Measurements for smart electricity grids:
workshop and open consultation

What's going on in IEC/TC85 and IEC/TC64 about DC applications ?

Public

Presenters

- Franck GRUFFAZ
  - Schneider Electric, Grenoble, France
  - Convenor of IEC TC85/WG20
  - Project leader IEC 61557-12-2 (tests)



- Pierre-Henri HERR
  - Socomec, Benfeld, France
  - Chair of CLC TC85X
  - Project leader IEC 61557-12



Public

Market needs for measurements in DC applications

- Despite DC applications are still negligible compared to AC applications, some applications e.g. EV DC power transfer including bidirectional, battery energy storage system (BESS), Photovoltaic (PV), DC interconnection links, Interlink converters, UPS DC, ... are using it, and new projects are starting.
- This is why IEC Technical Committees have started to work on DC applications in order to prepare the future:
  - TC64: prepare requirements for integration of DC grids within installations
  - TC85: specify devices dedicated to DC measurement:
    - Cost allocation
    - Energy Efficiency of DC grid and converters
    - Power Quality Monitoring of DC grid

Public

What’s going on in IEC TC64 ?

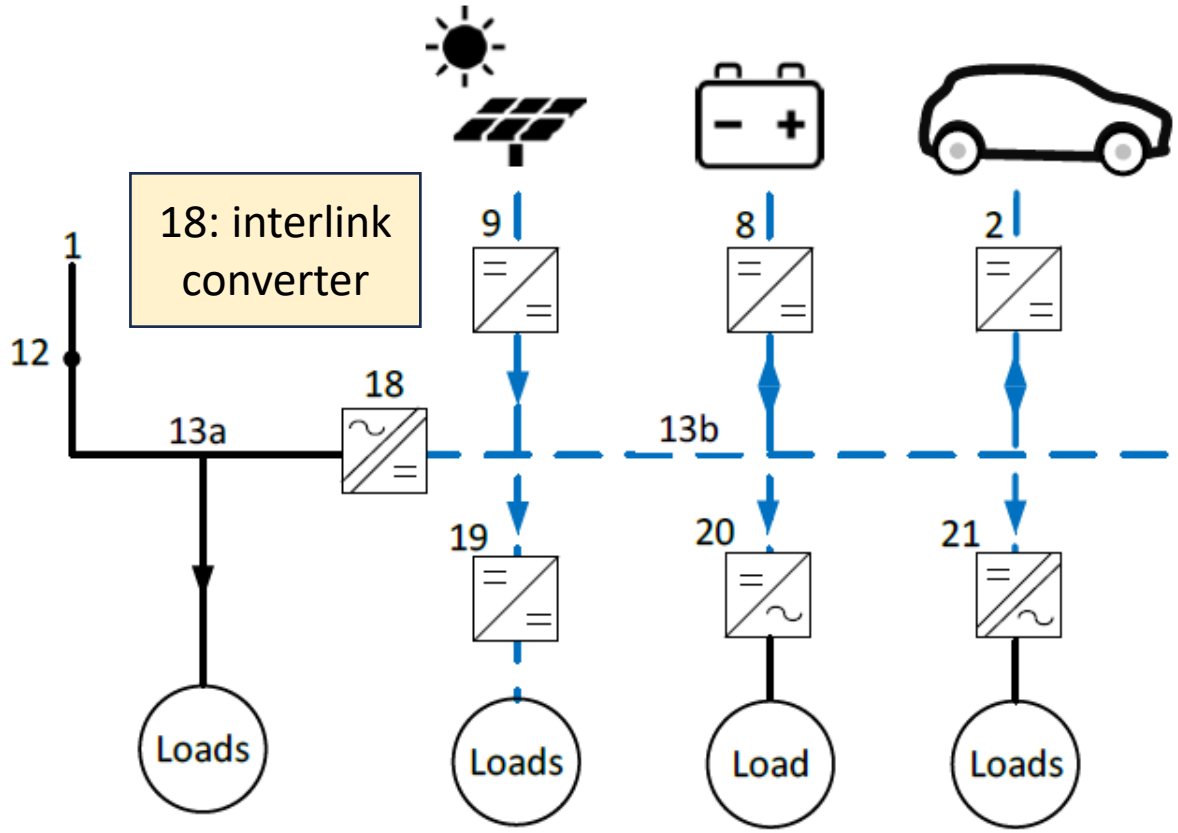
IEC - TC 64 Dashboard> Scope

TC 64 Electrical installations and protection against electric shock

Public

IEC 60364-8-82 Prosumer's Electrical Installations (**PEI**)

- Objectives
  - To ensure safe integration of renewable local power sources
  - To manage the transition between the different operating modes
- Scope
  - New and existing installations producing and consuming electrical energy (Prosumer)



Public

Prosumer's electrical installations (**PEI**) future amendment of IEC 60364-8-82

- **Introduction of the Interlink converter between AC and DC systems**
- **Isolation between AC and DC distribution systems**
- **Protection devices under study**



Public

What’s going on in IEC TC85 ?

IEC - TC 85 Dashboard> Scope

TC 85	Measuring equipment for electrical and electromagnetic quantities

Public

IEC TS 63191:2023, annex I (DC distribution)

power quality parameters
For DC grids

Annex I (informative) DC distribution 85
I.1 General 85
I.2 DC demand-side power quality disturbances and impact 85
I.2.1 General 85
I.2.2 Frequency 85
I.2.3 Magnitude of supply voltage deviations, under-deviations, over-deviations 85
I.2.4 Transient overvoltages 86
I.2.5 Supply voltage unbalance, current unbalance 87
I.2.6 Voltage and current harmonics, interharmonics and subharmonics 87
I.2.7 Rapid voltage changes 88
I.3 Examples of demand-side AC distribution and of demand-side DC distribution 88
I.4 Examples of AC signals and DC signals 89

Public

IEC 61557-12
Power metering and monitoring devices (PMD)

- IEC 61557-12:2018 "*Power metering and monitoring devices (PMD)*" standard covers only AC devices

- A maintenance was set to add DC requirements in IEC 61557-12 standard

➔ A first draft with DC implementation was circulated within TC85/WG20

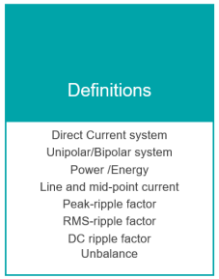
Public

IEC 61557-12 & DC
New elements for DC

Names	Definitions	Functions
PMD-AC	PMD-DC	Active energy/power
PMD-DC	Direct Current system	Line and mid-point current
	Line and mid-point Voltage/Current	Voltage
	Overall active power /energy	Voltage Dip/Swell/Interruption
	DC power / energy	Voltage & Current Unbalance
	Ripple voltage	RMS-ripple factor
	RMS-ripple/ Peak-ripple / DC ripple factor	Peak-ripple factor
		DC ripple factor

Public

IEC 61557-12 & DC
DC definitions



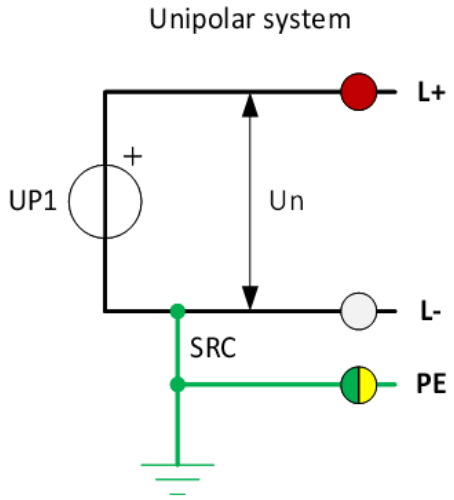
General definitions

3.1.4
direct current system
DC system
electrical system fed by unidirectional voltage

[SOURCE: IEC 60050-601:1985, 601-01-04]

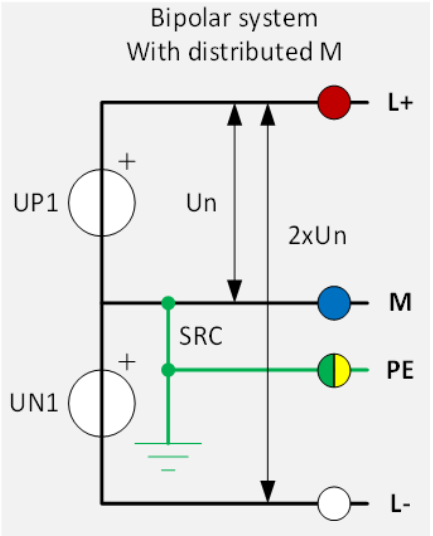
3.1.5
unipolar DC system
DC system comprising of two lines

Example:



3.1.6
bipolar DC system
DC system comprising positive, midpoint and negative lines

Example:



IEC 61557-12 & DC
DC definitions

Definitions

Direct Current system
Unipolar/Bipolar system
Power /Energy
Line and mid-point current
Peak-ripple factor
RMS-ripple factor
DC ripple factor
Unbalance

Power DC, AC & Overall

3.1.8
DC power
DC active power
product of the mean value of direct current flowing through a two-terminal circuit and the mean value of direct voltage across it

$$P_{DC} = \frac{1}{T}\int_0^T idt \times \frac{1}{T}\int_0^T udt$$

3.1.7
overall active power
mean value, taken over time T, of the instantaneous power p

$$P_{AC+DC} = \frac{1}{T}\int_0^T pdt$$

Note 1 to entry: under periodic conditions, T is generally an integer multiple of the period.

Note 2 to entry: Under sinusoidal conditions, the active power is the real part of the complex power S, thus P=Re(S)

Note 3 to entry: The coherent SI unit for active power is watt, W.

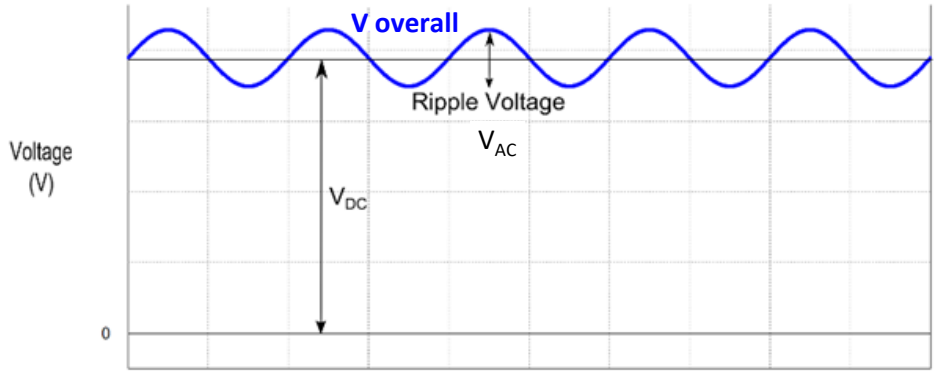
Note 4 to entry: For historical reason, P without subscript is used for pure AC signal

[SOURCE: IEC 60050-131:2013, 131-11-42 modified]

3.1.9
active power
AC active power
Difference between overall active power and DC active power

$$P = P_{AC} = P_{AC+DC} - P_{DC}$$

Note1 to entry: for historical reason the active power wording is used for AC active.



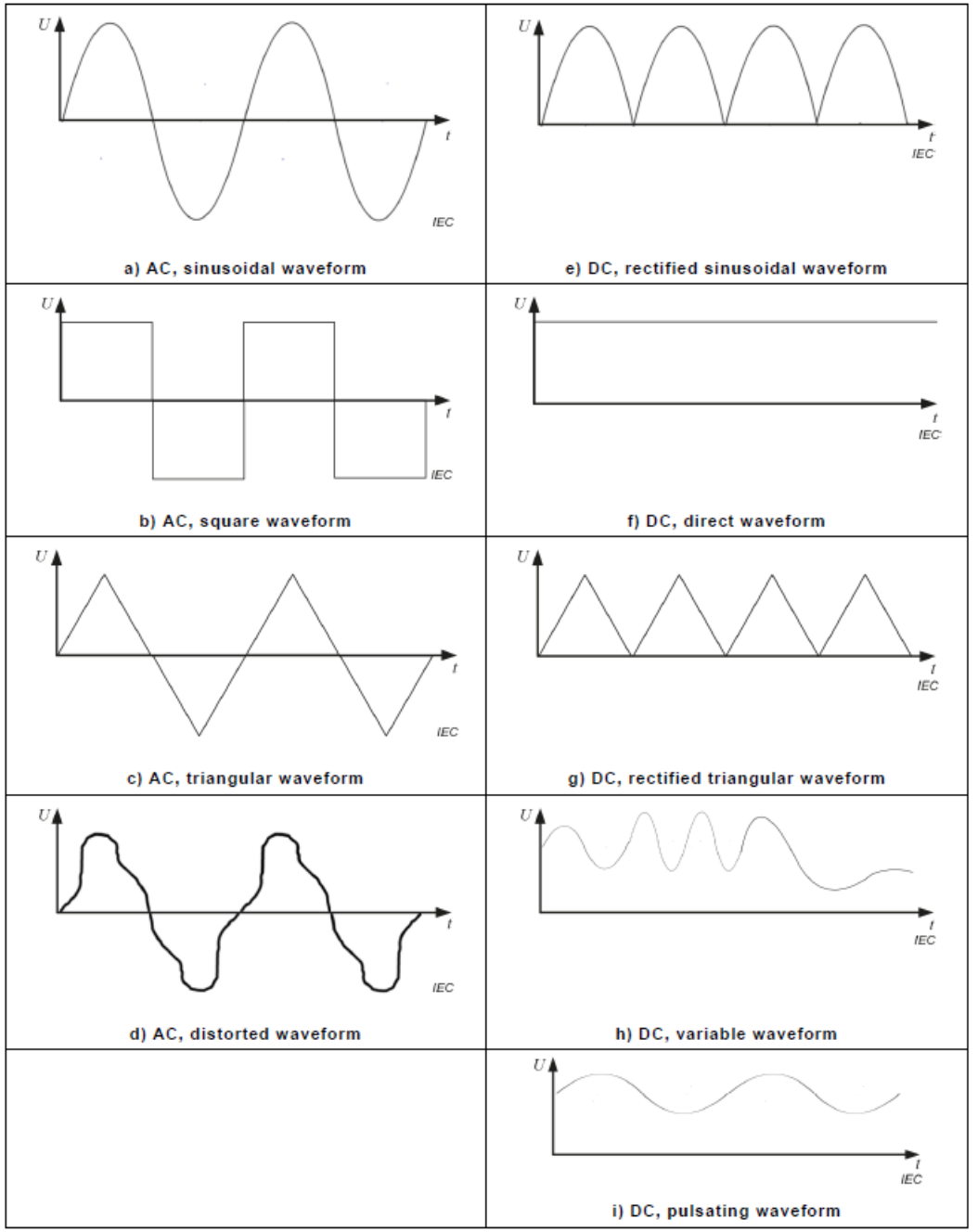
Energy DC, AC & Overall

The energy is the integral of Power

$$\mathrm{E} = \int P\, dt$$

Public

QUESTIONS ?


U
t
IEC
a) AC, sinusoidal waveform
b) AC, square waveform
c) AC, triangular waveform
d) AC, distorted waveform
e) DC, rectified sinusoidal waveform
f) DC, direct waveform
g) DC, rectified triangular waveform
h) DC, variable waveform
i) DC, pulsating waveform