# GENERALIZED D.C./D.C. CONVERTER EXPERIMENTAL SET UP

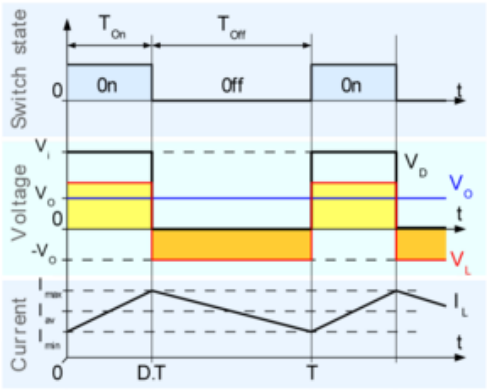
## (BUCK MODE) GDCDCCK-Series

**Introduction & operating principle:**

GDCDCCK series of generalized DC/DC set ups/tools are available for buck, boost, buck-boost and cook topologies offers general experimental facility to characterize all voltage/current behavior viz-viz change in duty cycle, filtering inductance, source resistance and switching frequency and impact od controller gains on steady state/transient behaviour. These are available in more than 5 regular and custom specification models virtually offering all research and development/academic solution. These useful diagnostic tool for telecom, non-conventional resources, railway ,defense, computer, academics automobile, medical, forging, aerospace, and many research & development applications, avionics, medical, heavy electrical engineering, solid state physics application, process control, non conventional energy applications etc. These are available in various power ranges from 1-100 kilo watts and frequency from 50-2000 cycles.

**Operating Principle:**

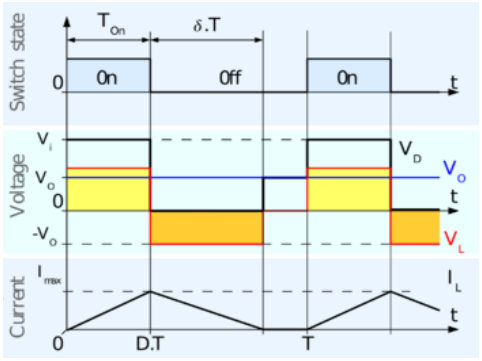
In Buck converter , during the switching transistor is switched on, inductor absorb energy as (Vin – Vo) appears across it. During off period,Vo appears across inductor through D1, subsequently o/p voltage falls. Back emf from L1 now causes current to flow around the circuit via the load and D1, which is now forward biased. Once the inductor has returned a large part of its stored energy to the circuit and the load voltage begins to fall, the charge stored in C1 becomes the main source of current, keeping current flowing through the load until the next 'on' period begins ..Vout/Vin = D and ..Iout/Iin =1/ D



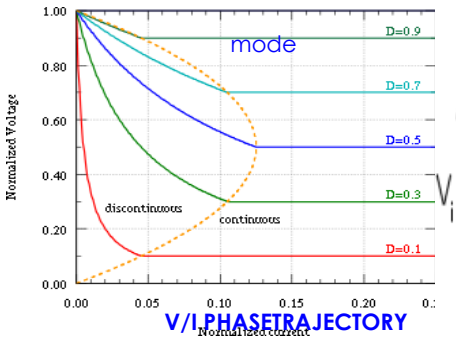

BUCK converter in C.C.M.

**Benefits:**

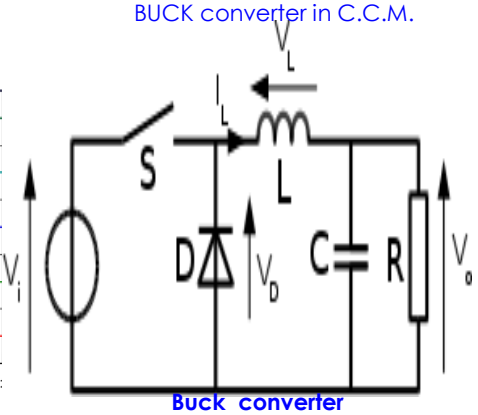
Simple installation and operational compatibility /Consistent S.C,/Over/under voltage protection




BUCK converter in D.C.M. ode




V/I PHASETRAJECTORY




Buck converter

**Electrical/Mechanical specifications of of Buck converter set up** **Power 500-2000 watts**

| MODEL | V.A. | Vin D.C. | Vout D.C | Frequency Hz | %Duty cycle range | Inductnce/ source resistance step | controllers |
|---|---|---|---|---|---|---|---|
| **GDCDCB-00001** | 500.0 | 0-24/48 | 0-24 | 10/20/40 | 0-100% | **Three** | PID/SLM |
| **GDCDCB-00002** | 1000.0 | 0-48/72 | 0-48 | 10/20/40 | **0-100%** | **Three** | PID/SLM |
| **GDCDCB-00005** | 2000.0 | 0-72/96 | 0-72 | 10/20/40 | 0-100% | **Three** | PID/SLM |
| **GDCDCB-00010** | 5000.0 | 0-96/120 | 0-96 | 10/20/40 | **0-100%** | **Three** | PID/SLM |

**General specification of Buck DC/DC CONVERTER :**

Operating voltage: 24/48/72/96 220 volts D.C.
Output voltage: depending on gain,load, dutycycle but above unity
Watts: 500/1000/2000/5000 watts
Parametric variation: source resistance, smoothing induance, duty cycle Frequency, load in three steps
Controller type gain parameter: PID and sliding mode
topologies: BUCK, BOOST, BUCK-BOOST ETC
Display: Regulation of O/P voltage: better than 0.5 % of measurement
Repeatability of O/P voltage: 100 percent
Display: 3 digit LED/LCD for source resistance, smoothing induance, duty cycle , Frequency, load , efficiency , voltage, current PID and sliding mode in three steps
*Protection*: S.C,/Over/under voltage/over temperature indication


**GDCDCB-00002**

**Dimensional specs of on line AC TO AC CONVETER :**

**GDCDCB-00001 12x24x15 inch 10 kg GDCDCB-00002 15x24x20 inch 16 kg**
**GDCDCB-00005 18x24x24 inch 26 kg GDCDCB-00010 24x24x30 inch 47 kg**

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# GENERALIZED D.C./D.C. CONVERTER EXPERIMENTAL SET UP

**(BOOST MODE)** **GDCDCBT-Series**

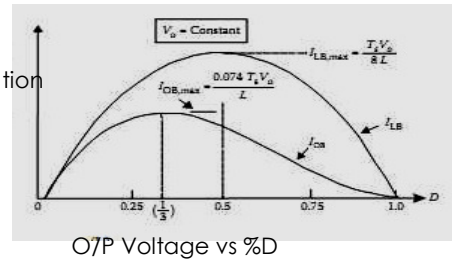
**Introduction** GDCDCB series of generalized DC/DC set ups/tools are available for buck, boost, buck-boost and cook topologies offers general experimental facility to characterize all voltage/current behavior viz-viz change in duty cycle, filtering inductance, source resistance and switching frequency and impact od controller gains on steady state/transient behaviour.These are available in more than 5 different model including regular and custom specification models virtually offering all research and development/academic solution. These useful diagnostic tool for telecom, non-conventional resources, railway ,defense, computer, academics automobile, medical, forging, aerospace, and many research & development applications, avionics, medical, heavy electrical engineering, solid state physics application, process control, non conventional energy applications etc. These are available in various power ranges from 1-100 kilo watts and frequency from 50-2000 cycles.

**Operating Principle:**

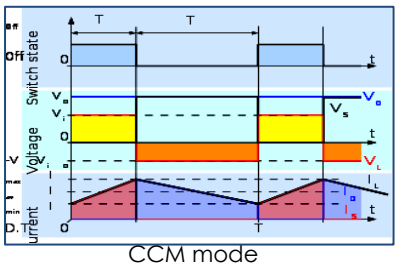
In the Boost converter , during Turn on periods , switch conduct through inductor storing huge energy. During Toff, C1is connected to Vin through charged inductor and D1 as result inductor voltage is $V_{IN}$ –Vo, so maintaining an almost steady output voltage across the load…Vo/Vin= 1/1-D & Iin/Io =1-D.

**Benefits:**

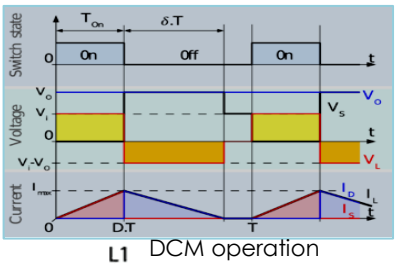
Simple installation and operational compatibility /Consistent 2. S.C,/Over/under voltage protection
DAS facility, all parameter display



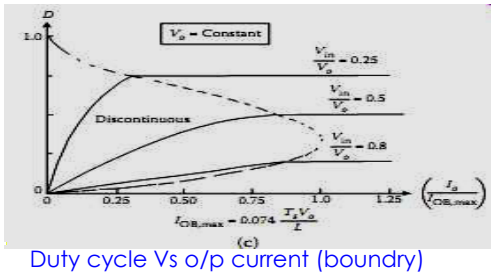

O7P Voltage vs %D



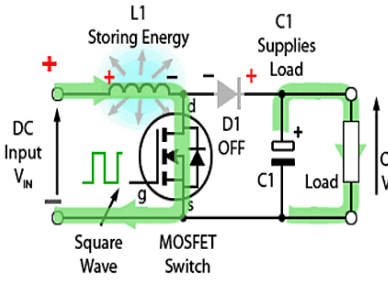

CCM mode



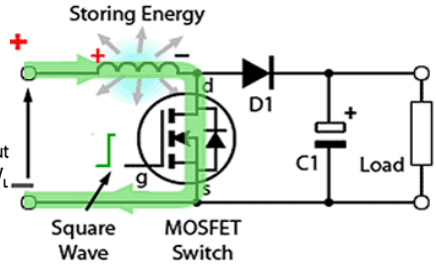

L1 DCM operation




Duty cycle Vs o/p current (boundry)




HIGH ON Boost converter(turn-on)




HIGH ON Boost converter(turn-off

**Electrical/Mechanical specifications of of Boost converter set up** **Power 500-2000 watts**

| MODEL | V.A. | Vin D.C. | Vout D.C. | Frequency K.Hz | %Duty cycle range | Inductnce/ source resistance step | controllers |
|---|---|---|---|---|---|---|---|
| **GDCDCBT-00001** | 500.0 | 24/48 | 0-48 | 10/20/40 | 0-100% | **Three** | PID/SLM |
| **GDCDCBT-00002** | 1000.0 | 48/72 | 0-72 | 10/20/40 | **0-100%** | **three** | PID/SLM |
| **GDCDCBT-00005** | 2000.0 | 72/96 | 0-96 | 10/20/40 | 0-100% | **Three** | PID/SLM |
| **GDCDCBT-00010** | 5000.0 | 96/120 | 0-120 | 10/20/40 | **0-100%** | **three** | PID/SLM |

## General specification of Boost DC/DC CONVERTER :

Operating voltage: 24/48/72/96 220 volts D.C.
Output voltage: depending on gain,load, dutycycle but above unity
Watts: 500/1000/2000/5000 watts
Parametric variation: source resistance, smoothing induance, duty cycle
Frequency, load in three steps
Controller type gain parameter: PID and sliding mode
topologies: BUCK, BOOST, BUCK-BOOST ETC
Display: Regulation of O/P voltage: better than 0.5 % of measurement
Repeatability of O/P voltage: 100 percent
Display: 3 digit LED/LCD for source resistance, smoothing inductance., duty cycle , Frequency, load , efficiency , voltage, current
PID and sliding mode in three steps
*Protection*: S.C,/Over/under voltage/over temperature indication


**GDCDCB-00002**

**Dimensional specs of on line AC TO AC CONVETER :**

**GDCDCBT-00001 12x24x15 inch 10 kg GDCDCBT-00002 15x24x20 inch 16 kg**
**GDCDCBT-00005 18x24x24 inch 26 kg GDCDCBT-00010 24x24x30 inch 47 kg**

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# GENERALIZED D.C./D.C. CONVERTER EXPERIMENTAL SET UP

(CUK MODE) GDCDCCK-Series

**Introduction & operating principle:**

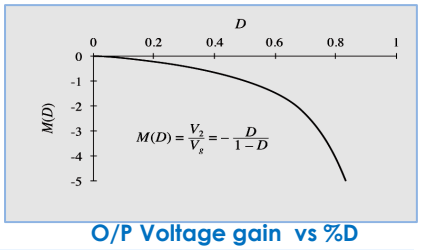
GDCDCCK series of generalized DC/DC set ups/tools are available for buck, boost, buck-boost and cook topologies offers general experimental facility to characterize all voltage/current behavior viz-viz change in duty cycle, filtering inductance, source resistance and switching frequency and impact od controller gains on steady state/transient behaviour. These are available in more than 5 different model including regular and custom specification models virtually offering all research and development/academic solution. These useful diagnostic tool for telecom, non-conventional resources, railway ,defense, computer, academics automobile, medical, forging, aerospace, and many research & development applications, avionics, medical, heavy electrical engineering, solid state physics application, process control, non conventional energy applications etc.

**Operating Principle:**

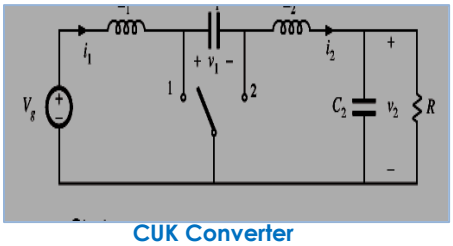
When switch is turned on, D1is off being reversed diades, current flows from the input source through L1 and MOSFET, storing energy in L1. When MOSFET is switch is off,D2is forward biased and current flows from the input source, through L1 and diode, charging up C1 to a voltage somewhat higher than Vin and transferring some of the energy stored in L1and L2 discharges C2 through D2. Again when MOSFET is turned on again, C1 discharges through L2 into the load, with L2 and C2 acting as a smoothing filter. If closely wateched, then C1 flip-flop between input and output circuit. **$Vo/Vin=I_{l1}/I_{l2}= -D/(1-D)$**

**Benefits:**

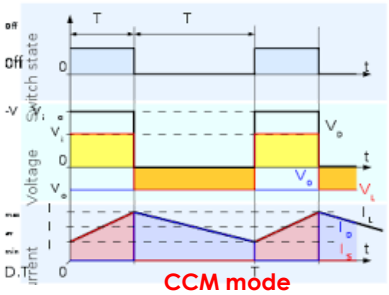
1. Simple installation and operational compatibility /Consistent
2. S.C,/Over/under voltage protection
3. DAS facility, all parameter display



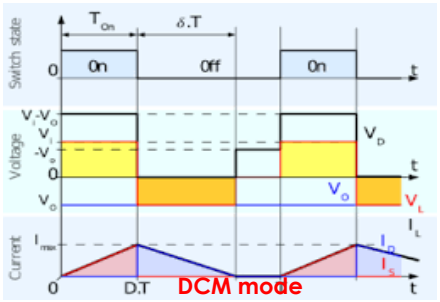

O/P Voltage gain vs %D



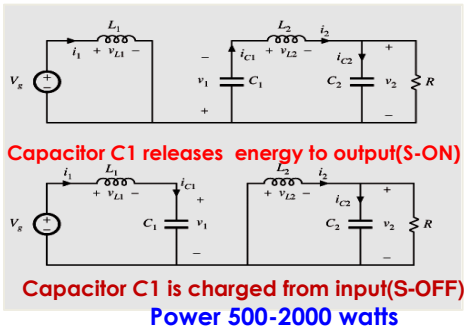

CUK Converter




CCM mode




DCM mode




**Electrical/Mechanical specifications of of Boost converter set up** **Power 500-2000 watts**

| MODEL | V.A. | Vin D.C. | Vout D.C. | Frequency K.Hz | %Duty cycle range | Inductnce/ source resistance step | controllers |
|---|---|---|---|---|---|---|---|
| GDCDCCKT-00001 | 500.0 | 24/48 | 0-48 | 10/20/40 | 0-100% | Three | PID/SLM |
| GDCDCCKT-00002 | 1000.0 | 48/72 | 0-72 | 10/20/40 | 0-100% | three | PID/SLM |
| GDCDCCKT-00005 | 2000.0 | 72/96 | 0-96 | 10/20/40 | 0-100% | Three | PID/SLM |
| GDCDCCKT-00010 | 5000.0 | 96/120 | 0-120 | 10/20/40 | 0-100% | three | PID/SLM |

**General specification of CUK DC/DC CONVERTER :**

Operating voltage: 24/48/72/96 220 volts D.C.
Output voltage: depending on gain,load, dutycycle but above unity
Watts: 500/1000/2000/5000 watts
Parametric variation: source resistance, smoothing induance, duty cycle
Frequency, load in three steps
Controller type gain parameter: PID and sliding mode
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GDCDCCK-00002

**Dimensional specs of on line AC TO AC CONVETER :**

**GDCDCCKT-00001 12x24x15 inch 10 kg GDCDCCKT-00002 15x24x20 inch 16 kg**
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