KNOW HOW IS THE FUTURE

The Converter Intelligent!

DC-DC Converter Qone LEC / HEC

Output Power up to 160 Watt

Isolated

Single Output

For standard euro rack size 19''

Qone comes with luxury as a standard.

It is generously equipped, leaving any competitors behind.

The intelligent converter.
Effective, flexible, small.
Made by AUTRONIC.

Its merits are:

- High power density
- Fully integrated heatsink (or mounting surface) provides extremly low thermal stress to temperature sensitive components
- Coated and partial encapsulated assembly for better vibration resistance
- Overtemperature and overvoltage shutdown
- Short circuit protection
- Remote on/off
- Yellow LED indicates operating mode
- CE certified
- Fixed switching frequency 300 kHz
- Reverse polarity protection by internal protector
- Voltage Control (VC)
- Thermal Warning (TW)
- Synchronization (Sy)
- Voltage in Fail (ViF)
- Voltage out Fail (VoF)

innovative energies

Order Numbers and Specific Chacteristics

The standard euro rack size 19" LEC and HEC are available. You have the choice of different mechanical case options (compare drawing page 4):
LEC-C/-CS (CS=cut): Cassette for chassis mounting without front plate, without LED, for mounting on power loss dissipating metal surface (heatsink).
HEC-F/-FS (FS=cut): Cassette for chassis mounting without front plate, without LED, on no power loss dissipating surface.(See datasheet mechanical "accessiores")
The order numbers consist of eleven digits (eight for the basis number and three for the mechanical Version).
Other type on request

						Order number							Derating (see diagram 1)				
	I_{out} nom [12] (A)	P_{out} max (W)	η typ (%)[1]	I_{in} max [12] (A)	Pro-tector [2]	LEC		-C	-CS	HEC		-F	-FS	LEC (Diagram1) Pd (W)	Td (°C)	DF (W/K)	LEC-C and LEC-CS $P_{out\ max}$ at 70°C R_{thCA} [5] (K/W)	DF>70°C [9] (W/K)
$V_{in\ nom}$ = 12 V – see table 1																		
$V_{in\ operating}$ = 8 to 15 V, $V_{in\ range}$ = 7 to 18 V [3b) 6)]																		
3,3 [7]	17,6	60	76	16,0	T15	81 32 05 04	22 4	42 1	41 6					56	70	1,49	1,9	1,71
5 [7]	15,6	80	79	16,0	T15	81 32 08 04	22 1	42 7	41 3					67	70	1,84	1,7	2,29
12	7,5	90	78	16,0	T15	81 32 12 04	22 5	42 2	41 7					73	65	1,86	1,4	2,57
15	6,7	100	80	16,0	T15	81 32 15 04	22 2	42 8	41 4					82	65	2,10	1,4	2,86
24	4,2	100	79	16,0	T15	81 32 24 04	22 1	42 7	41 3					77	65	1,99	1,3	2,86
$V_{in\ nom}$ = 24 V																		
$V_{in\ operating}$ = 16 to 30 V, $V_{in\ range}$ = 14,4 to 36 V [3b) 6)]																		
3,3 [7]	17,6	60	76	7,1	T15	82 32 05 04	22 6	42 3	41 8					56	70	1,49	1,9	1,71
5[7][11]	15,6	80	80	8,5	T15	82 32 08 04	22 3	42 9	41 5					71	70	1,93	1,8	2,29
12	8,3	100	81	10,7	T15	82 32 12 04	22 7	42 4	41 9					94	65	2,45	1,5	2,86
15	7,7	115	82	12,3	T15	82 32 15 04	22 4	42 1	41 6					100	65	2,56	1,4	3,29
24[11]	5,4	130	84	13,2	T15	82 32 24 04	22 3	42 9	41 5					116	65	3,04	1,4	3,71
$V_{in\ nom}$ = 12/24 V																		
$V_{in\ operating}$ = 10 to 30 V, $V_{in\ range}$ = 10 to 40 V [3b) 4) 6)]																		
3,3 [7]	17,6	60	76	11,2	T15	83 32 05 05	22 1	42 7	41 3					56	70	1,49	1,9	1,71
5 [7]	15,6	80	79	13,5	T15	83 32 08 05	22 7	42 4	41 9					67	70	1,84	1,7	2,29
12	7,9	95	79	16,0	T15	83 32 12 05	22 2	42 8	41 4					77	65	1,99	1,4	2,71
15	7,0	105	80	16,0	T15	83 32 15 05	22 8	42 5	41 1					82	65	2,10	1,3	3,00
24 [8]	4,8	115[8]	81	16,0	T15	83 32 24 05	22 7	42 4	41 9					88	65	2,28	1,3	3,29
$V_{in\ nom}$ = 36 V																		
$V_{in\ operating}$ = 24 to 45 V, $V_{in\ range}$ = 21,6 to 51 V [3b) 6)]																		
24[8]	5,4	130	84	9,8	T15	84 32 24 05	22 9	42 6	41 2					116	65	3,04	1,4	3,71
$V_{in\ nom}$ = 48 V																		
$V_{in\ operating}$ = 33 to 60 V, $V_{in\ range}$ = 32,5 to 80 V [3a) 6)]																		
3,3[7][9]	17,6	60	76	3,0	T6,3	85 32 05 04	22 3	42 9	41 5					56	70	1,49	1,9	1,71
5 [7]	15,6	80	80	3,9	T6,3	85 32 08 04	22 9	42 6	41 2					71	70	1,66	1,8	2,29
12 [9]	8,3	100	83	4,7	T6,3	85 32 12 04	22 4	42 1	41 6					88	65	2,28	1,5	2,86
15 [9]	7,7	115	84	5,3	T15	85 32 15 04	22 1	42 7	41 3					94	65	2,45	1,4	3,29
24 [9]	5,4	130	86	5,8	T15	85 32 24 04	22 9	42 6	41 2					108	65	2,80	1,4	3,71
$V_{in\ nom}$ = 72 V																		
$V_{in\ operating}$ = 48 to 90 V, $V_{in\ range}$ = 43,2 to 101 V [3b) 6)]																		
24	5,4	130	84	4,5	T6,3	86 32 24 04	22 2	42 8	41 4					108	65	2,80	1,4	3,71
$V_{in\ nom}$ = 110 V																		
$V_{in\ operating}$ = 77 to 138 V, $V_{in\ range}$ = 66 to 160 V [3b) 6)]																		
3,3 [7]	17,6	60	76	1,5	T6,3	87 32 05 04	22 7	42 4	41 9					56	70	1,49	1,9	1,71
5 [7]	15,6	80	80	1,9	T6,3	87 32 08 04	22 4	42 1	41 6					71	70	1,93	1,8	2,29
12	9,6	115	81	2,6	T6,3	87 32 12 04	22 8	42 5	41 1					88	65	2,28	1,3	3,29
15	8,7	130	82	3,3	T6,3	87 32 15 04	22 5	42 2	41 7					94	65	2,45	1,2	3,71
24 [9]	6,7	160	84	3,6	T6,3	87 32 24 04	22 4	42 1	41 6					108	65	2,80	1,1	4,57

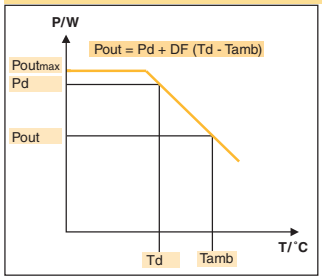
Models in blue are not recommended for new designs

In case of $V_{in} = V_{in\ nom}$ and free convection. Available up to +85°C. Typical course of Characteristic, detailed Data on request.

Table 1: Max. Output Power P_{out} (W) at Permanent Operation

$V_{out\ nom}$ \ V_{in}	7 V	7,5 V	8 V	9 V	10-18 V	12 V
3,3 V	60	60	60	60	60	60
5 V	77	80	80	80	80	80
12 V	80	85	87	87	87	90
15 V	82	87	92	98	100	100
24 V	80	85	90	95	95	100

Diagram 1: Output Power P_{out} (W) / Ambient Temperature T_{amb} (°C)



Td = Reference Temperature of Derating
Pd = Output Power at Td
DF = Derating-Factor

[1] P_{out} = 0,8 $P_{out\ max}$; $V_{in} = V_{in\ nom}$
[2] For disconnecting from the pretending supply, sufficient current of the supply point to trigger the fuse in case of short circuit has to be made sure (t<300 ms).
[3a] Converter input according to Railway Standard EN 50155 (Vin operating).
[3b] Converter input and critical input according to Railway Standard EN 50155 ($V_{in\ operating}$ and $V_{in\ range}$; not at $V_{in\ nom}$=12 V).
[4] Adjust V_{out}, at $V_{in\ nom}$ = 24 V
[5] Necessary thermal resistance of mounting surface (chassis) to ambient for $P_{out\ max}$ up to T_{amb}=70°C. Typical value at free convection
[6] If the operating voltage is exeeded, the converters may be operated only with restricted load.
[7] 3,3 V adjusted to 3,4 V and 5 V adjusted to 5,1 V
[8] $P_{out\ max}$ = 108 W permanent, 115 W for 1 min. ED 50%
[9] Switching frequency 200 kHz
[10] Derating factor. Valid up to T_{amb}=85°C
[11] 40V_{in} for 100ms permissible
[12] Permissible continuous current depends on the used type of contact and ambient temperature.

The

Technical Data

At T_{amb}=25 °C, $V_{in\ nom}$, $I_{out\ nom}$, unless otherwise specified.

Input Characteristics

	Symbol	Unit	min	typ	max	Notes
Input voltage	V_{in}					
Nominal input voltage	$V_{in\ nom}$	V				1)
Input voltage range						
– Min. input voltage	$V_{in\ min}$	V	1)			
– Max. input voltage	$V_{in\ max}$	V			1)	
Threshold						
– Voltage on threshold	$V_{in\ on}$	V		1,05 $V_{in\ min}$		
– Voltage off threshold	$V_{in\ off}$	V		$V_{in\ min}$		
Input current	I_{in}					
Max. input current	$I_{in\ max}$	A			1)	
No load input current	$I_{in\ off}$	mA		10 8)		Switched off by En, V_{in} = $V_{in\ nom}$
Polarity and short circuit protection						**Integrated Protection** 1)
Remote on/off						"on" = En open, "off" = En to GND (EA, Sync)

Output Characteristic

	Symbol	Unit	min	typ	max	Notes
Output voltage	V_{out}					Short circuit protected and zero load operation
Nominal output voltage	$V_{out\ nom}$	V				1)
Accuracy		%		±0,2 4)		$V_{in\ nom}$; 50 % I_{out}; T_{amb} 25 °C
Regulation						
– Line regulation		%		±0,6		70 % – 130 % $V_{in\ nom}$; 50 % $I_{out\ nom}$; T_{amb} 25 °C
– Static load regulation		%		±0,6 9)		10 % – 100 % $I_{out\ nom}$; $V_{in\ nom}$; T_{amb} 25 °C
– Temperature coefficient		%/K		±0,01		-25 bis +85 °C (heat sink); $V_{in\ nom}$; 50 % $I_{out\ nom}$
– Dynamic load change Voltage deviation Recovery time		A % ms		 4 6) 0,5	 2,0	25 % – 100 % – 25 % $I_{out\ nom}$ with load capacity (I_{out}/A) * 300 µF 2)
Rising characteristics						
– Rise time		ms		60		$V_{in\ nom}$; 50 % $I_{out\ nom}$; Resistive load
– Overshoot				5)		
Ripple and noise		%		3		according to EN 61204; V_{ss} / 20 MHz bandwidth
Trim range		%	-30		+10	External voltage; adjustment by VC 3)
Overvoltage protection		V		1,2 V_{out}		The converter switches off. Restart after ca. 1,5 s.
Output current	I_{out}					
Nominal output current	$I_{out\ nom}$	A				1)
Overcurrent protection		A	1,08 $I_{out\ nom}$		1,15 $I_{out\ nom}$	The converter switches off. Restart after ca. 1,5 s
Output power	P_{out}					
Max. output power	$P_{out\ max}$	W			1)	
Derating						1)
Efficiency		%		1)		80 % $P_{out\ max}$; $V_{in\ nom}$
Overtemperature shutdown		°C	101	105	107	Case temperature The converter switches off. Restart after ca. 1,5 s
Parallel connection	I_{out}	A				Parallel connection is possible. More information on request.
Series connection						max. 2 converters

Thermal Protection TW (Thermal Warning)

Operating criteria (Transistor is conducting)	Overtemperature shutdown -5K Risk of overtemperature exists.
Output TW	Output with npn-transistor, emitter connected with S-; max. current 30 mA

MTBF

	1.000.000 h; T_{amb} 25 °C

Ambient Temperature Range

Operating	-40 to +85 °C
Storage/Transport	-40 to +105 °C

Isolation

Input/Output	1.500 V_{eff}
Input/Case	1.500 V_{eff}
Output/Case	500 V_{eff}

EMC

Product Standard	EN 61204-3:2000
Emission (conducted)	conducted emission acc. to EN 55022 7)
Immunity	
Elecrostatic discharge (ESD)	EN 61000-4-2, class B
Electric field	EN 61000-4-3, class B EN 61000-4-6, class B
Fast transient (Burst)	EN 61000-4-4, class B
Transient (Surge)	EN 61000-4-5, class B

Mechanical Stress

Shock	IEC 68-2-27
Continuous shock	IEC 68-2-29
Vibration	IEC 68-2-6

1) See table "Order Numbers and Specific Characteristics" (page 2).
2) It is recommended that an electrolytic capacitor (low ESR type required) is installed at the output (V_{out}+, V_{out}-), if the load itself does not have adequate capacity.
Recommended values V_{out} / Capacity: 3,3 V / 1000 µF; 5 V / 470 µF; 12 V, 15 V / 220 µF; 24 V / 100 µF
3) Use of V_{out}: higher V_{out} VC via resistor at S- lower V_{out} VC via resistor at S+
Restricted trim range at 3,3 V (-0% / +10%) and 5 V (-15% / +10%)
Use of an external voltage: higher V_{out} VC < 2,6 V with reference to S- lower V_{out} VC > 2,6 V with reference to S-
4) At 3,3 V and 5 V ±0,4 %
5) See ripple and noise
6) At 3,3 V and 5 V 8 %
7) See "Installation Instructions" (page 4)
8) At $V_{in\ nom}$ = 12/24 V and $V_{in\ nom}$ = 12V 20mA
9) At 3,3 V ±3% and 5 V ±2%

Special Features

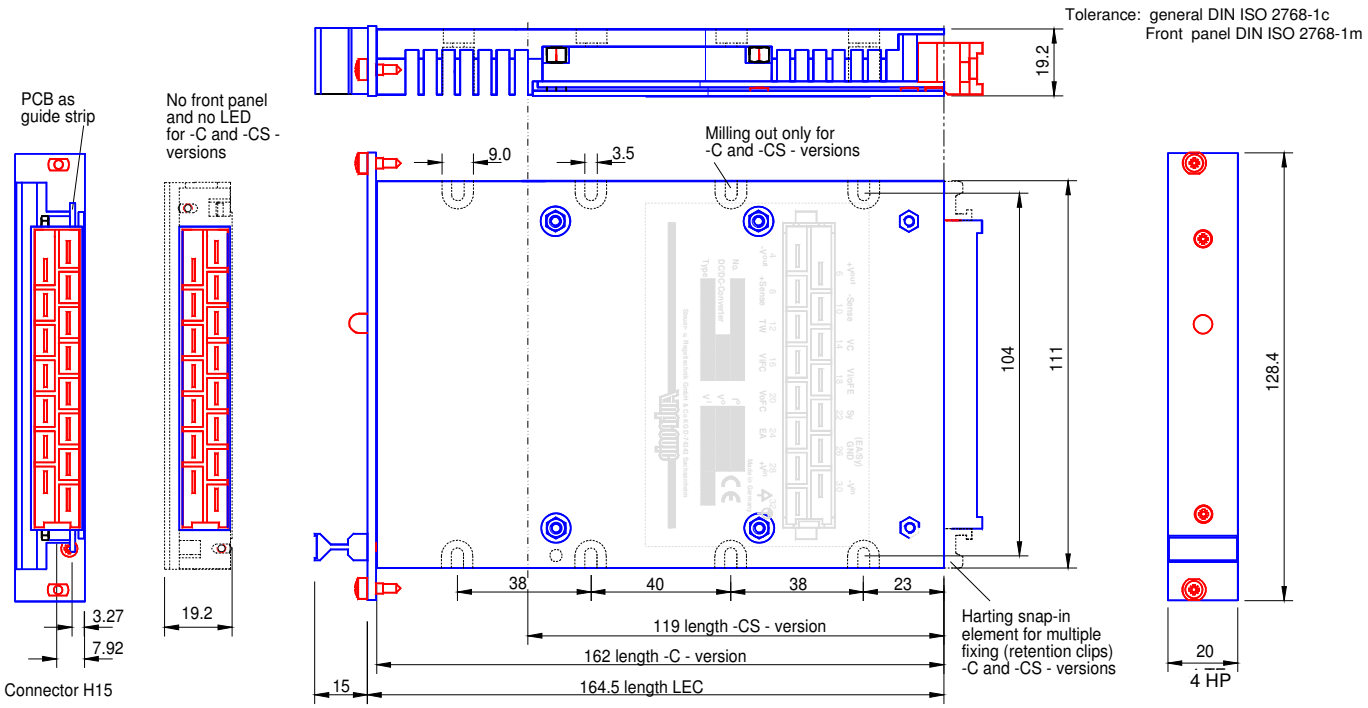
Input Monitoring ViF (Voltage in Fail), Output Monitoring (Voltage out Fail)

Operating criteria for "good"-Signal (Transistor is conducting). Input voltage over $V_{in\ min}$ and converter is switched on. Output voltage in the range of $V_{out\ nom}$ ±5 %

Output ViF, VoF	Isolated Optocoupler-Output with npn-Transistor		
Current	5 mA		
Pins	Collector ViFC, Colletor VoFC, Emitter Vi/oFE		
Isolation	ViF-Case: 1.500 V_{rms};	ViF-V_{in}: 1.500 V_{rms};	ViF- V_{out}: 500 V_{rms};
	VoF-Case: 1.500 V_{rms};	VoF-V_{out}: 500 V_{rms};	VoF-V_{in}: 1.500 V_{rms}

Additional Technical Data

Drawing (dimensions in mm)



Packaging

Standard Euro rack size 19" and chassis mounting

Class of protection

Class I	EN 60950

Degree of protection

IP20 (inserted in rack) IP10 (other Versions)	DIN 40050 (IEC 529)

Pollution degree

2	EN 60950

Weight

LEC ca. 565 g	-C - Version ca. 550 g	-CS - Version ca. 415 g

Installation Instructions

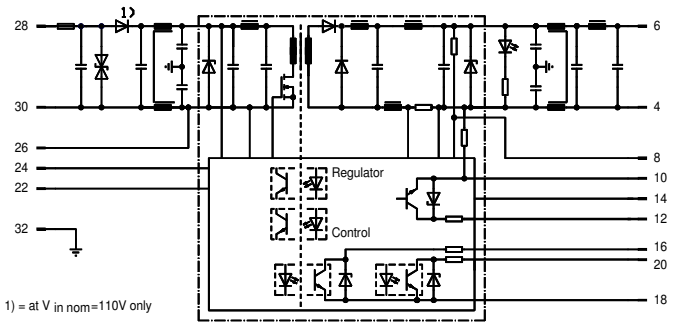
The converters have to be installed according to the guidelines curently in force, like other open electronic component assemblies. Plug in not under voltage if converter connected parallel or in series. Attention mus be paid to sufficient ventilation, carry off heat, fastening and protection against accidental contact.

Attention! At $P_{out\ max}$ (constantly) a warming up of the front plate up to 45°C over the ambient temperature is possible.

The pin 32, Case/PE: (⏚ / ⏚), has to be properly connected in order to assure operation.

In built-in condition our devices may show different EMC properties. Measures of improvement on request.

Block Diagram



Pin Allocation

4	V_{out}-	- Output Voltage
6	V_{out}+	+ Output Voltage
8	S+	Page 3[3]*
10	S-	**
12	TW	Thermal Warning
14	VC	Voltage Control
16	ViFC	Voltage in Fail
18	Vi/oFE	Voltage in/out Fail
20	VoFC	Voltage out Fail
22	Sy	Synchronization
24	En	Enable
26	GND (EA, Sy)	Ground (EA, Sy)
28	V_{in}+	+ Input Voltage
30	V_{in}-	- Input Voltage
32	⏚	Case

* Positive reference for VC
** Negative reference for VC