The Charging Algorithms of the Program BB220Im

Status LED:

Whole main charging	=	orange
Ready/Pause/Trickle charge	=	green
Error/ Battery not connected	=	flashing red
No Algorithm	=	red
Code switch position test	=	flashing green if battery not connected

Charging algorithms for 48 V, 30 A PAC 1600:

Switch position	Battery Voltage	Battery type	Max Charging Current = I1	Battery capacity	Currents I2	Currents I3	Charging curve
0				NO ALGORITHM			
1	48 V	Unsealed	30,0 A	145-175Ah	8,0A	8,0A	LK10-06
2	48 V	Unsealed	30,0 A	176-210Ah	9,7A	9,7A	LK10-06
3	48 V	Unsealed	30,0 A	211-250Ah	11,5A	11,5A	LK10-06
4	48 V	Unsealed	30,0 A	251-300Ah	13,8A	13,8A	LK10-06
5	48 V	Unsealed	30,0 A	301-360Ah	16,5A	16,5A	LK10-06
6	48 V	Unsealed	30,0 A	175-210Ah	9,7A	9,7A	LK10-04
7	48 V	Unsealed	30,0 A	211-250Ah	11,5A	11,5A	LK10-04
8	48 V	Unsealed	30,0 A	251-300Ah	13,8A	13,8A	LK10-04
9	48 V	Unsealed	30,0 A	301-360Ah	16,5A	16,5A	LK10-04
10 = A				NO ALGORITHM			
11 = B	48 V	Sealed	30,0 A	300-350Ah	3,9A	2,0A	LK20-09
12 = C	48 V	Sealed	30,0 A	251-299Ah	3,3A	1,7A	LK20-09
13 = D	48 V	Sealed	30,0 A	211-250Ah	2,8A	1,4A	LK20-09
14 = E	48 V	Sealed	27,0 A	176-210Ah	2,3A	1,2A	LK20-09
15 = F	48 V	Sealed	22,4 A	145-175Ah	1,9A	1,0A	LK20-09

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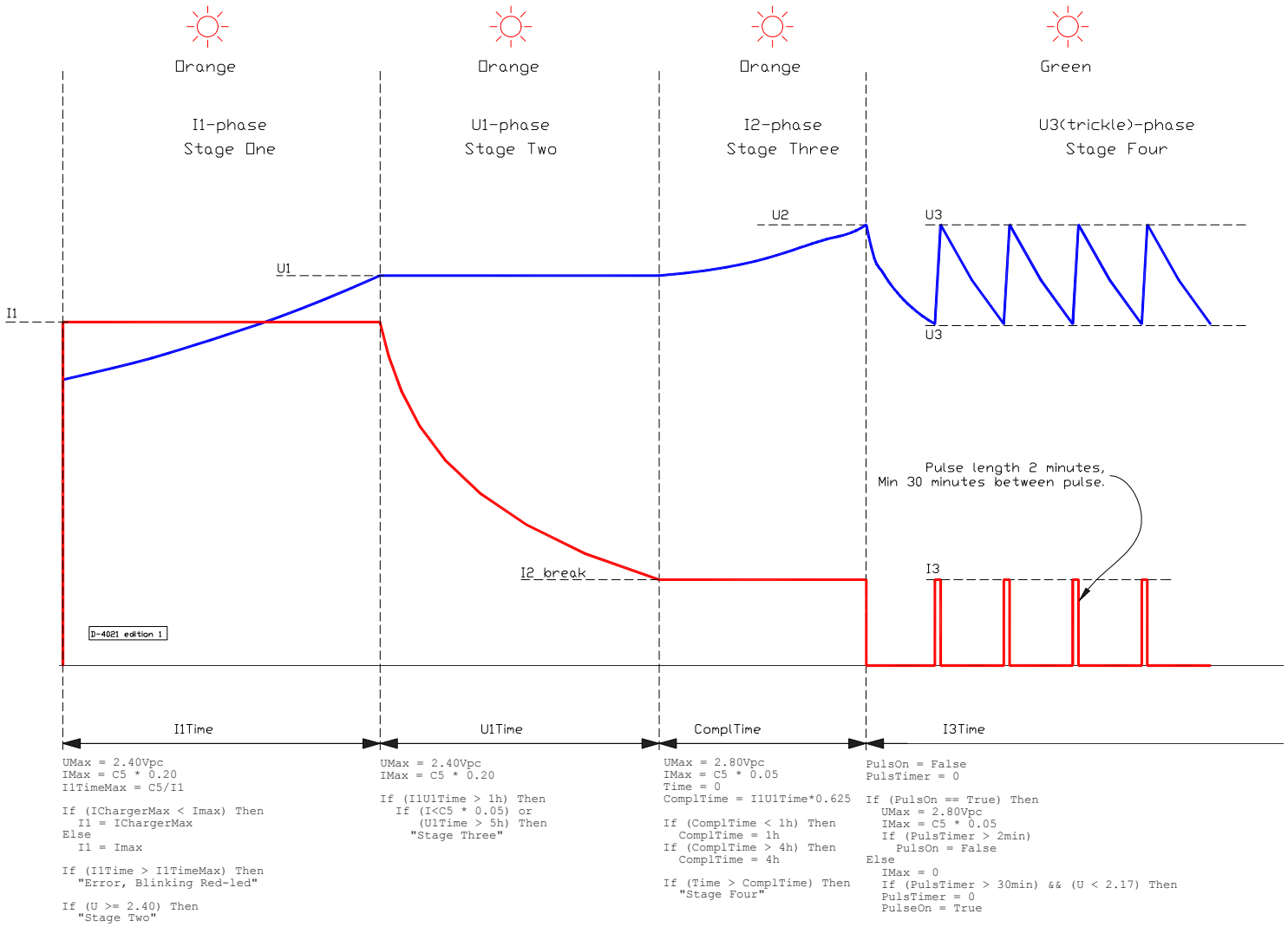
Unsealed Battery



Charging Curve LK10-06 for unsealed batteries:

Switch position	Battery capacity	Voltage U1 V/Cell	Voltage U2 V/Cell	Voltage U3 V/Cell	Current I1	Current I2	Current I3	Max. I1 Time	Max. U1Time
1	145-175Ah	2,40V	2,80V	2,80V	30,0 A	8,0A	8,0A	5,5h	5,0h
2	176-210Ah	2,40V	2,80V	2,80V	30,0 A	9,7A	9,7A	6,5h	5,0h
3	211-250Ah	2,40V	2,80V	2,80V	30,0 A	11,5A	11,5A	8,0h	5,0h
4	251-300Ah	2,40V	2,80V	2,80V	30,0 A	13,8A	13,8A	9,5h	5,0h
5	301-360Ah	2,40V	2,80V	2,80V	30,0 A	16,5A	16,5A	11,0h	5,0h

Charger starts if battery voltage is between 1,4Vpc and 2,9Vpc.

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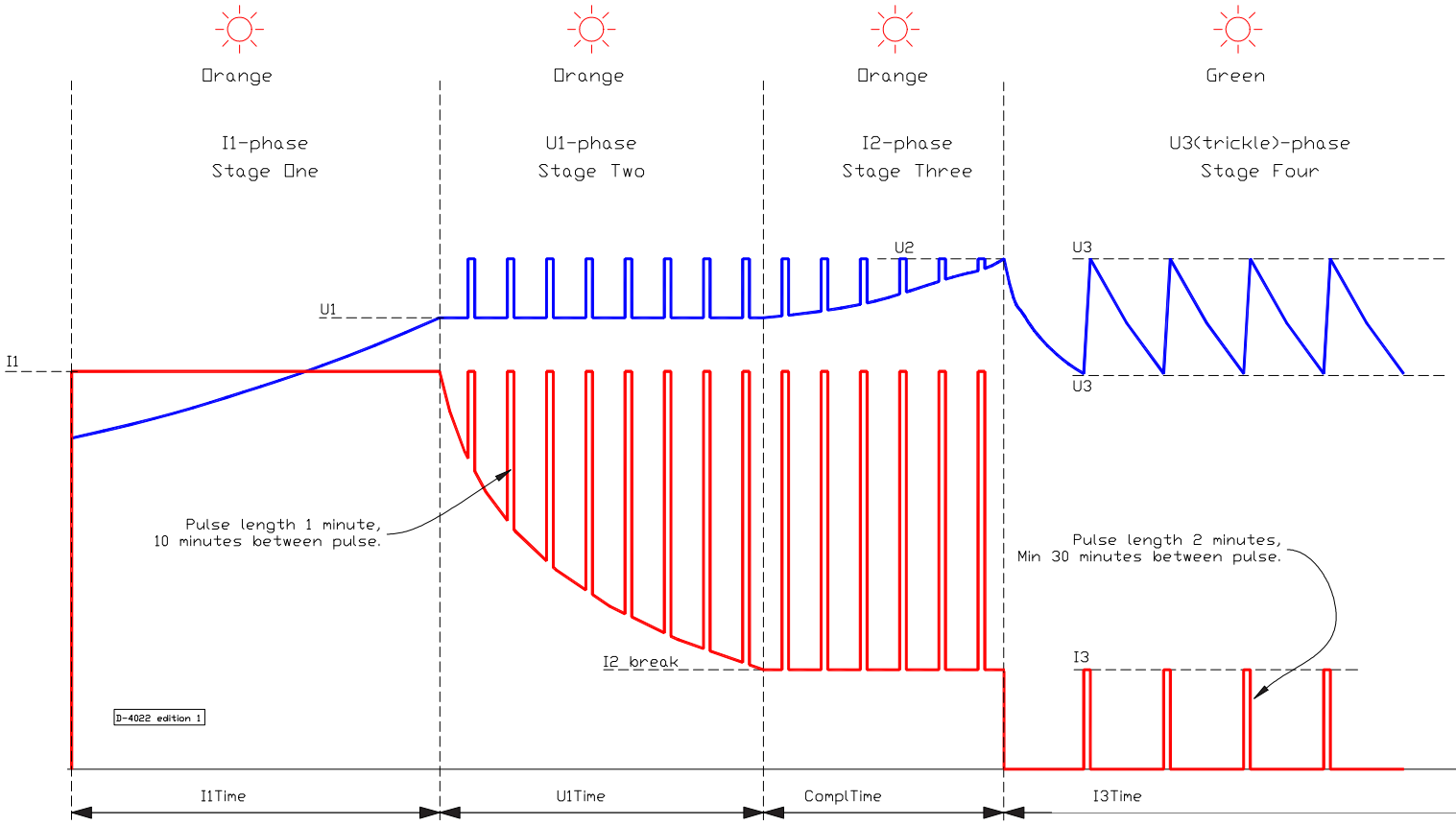
Unsealed Battery




```
UMax = 2.40Vpc
IMax = C5 * 0.20
I1TimeMax = C5/I1

If (IChargerMax < Imax) Then
   I1 = IChargerMax
Else
   I1 = Imax

If (I1Time > I1TimeMax) Then
   "Error, Blinking Red-led"

If (U >= 2.40) Then
   "Stage Two"
```

```
IMax = C5 * 0.20

If (PulsTimer < 9min) Then
  UMax = 2.40Vpc
  If (PulsTimer > 1min) Then
    If (I1U1Time > 1h) Then
      If (I < (C5*0.05)) or
              (U1Time > 5h) Then
         "Stage Three"
Else
  UMax = 2.80Vpc
  If (PulseTimer > 10min) Then
    PulsTimer = 0
```

```
UMax = 2.80Vpc
Time = 0
ComplTime = I1U1Time * 0.3

If (ComplTime < 1h) Then
  ComplTime = 1h
If (ComplTime > 3h) Then
  ComplTime = 3h

If (Time > ComplTime) Then
  "Stage Four"
If (PulsTimer < 9min) Then
  IMax =  C5 * 0.05
Else
  IMax =  C5 * 0.20
  If (PulseTimer > 10min)
Then
    PulsTimer = 0
```

```
PulsOn = False
PulsTimer = 0

If (PulsOn == True) Then
  UMax = 2.80Vpc
  IMax = C5 * 0.05
  If (PulsTimer > 2min)
    PulsOn = False
Else
  IMax = 0
  If (PulsTimer > 30min) && (U <
2.17) Then
  PulsTimer = 0
  PulseOn = True
```

Charging Curve LK10-04 for unsealed batteries:

Switch position	Battery capacity	Voltage U1 V/Cell	Voltage U2 V/Cell	Voltage U3 V/Cell	Current I1	Current I2	Current I3	Max. I1 Time	Max. U1Time
6	175-210Ah	2,40V	2,80V	2,80V	30,0 A	9,7A	9,7A	6,5h	5,0h
7	211-250Ah	2,40V	2,80V	2,80V	30,0 A	11,5A	11,5A	8,0h	5,0h
8	251-300Ah	2,40V	2,80V	2,80V	30,0 A	13,8A	13,8A	9,5h	5,0h
9	301-360Ah	2,40V	2,80V	2,80V	30,0 A	16,5A	16,5A	11,0h	5,0h

Charger starts if battery voltage is between 1,4Vpc and 2,9Vpc.

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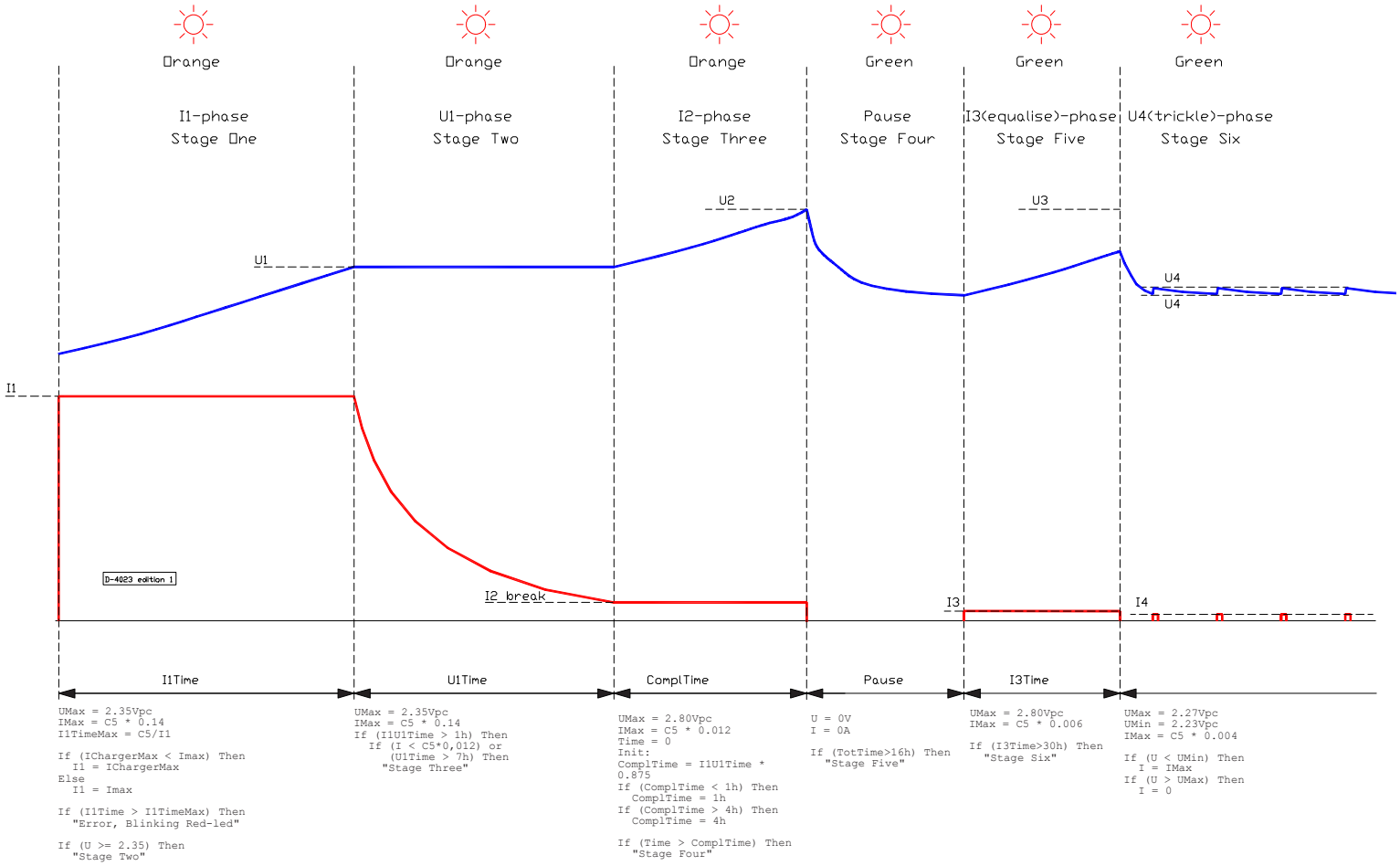
Sealed Battery



Charging Curve LK20-09 for Sealed battery:

Switch position	Battery capacity	Voltage U1 V/Cell	Voltage U2 V/Cell	Voltage U3 V/Cell	Voltage U4 V/Cell	Current I1	Current I2	Current I3	Current I4	Max. I1 Time	Max. U1 Time
10 = A	NO ALGORITHM										
11 = B	300-350Ah	2,35V	2,80V	2,80V	2,24V	30,0 A	3,9A	2,0A	1,3A	11,0h	7,0h
12 = C	251-299Ah	2,35V	2,80V	2,80V	2,24V	30,0 A	3,3A	1,7A	1,1A	9,5h	7,0h
13 = D	211-250Ah	2,35V	2,80V	2,80V	2,24V	30,0 A	2,8A	1,4A	0,9A	8,0h	7,0h
14 = E	176-210Ah	2,35V	2,80V	2,80V	2,24V	27,0 A	2,3A	1,2A	0,8A	7.5h	7,0h
15 = F	145-175Ah	2,35V	2,80V	2,80V	2,24V	22,4 A	1,9A	1,0A	0,6A	7.5h	7,0h

Charger starts if battery voltage is between 1,4Vpc and 2,9Vpc.

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Other rules:

- **Note!**
  Charging voltage is compensated depending on battery's temperature.
  If Temperature sensor if connected to charger terminal J3 (TEMP/SENSE).

- ## Unsealed battery
  U = V-0.004*C*(T-25)
  Where:
  U = Output voltage
  V = Voltage on the table
  C = Cell number
  T = Battery's temperature in Celsius

  Temperature compensation working between ±0° and +52° Celsius.
  If the temperature increase to over +52 Celsius output current reduce in step up to +59° Celsius. At +60° Celsius charging stop, charger alarm (Blink Red LED).

- ## Sealed battery
  U = V-0.004*C*(T-30)
  Where:
  U = Output voltage
  V = Voltage on the table
  C = Cell number
  T = Battery's temperature in Celsius

  Temperature compensation working between ±0° and +45° Celsius.
  If the temperature increase to over +45 Celsius output current reduce in step up to +52° Celsius. At +53° Celsius charging stop, charger alarm (Blink Red LED).

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