

Title: METERING FUNCTIONAL APPLICATION GUIDE FOR INDEPENDENT POWER PRODUCERS

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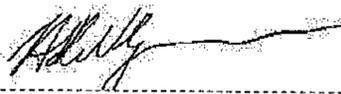
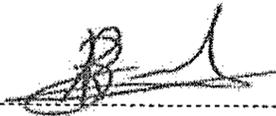
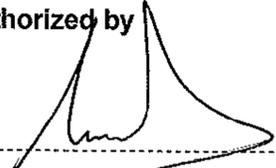
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Revision history

Date	Rev.	Compiled by	Remarks
May 2015	1	HPD Groenewald	Original document

1. Scope

1.1 Purpose

The purpose of this technical bulletin is to provide additional guidance on the application of metering for Embedded generation as defined in Eskom standard 240-61268576: Standard for the interconnection of embedded generation.

1.2 Applicability

This document is applicable to design engineers, metering maintenance staff, IPP's and the Single buyer's office.

2. Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.1.1 Normative

ISO 9001 Quality Management Systems.

240-61268576: Standard for the interconnection of embedded generation.

240-55197966: Procedure for the commissioning of metering and measurements installations (MV & HV)

240-55198029: Procedure for the maintenance of metering and measurements installations (MV and HV)

DST 34-749: Standard for sealing of metering equipment

2.2 Definitions

2.2.1 General

Definition	Description
Facility meter	Means the Meter used for the purposes of measurement of Energy Output and invoicing under the Power Purchase Agreement.
Embedded Generator:	A legal entity that operates or desires to operate any generating plant that is or will be connected to the Grid at MV or HV levels and renewable power plant connected at EHV levels. This definition includes all types of connected generation, including co-generators and renewables. Alternatively, the item of generating plant that is or will be connected to the Grid at MV or HV levels and renewable power plant connected at EHV levels
Point(s) of Connection (POC):	The electrical node(s) on the Network Service Provider's network where the Embedded Generator's electrical equipment is physically connected to the Network Service Provider's electrical equipment.

Definition	Description
System meter	The Meter situated on the Grid side, used for the purpose of measurement of energy received by the Grid and will act as the check meter for the Facility Meter. Where the "System Meter" is required to be installed at the Facility installation it will continue to act as the check meter.
Import kWh:	Active energy imported to the Eskom network
Export kWh:	Active energy exported from the Eskom network
Q1 kvarh:	Lagging reactive energy when kWh is imported
Q2 kvarh:	Leading reactive energy when kWh is exported
Q3 kvarh:	Lagging reactive energy when kWh is exported
Q4 kvarh:	Leading reactive energy when kWh is imported

2.3 Abbreviations

Abbreviation	Description
IPP	Independent power producer
CT	Current instrument transformer
POC	Point of Connection
PPA	Power Purchase Agreement
SBO	Single buyers office
VT	Voltage instrument transformer

3. Requirements

3.1 General design requirements

General design requirements for the metering installations at IPPs are provided in the standard for the interconnection of embedded generation 240-61268576 and the Power purchase agreements between the IPP and the Single buyer's office (SBO).

The layout of IPP plant and distance from generator to the POC varies from project to project and while the billing is done according to data from the facility meter it becomes important to provide guidelines on the options regarding the installation and maintenance of the facility meter.

3.2 Regulatory requirements

The Transmission and Distribution metering Grid codes stipulates the regulatory requirements for the installation and maintenance of metering installations. The most important requirements that must be met are the following:

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- a) Main and check meters must be installed.
- b) The accuracy class of the meters, CTs and VTs must be according to requirements of SANS 474 / NRS057. CTs with an accuracy class of 0.2S are preferred for these installations because it caters for a wider accurate operating range – specifically at lower loading conditions.
- c) The meters to be installed must be from an accepted list. SANS 474 / NRS057 par. 4.4.1.2: “Licensees should maintain a list of approved metering equipment, which can be used by licensees to purchase metering equipment of acceptable quality and standards.
NOTE: It is recommended that licensees collectively maintain a national register of approved metering equipment. Approved equipment will have been type tested and certified for compliance with relevant standards and have met the quality assurance requirements of the licensees.”
If the IPP does not have such a list of approved metering equipment, then they should specify equipment according to Eskom’s list of approved metering equipment.
- d) The metering installation must be commissioned and maintained by qualified metering staff – level 4 metering workers.
- e) The meters and relevant control circuitry must be sealed after commissioning to ensure that the integrity of the installation remains intact.

3.3 Options on the positioning of the facility metering installation

The options for the installation of the facility meter are listed according to 3.3.1 and 3.3.2. Any deviation from these two options must be negotiated by the IPP through the SBO.

3.3.1 Facility metering installation adjacent to POC

The Facility metering installation is adjacent to the POC or within a distance such that the calculated line loss at full load conditions is acceptable to the SBO.

- a) The Facility metering installation shall have a main and check meter installed, VTs of class 0.2 and CTs of class 0.2S. The secondary current of the CTs should be preferably 1A.
- b) All metering equipment will be purchased, commissioned and maintained by the IPP.
- c) Eskom shall have a main (System) and check meter installed at or adjacent to the POC, VTs of class 0.2 and CTs of class 0.2S.
- d) The SBO will have communication access to both the Facility meter and System meter to retrieve metering data.

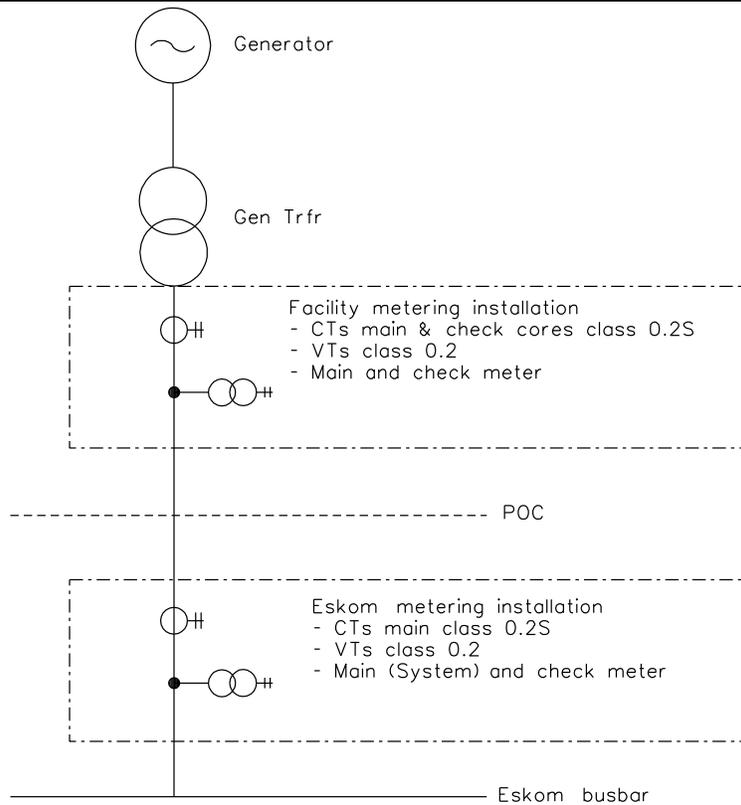


Figure 1: IPP adjacent to Eskom POC

3.3.2 IPP remote from POC

Power is transferred to Eskom by IPP-owned power lines. The IPP is remote from the POC to Eskom or from a distance such that the calculated line loss at full load conditions is not acceptable to the SBO. The IPP has to install Facility metering equipment adjacent to Eskom's substation.

- a) The Facility metering installation shall have a main and check meter installed, VTs of class 0.2 and CTs of class 0.2S. The secondary current of the CTs should be preferably 1A.
- b) All metering equipment will be purchased, commissioned and maintained by the IPP.
- c) Eskom shall have a main (System) and check meter installed at or adjacent to the POC, VTs of class 0.2 and CTs of class 0.2S.
- d) The SBO will have communication access to both the Facility meter and System meter to retrieve metering data.

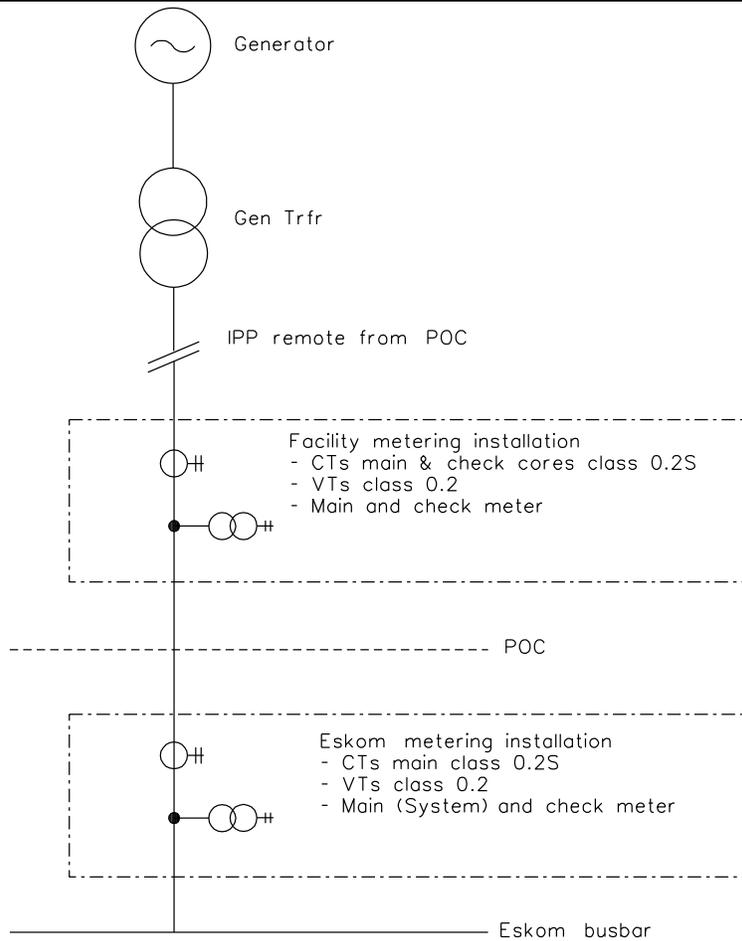


Figure 2: IPP remote from Eskom POC

3.3.3 IPP feeding into a non-Eskom owned network

The IPP is feeding into a non-Eskom owned network and is thus not supplying power directly to Eskom.

- The metering installation shall have main and check meters installed, VTs of class 0.2 and CTs of class 0.2S. The secondary current of the CTs should be preferably 1A.
- The Facility meters shall be the main and check metering installation.
- The buyer reserves the right to have a back-up meter installed utilising the IPP's CTs and VTs if the buyer wants to exercise this right for own metering or QOS purposes..
- All metering equipment will be purchased, commissioned and maintained by the IPP. The buyer shall purchase, commission and maintain the buyer's meter where required.
- The SBO will have communication access to both the main and check Facility meters..

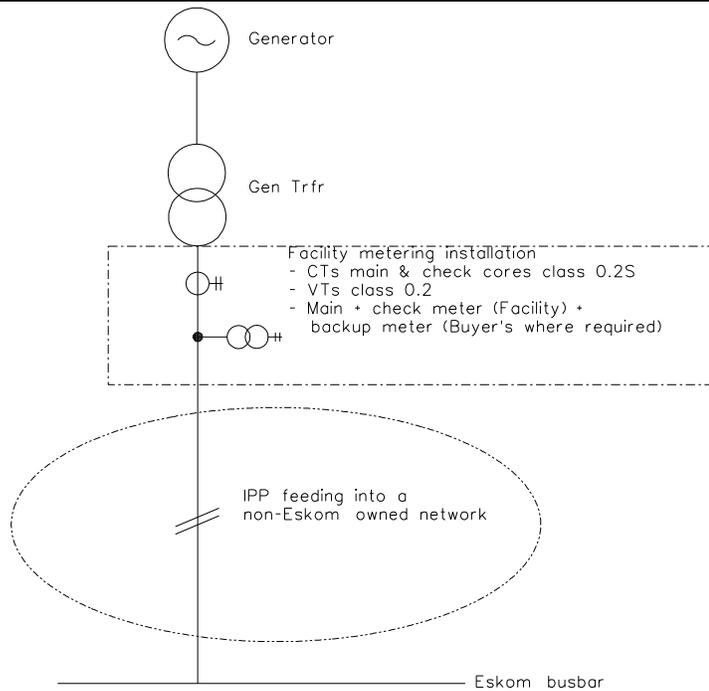


Figure 3: IPP metering within a non-Eskom owned network

3.4 Communication considerations

3.4.1 Access to data

The SBO requires communication to both the Facility meter(s) and the System meter(s) where applicable to download data. The IPP requires access to the Facility meters.

3.4.2 Ownership of communication equipment

In line with the PPA the IPP must own, install and maintain the Facility meters communication infrastructure to facilitate SBO remote access to these meters. The following are the SBO requirements for the communication at the Facility meter:

- The IPP to install an Eskom approved modem
- The IPP to procure a Prodata or similar M2M data contract SIM from MTN SP
- The IPP to provide SIM details to SBO
- The SBO to provision SIM card on APN
- The modem to be configured with APN details (Eskom)

NB: It is envisage that the IPP will have to install a separate communication solution to access the facility meter remotely to that of the SBO as most modems can only be configured for a single APN. The APN currently deployed is a private Eskom APN.

Notes:

- Eskom has only one APN available, which is with MTN. Thus, only an MTN SIM card as per above specification will suffice.
- In instances where there is no MTN communication in a specific area, then Vodacom becomes the next preferred choice.

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3.4.3 Sharing of communication

The sharing of communication ports on meters creates operational problems. The PPA requires that the SBO have preferential access to the Facility meter for the retrieval of billing data. While the SBO access the meter communication port, the IPP will not be able to simultaneously communicate through the same communication port. The same applies for the opposite case.

For this reason it is preferred that meters are installed which provides for two independent communication ports whereby the SBO will have permanent access to one port and the IPP can install their own communication equipment to the other port to retrieve the same billing data.

3.4.3.1 Communication to facility meters

Figure 4 indicates the required layout for communication access to facility meters by the IPP, SBO and for Quality of supply purposes. This layout is to be applied for the metering configurations as shown in paragraph 3.3.1 and 3.3.2.

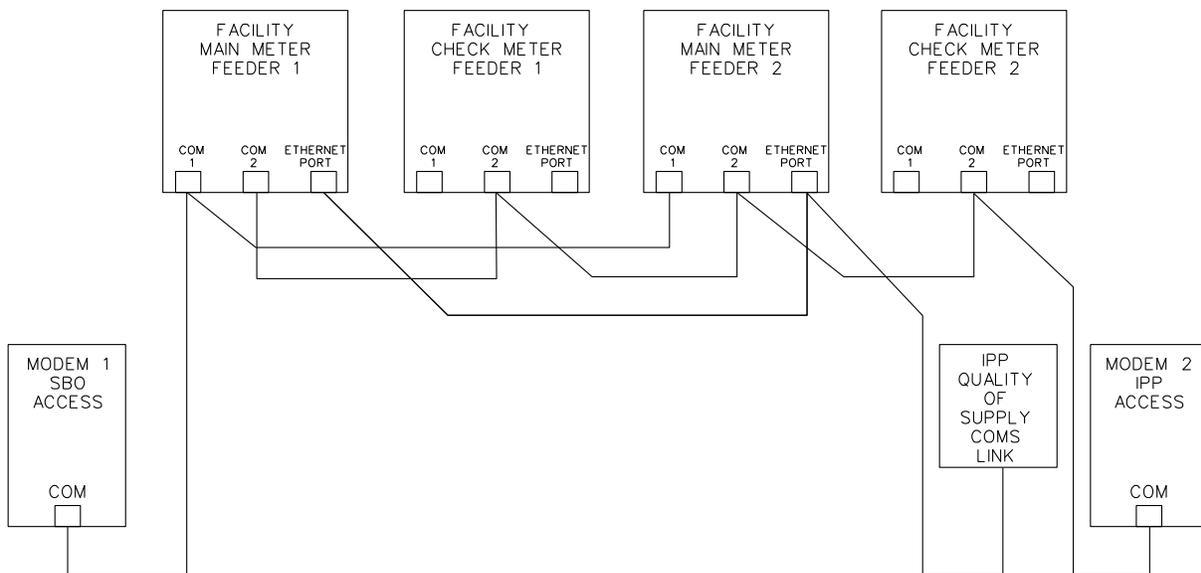


Figure 4: Communication to the facility meters according to 3.3.1 & 3.3.2

3.4.3.2 Communication to system meters

Figure 5 indicates the required layout for communication access to Eskom's system meters by Eskom and the SBO.

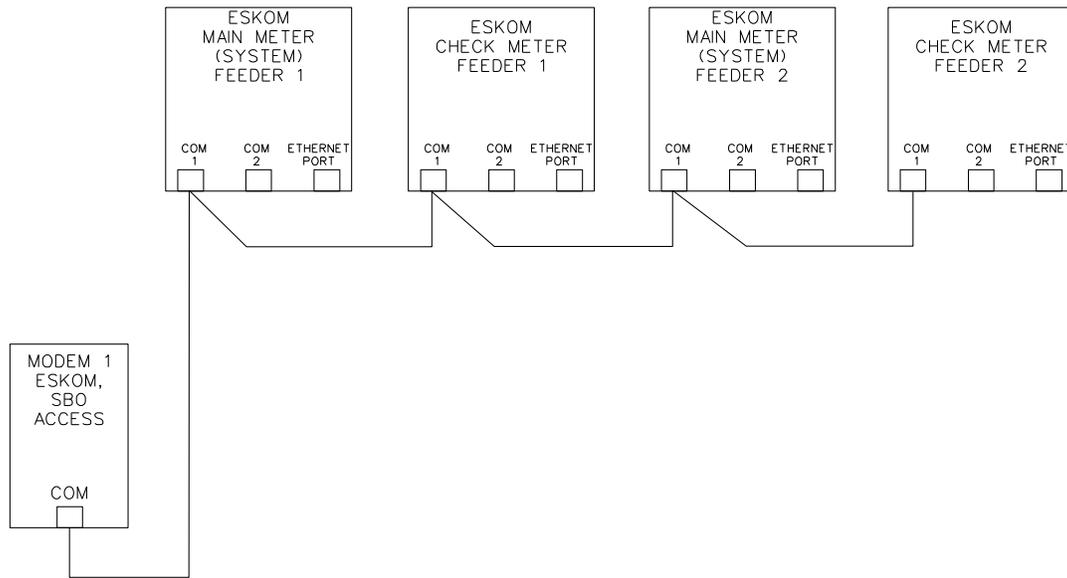


Figure 5: Communication to the system meters according to 3.3.1 & 3.3.2

3.4.3.3 Communication to IPP embedded in a non-Eskom network

Figure 6 indicates the required layout for communication access to facility meters by the IPP and SBO. Eskom may have a need to install meters in the check circuit where they will have access to. This layout is to be applied for the metering configurations as shown in paragraph 3.3.3.

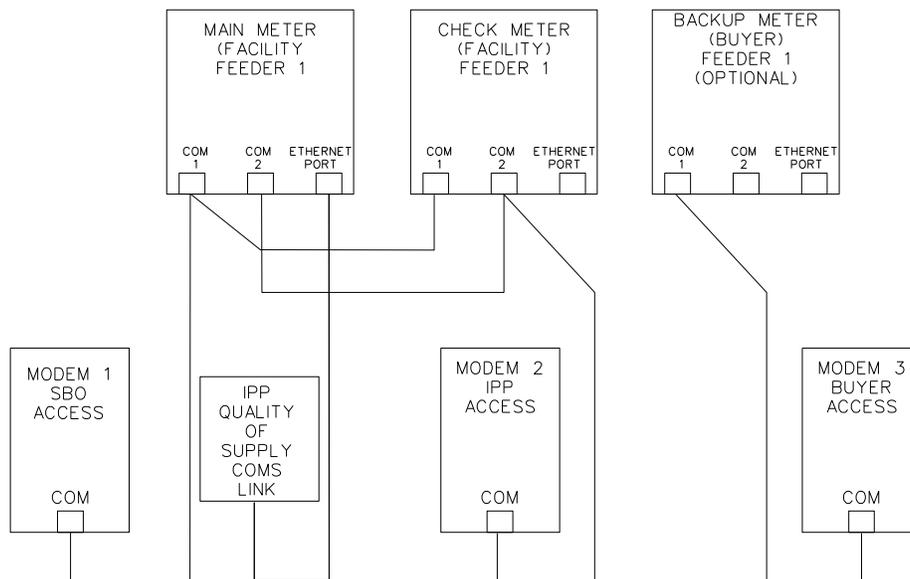


Figure 6: Communication to meters in a non-Eskom owned network according to 3.3.3

3.5 List of approved meters

Eskom is maintaining a list of approved meters and various meters are available for the various installations. However, the selected meter has to fulfil all the requirements as listed in this document and specifically the communication requirements as listed in paragraph 3.4. An example of a meter which fulfils all of these requirements is the Schneider ION8800 meter.

3.6 Commissioning and maintenance

Eskom has extensive commissioning and maintenance test requirements. It is recommended that the Facility metering installations be commissioned and maintained according to Eskom's documents 240-55197966: *Procedure for the commissioning of metering and measurements installations (MV & HV)* and 240-55198029: *Procedure for the maintenance of metering and measurements installations (MV and HV)*.

3.6.1 Data Channel allocation

The meter shall be configured to record import and export active energy (kWh) and reactive energy (kvarh) in all four quadrants.

The order for the configuration of the data channels shall be:

- Channel 1 – kWh forward
- Channel 2 – kWh reverse
- Channel 3 – kvarh Q1
- Channel 4 – kvarh Q2
- Channel 5 – kvarh Q3
- Channel 6 – kvarh Q4

3.6.2 Sealing

Eskom shall seal its own equipment according to the sealing standard DST 34-749 *Standard for sealing of metering equipment*. The IPP shall seal their metering equipment. If the IPP does not have sealing equipment, then they can request Eskom to seal their metering equipment and the required seal numbers shall be recorded in the commissioning / maintenance sheets.

3.7 Metering sign-off sheet

The metering installation shall be signed off by Eskom and the IPP using the sheet below to check and approve the requirements for metering installations.



Compliance tick
sheet_rev06.xlsx

Metering Requirements - Sign-off sheet for IPP's			
IPP Name:		FDR/TRFR:	
No	Activity	Specify Compliance/Comments	Tick Box
1	Facility Meter Type		
2	Facility Meter Serial Number		
3	Facility Modem Type		
4	Facility Modem Serial Number		
5	Facility Modem Port Number		
6	Facility SIM MSISDN (Voice No) Provide to SBO ASAP		
7	Facility SIM IP Address		
8	Facility Contract SIM (Prodata or M2M package)		
9	IPP to specify IPP's communication solution and how preferential remote access will be guaranteed to SBO		
10	Meter Seal No 1.		
11	Meter Seal No 2.		
12	Meter Seal No 3.		
13	CT Test block Seal No		
14	VT Test Block Seal No		
15	Did Eskom representative witness sealing of IPP metering equipment		
16	Did IPP representative witness sealing of Eskom metering equipment		
17	If IPP did not witness sealing, were they notified in advance in accordance with PPA		
18	Photographs taken of IPP meters and seals		
19	Completed Commissioning sheet details (Instantaneous measurements like Voltages, Current, phase angles, etc)		
20	Meters SANAS calibration test results		
21	Meters configuration details & correctness checked 1. Active Energy - Import kWh 2. Active Energy - Export kWh 3. Reactive Energy - Q1 kvarh 4. Reactive Energy - Q2 kvarh 5. Reactive Energy - Q3 kvarh 6. Reactive Energy - Q4 kvarh	1. 2. 3. 4. 5. 6.	
22	Meters date and time checked for correctness		
23	Communication tested with Tx (SBO)		
24	CT Calibration Certificates		
25	CT on site test results 1. CT insulation tests 2. CT Magnetising tests 3. CT Accuracy tests 4. CT ratio tests 5. CT polarity tests	1. 2. 3. 4. 5.	
26	VT Calibration Certificates		
27	VT on site test results 1. VT insulation tests 2. VT ratio tests 3. VT polarity tests	1. 2. 3.	
General Comments:			
IPP's Representative		Eskom Representative	
Name:		Name:	
Date:		Date:	
Signature:		Signature:	

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