuration

## **10. Description of Variant 9**

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS4 (Figure 11) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       200 A  
   Maximum current,  $I_{max}$       400 A
- Accuracy class:      1
- The HACS CS4 is solid core.
- Three (3) x single phase configuration

## **11. Description of Variant 10**

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS4S (Figure 12) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       200 A  
   Maximum current,  $I_{max}$       400 A
- Accuracy class:      1
- The HACS CS4S is split core.
- Three (3) x single phase configuration

## **12. Description of Variant 11**

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS4L (Figure 13) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       200 A  
   Maximum current,  $I_{max}$       400 A
- Accuracy class:      1
- The HACS CS4L is solid core.
- Three (3) × single phase configuration

## **13. Description of Variant 12**

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS8 (Figure 14) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       400 A  
   Maximum current,  $I_{max}$       800 A
- Accuracy class:      1
- The HACS CS8 is solid core.
- Three (3) × single phase configuration

## **14. Description of Variant 13**

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS8S (Figure 15) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                       400A  
   Maximum current,  $I_{max}$       800 A
- Accuracy class:      1
- The HACS CS8S is split core.
- Three (3) × single phase configuration

## **15. Description of Variant 14**

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS12S (Figure 16) used to measure electrical energy.



This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                   600 A  
   Maximum current,  $I_{max}$       1200 A
- Accuracy class:      1
- The HACS CS12S is split core.
- Three (3) × single phase configuration

#### **16. Description of Variant 15**

**approved on 13/04/21**

A Satec model EM133 HACS, class 1 electronic polyphase current transformer (CT) operated static watt hour meter with current transformer HACS CS30S (Figure 17) used to measure electrical energy.

This variant has the same Field of Operation, Features and Functions as described for the pattern except for the following:

- Rated currents:      Rated current,  $I_n$                   1500 A  
   Maximum current,  $I_{max}$       3000 A
- Accuracy class:      1
- The HACS CS30S is split core.
- Three (3) × single phase configuration

## TEST PROCEDURE

Instruments tested for initial verification shall comply with the certificate of approval and technical schedule, and the maximum permissible errors for verifications at the operating conditions in effect at the time of verification.

### **Maximum Permissible Errors (MPEs)**

The MPEs for the pattern and variants 1, 2 & 3 are the same as specified in the *National Trade Measurement Regulations 2009* (Cth) for a class 0.5 transformer-operated electricity meter, with basic current substituted for nominal current for direct connected meter.

The MPEs for the variants 4, 5 & 6 are those specified in the *National Trade Measurement Regulations 2009* (Cth) for a class 1 direct connected electricity meter.

Meters shall be verified in accordance with NITP 14 *National Instrument Test Procedures for Utility Meters*.

Evidence of verification shall be confirmed via a verification mark, or equivalently via a certificate of verification identifying meters by serial number issued by a utility meter verifier in accordance with NITP 14.

NOTE: NMI reserves the right to vary this procedure. Any such variation shall be notified in writing by NMI.

FIGURE 14/2/72 – 1



Satec Model EM133 Electricity Meter (Including Typical Mechanical Sealing)

FIGURE 14/2/72 – 2



Expansion Modules

FIGURE 14/2/72 – 3



Optional Remote Display for Panel Mounted Option

FIGURE 14/2/72 – 4



Variant 2 - Satec Model EM133 -XM-100A Electricity Meter

FIGURE 14/2/72 – 5



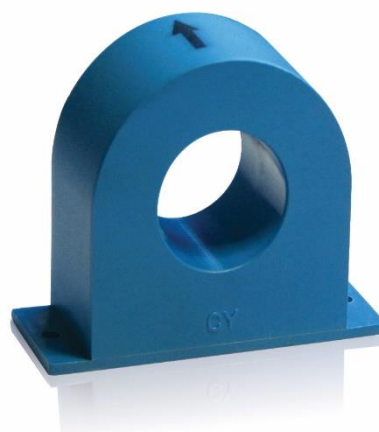
Variant 3 - Satec Model EM133 -XM-5A Electricity Meter

FIGURE 14/2/72 – 6



Variant 4 – Satec Model EM-133-XM-HACS meter with CS1 HACS

Figure 14/2/72 – 7



Variant 5 – Satec Model EM-133-XM-HACS meter with CS1L HACS

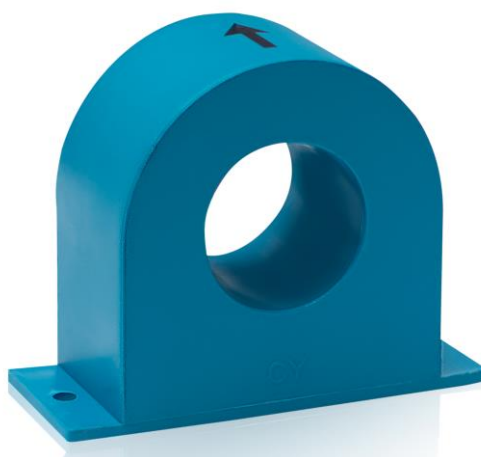
Figure 14/2/72 – 8



Variant 6 – Satec Model EM-133-XM-HACS meter with CS1S HACS



Figure 14/2/72 – 9



Variant 7 – Satec Model EM-133-XM-HACS meter with CS2 HACS

Figure 14/2/72 – 10



Variant 8 – Satec Model EM-133-XM-HACS meter with CS2S HACS

Figure 14/2/72 – 11



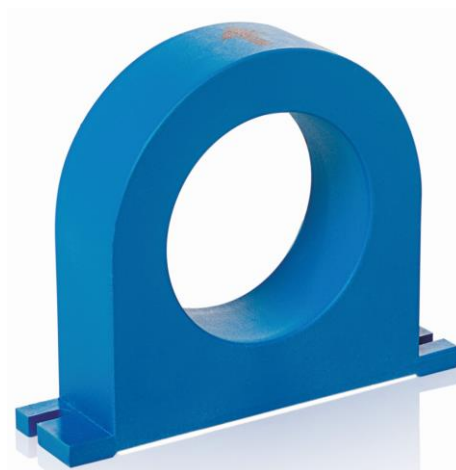
Variant 9 – Satec Model EM-133-XM-HACS meter with CS4 HACS

Figure 14/2/72 – 12



Variant 10 – Satec Model EM-133-XM-HACS meter with CS4S HACS

Figure 14/2/72 – 13



Variant 11 – Satec Model EM-133-XM-HACS meter with CS4L HACS

Figure 14/2/72 – 14



Variant 12 – Satec Model EM-133-XM-HACS meter with CS8 HACS



Figure 14/2/72 – 15



Variant 13 – Satec Model EM-133-XM-HACS meter with CS8S HACs

Figure 14/2/72 – 16



Variant 14 – Satec Model EM-133-XM-HACS meter with CS12S HACs

Figure 14/2/72 – 17



Variant 15 – Satec Model EM-133-XM-HACS meter with CS30S HACs

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