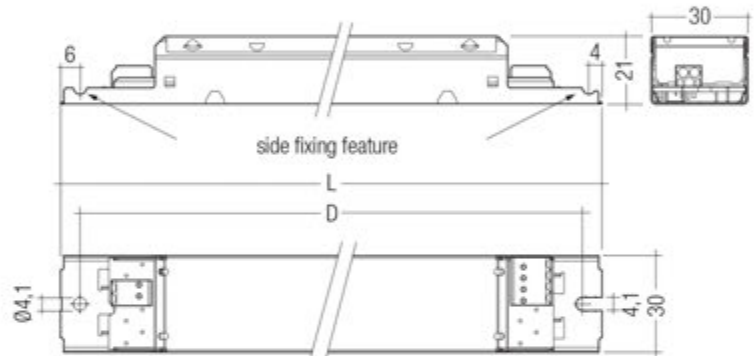




AES Ip, 14 – 54 W
T5 fluorescent lamps

Product description

- CELMA Energy Efficiency Index A2 BAT
- Nominal life up to 75,000 hours (at ta. 50 °C with a failure rate max. 0.15 % per 1,000 hours)
- Large temperature range (for values see table)
- Fixed frequency operation for constant lamp current
- Lamp preheating for min. 30,000 starts without replacement of lamps
- Constant luminous flux irrespective of fluctuations in mains voltage
- Designed for THD < 10 %
- For luminaires of protection class I and protection class II
- Automatic start after replacement of defective lamps (detects 1 lamp)
- Safety shutdown of defective lamps and at end of lamp life
- Push terminal for rapid automatic or manual wiring
- For emergency lighting systems as per EN 50172



Technical data

Mains voltage range	220 – 240 V
AC voltage range	198 – 264 V
DC voltage range	176 – 280 V (lamp start ≥ 198 V DC)
Mains frequency	0 / 50 / 60 Hz
Overvoltage protection	320 V AC, 1 h
Defined warm start	≤ 1.5 s
Operating frequency	≥ 40 kHz
Type of protection	IP20



Standards, page 3

Wiring diagrams and installation examples, page 6

Ordering data

Type	Article number	Packaging, carton	Packaging, pallet	Weight per piece
For luminaires with 1 lamp				
AES 1x14-35 Ip	28000144	10 pcs.	1,600 pcs.	0.165 kg
AES 1x54 Ip	28000146	10 pcs.	1,600 pcs.	0.165 kg
For luminaires with 2 lamps				
AES 2x14-28 Ip	28000145	10 pcs.	1,200 pcs.	0.245 kg
AES 2x54 Ip	28000147	10 pcs.	1,200 pcs.	0.245 kg

Specific technical data

Lamp wattage	Lamp type	Type	Article number	Length L	Hole spacing D	Lamp wattage	Circuit power	EEI	Current at 50 Hz		λ at 50 Hz		tc point	Ambient temperature ta	tc / ta for ≥ 50,000 h
									220 V	240 V	220 V	240 V			
For luminaires with 1 lamp															
1 x 14 W	T5	AES 1x14-35 lp	28000144	280 x 30 x 21 mm	270 mm	14.7 W	16.7 W	A2 BAT	0.075 A	0.069 A	0.97	0.95	60 °C	-20 ... 55 °C	55/50 °C
1 x 21 W	T5	AES 1x14-35 lp	28000144	280 x 30 x 21 mm	270 mm	20.6 W	22.4 W	A2 BAT	0.101 A	0.092 A	0.97	0.95	65 °C	-20 ... 55 °C	60/50 °C
1 x 28 W	T5	AES 1x14-35 lp	28000144	280 x 30 x 21 mm	270 mm	27.9 W	30.4 W	A2 BAT	0.137 A	0.123 A	0.98	0.96	65 °C	-20 ... 55 °C	60/50 °C
1 x 35 W	T5	AES 1x14-35 lp	28000144	280 x 30 x 21 mm	270 mm	35.5 W	37.8 W	A2 BAT	0.170 A	0.153 A	0.99	0.97	70 °C	-20 ... 55 °C	65/50 °C
1 x 54 W	T5	AES 1x54 lp	28000146	280 x 30 x 21 mm	270 mm	54.1 W	57.0 W	A2 BAT	0.254 A	0.230 A	0.98	0.96	75 °C	-20 ... 55 °C	70/50 °C
For luminaires with 2 lamps															
2 x 14 W	T5	AES 2x14-28 lp	28000145	360 x 30 x 21 mm	350 mm	29.4 W	32.2 W	A2 BAT	0.143 A	0.130 A	0.97	0.95	65 °C	-20 ... 55 °C	60/50 °C
2 x 21 W	T5	AES 2x14-28 lp	28000145	360 x 30 x 21 mm	350 mm	41.2 W	46.2 W	A2 BAT	0.204 A	0.186 A	0.97	0.95	65 °C	-20 ... 55 °C	60/50 °C
2 x 28 W	T5	AES 2x14-28 lp	28000145	360 x 30 x 21 mm	350 mm	55.8 W	60.2 W	A2 BAT	0.277 A	0.249 A	0.98	0.96	70 °C	-20 ... 55 °C	65/50 °C
2 x 54 W	T5	AES 2x54 lp	28000147	360 x 30 x 21 mm	350 mm	108.2 W	113.5 W	A2 BAT	0.518 A	0.465 A	0.99	0.97	80 °C	-20 ... 55 °C	75/50 °C

Standards

EN 55015
 EN 61347-2-3
 EN 60929
 EN 61000-3-2
 EN 61000-3-3
 EN 61547
 in accordance with EN 50172
 IEC 60068-2-64 Fh
 IEC 60068-2-29 Eb
 IEC 60068-2-30

Lamp starting characteristics

Warm start
 Starting time 1.5s with AC and DC operation
 Cathode heating will be reduced after preheat time

Lamp operation

Fix-frequent (equivalent to current controlled)

AC operation

Mains voltage:
 220–240 V 50/60 Hz
 198–264 V 50/60 Hz including safety
 tolerance ($\pm 10\%$)
 202–254 V 50/60 Hz including performance
 tolerance ($+6\% / -8\%$)

DC operation

220–240 V 0 Hz
 198–280 V 0 Hz certain lamp start
 176–280 V 0 Hz operating range
 Light output level in DC operation: 100 %

Emergency lighting

Use in emergency lighting installations according
 to EN 50172 or for emergency luminaires
 according to EN 61347-2-3 appendix J.

Instant start after mains interruption < 0.5 s
 Mains current for defective or missing lamps at
 DC operation < 5 mA

Mains currents in DC operation

Type	lamp type	wattage	mains current at	
			$U_k = 220V_{DC}$	$U_k = 240V_{DC}$
AES 1x14-35 lp	T5	1x14W	75 mA	69 mA
	T5	1x21W	101 mA	92 mA
	T5	1x28W	137 mA	123 mA
	T5	1x35W	170 mA	153 mA
AES 1x54 lp	T5	1x54W	254 mA	230 mA
	T5	2x14W	143 mA	130 mA
AES 2x14-28 lp	T5	2x21W	204 mA	186 mA
	T5	2x28W	277 mA	249 mA
AES 2x54 lp	T5	2x54W	518 mA	465 mA

Harmonic distortion in the mains supply

Type	lamp type	wattage	THD
			at 230V/50Hz
AES 1x14-35 lp	T5	1x14W	$< 15\%$
	T5	1x21W	$< 10\%$
	T5	1x28W	$< 10\%$
	T5	1x35W	$< 10\%$
AES 1x54 lp	T5	1x54W	$< 10\%$
	T5	2x14W	$< 15\%$
AES 2x14-28 lp	T5	2x21W	$< 10\%$
	T5	2x28W	$< 10\%$
AES 2x54 lp	T5	2x54W	$< 10\%$

Output voltage

Type	lamp type	wattage	U_{out}
AES 1x14-35 lp	T5	1x14W	430 V
	T5	1x21W	430 V
	T5	1x28W	430 V
	T5	1x35W	430 V
AES 1x54 lp	T5	1x54W	430 V
	T5	2x14W	430 V
AES 2x14-28 lp	T5	2x21W	430 V
	T5	2x28W	430 V
AES 2x54 lp	T5	2x54W	430 V

Ballast lumen factor (EN 60929 8.1)

Type	lamp type	wattage	AC/DC-BLF
			at $U = 198-254V, 25^\circ C$
AES 1x14-35 lp	T5	1x14W	1.05 ($\pm 5\%$)
	T5	1x21W	1.00 ($\pm 5\%$)
	T5	1x28W	1.00 ($\pm 5\%$)
	T5	1x35W	1.00 ($\pm 5\%$)
AES 1x54 lp	T5	1x54W	1.00 ($\pm 5\%$)
	T5	2x14W	1.05 ($\pm 5\%$)
AES 2x14-28 lp	T5	2x21W	1.05 ($\pm 5\%$)
	T5	2x28W	1.00 ($\pm 5\%$)
AES 2x54 lp	T5	2x54W	1.00 ($\pm 5\%$)

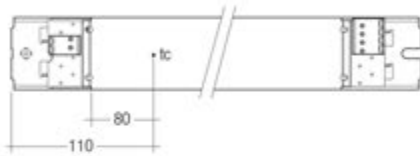
Energy class CELMA EEI = A2 BAT¹⁾

AES Ip optimises lamp start and ensures no energy is wasted. After the lamp has struck the filament heating is reduced automatically to a minimum value. This reduction in filament heating, saves energy, yet maintains the proper operating conditions for the lamp. The lamp is always operated within specification.

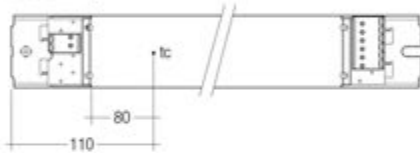
¹⁾ according to the EU directives on ecodesign requirements (EC) No. 245/2009 and (EC) No. 347/2010

Ambient temperature

AES 1x... Ip



AES 2x... Ip



The nominal t_a and t_c point are related to the ballast life duration.

The relation of t_c to t_a temperature depends also on the luminaire design. If the measured t_c temperature is approx. 5 K below t_c max., t_a temperature should be checked and eventually critical components (e.g. ELCAP) measured. Detailed information on request.

AES Ip is designed for an average service life of 75,000 hours (at t_a for $\geq 75,000$ h) under reference conditions and with a failure probability of less than 10 %. This corresponds to an average failure rate of 0.15 % for every 1,000 hours of operation.

Humidity: 5 % up to max. 85 %, not condensed (max. 56 days/year at 85 %)

Storage temperature: -40 °C up to max. +80 °C

The devices have to be within the specified temperature range (t_a) before they can be operated.

Expected lifetime

Type	Lamp type	Lamp power	t_a	40 °C	50 °C	55 °C	60 °C
AES 1x14-35 Ip	T5	1x14 W	t_c	45 °C	55 °C	60 °C	x
			Lifetime	100,000 h	75,000 h	75,000 h	x
		1x21 W	t_c	50 °C	60 °C	65 °C	x
			Lifetime	100,000 h	75,000 h	75,000 h	x
		1x28 W	t_c	50 °C	60 °C	65 °C	x
			Lifetime	100,000 h	75,000 h	75,000 h	x
1x35 W	t_c	55 °C	65 °C	70 °C	x		
	Lifetime	100,000 h	75,000 h	75,000 h	x		
AES 1x54 Ip	T5	1x54 W	t_c	60 °C	70 °C	75 °C	x
			Lifetime	100,000 h	60,000 h	40,000 h	x
AES 2x14-28 Ip	T5	2x14 W	t_c	50 °C	60 °C	65 °C	x
			Lifetime	100,000 h	75,000 h	75,000 h	x
		2x21 W	t_c	50 °C	60 °C	65 °C	x
			Lifetime	100,000 h	75,000 h	75,000 h	x
		2x28 W	t_c	55 °C	65 °C	70 °C	x
			Lifetime	100,000 h	75,000 h	50,000 h	x
AES 2x54 Ip	T5	2x54 W	t_c	70 °C	75 °C	80 °C	x
			Lifetime	75,000 h	50,000 h	35,000 h	x

x = not permitted

Maximum loading of automatic circuit breakers

Automatic circuit breaker type	C10	C13	C16	C20	B10	B13	B16	B20	Inrush current	
Installation Ø	1.5 mm ²	1.5 mm ²	1.5 mm ²	2.5 mm ²	1.5 mm ²	1.5 mm ²	1.5 mm ²	2.5 mm ²	I_{in}	Pulse
AES 1x14-35 Ip	32	44	50	64	16	22	25	32	13.0 A	211 µs
AES 1x54 Ip	28	40	44	58	14	20	22	29	18.0 A	171 µs
AES 2x14-28 Ip	18	24	28	34	9	12	14	17	21.3 A	225 µs
AES 2x54 Ip	14	16	24	28	7	8	12	14	37.7 A	182 µs

Wiring advice

The lead length is dependant on the capacitance of the cable.

For safety reasons, the AES Ip must only be earthed in the case of a safety class 1 luminaire.

Earthing is not required for the device to operate. Connection to earth reduces radio interference.

With standard solid wire 0.5/0.75 mm² the capacitance of the lead is 30–80 pF/m. This value is influenced by the way the wiring is made.

- keep lamp wires short
- lamp connection with multi-lamp ballasts should be made with symmetrical wiring
- lamp leads marked with * should be separated as much as possible from other lamp leads

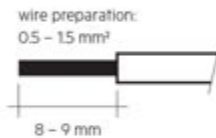
Ballast Type	Terminal	Maximum capacitance allowed			
		Cold	Hot	Cold	Hot
AES 1x... Ip		13, 14	15, 16	200 pF	100 pF
AES 2x... Ip		11, 12, 13, 14	15, 16	200 pF	100 pF

To avoid the damage of the control gear, the wiring must be protected against short circuits to earth (sharp edged metal parts, metal cable clips, louver, etc.)

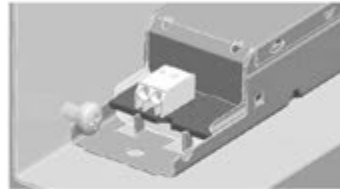
Installation instructions

Wiring type and cross section

Solid wire with a cross section of 0.5–1.5 mm². Strip 8–9 mm of insulation from the cables to ensure perfect operation of terminals.



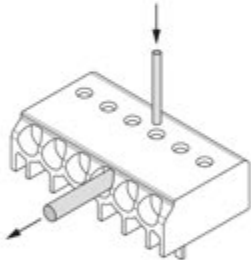
Side fixing feature



Screw M4, screw head diameter 8–10 mm

Release of the wiring

Loosen wire through twisting and pulling or using a Ø 1 mm release tool.



Defective lamp

If a lamp is defective, the ballast switches off and goes into standby. There is an automatic restart once the lamp has been changed.

T5 lamp information

	wattage	length
	14 W	549 mm
	21 W	849 mm
	28/54 W	1149 mm
	35 W	1449 mm

RFI

AES ballasts are RFI protected in accordance with EN 55015. To operate the luminaire correctly and to minimise RFI we recommend the following instructions:

- Connection to the lamps of the "hot leads" must be kept as short as possible (marked with *)
- Mains leads should be kept apart from lamp leads (ideally 5–10 cm distance)
- Do not run mains leads adjacent to the electronic ballast
- Twist the lamp leads
- Keep the distance of lamp leads from the metal work as large as possible
- Ballast must be earthed, either over the terminal or over the mounting screw of the ballast
- Mains wiring to be twisted when through wiring
- Keep the mains leads inside the luminaire as short as possible

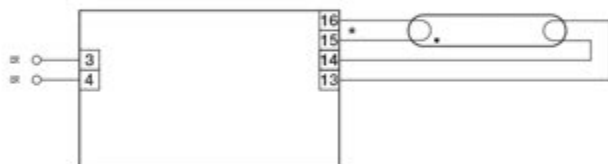
Isolation and electric strength testing of luminaires

Electronic devices can be damaged by high voltage. This has to be considered during the routine testing of the luminaires in production.

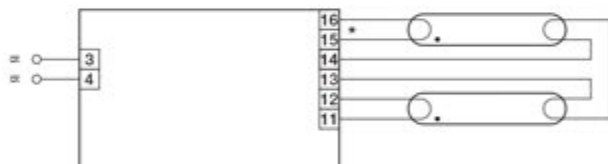
According to IEC 60598-1 Annex Q (informative only) or ENEC 303-Annex A, each luminaire should be submitted to an isolation test with 500 V_{DC} for 1 second. This test voltage should be connected between the interconnected phase and neutral terminals and the earth terminal.

The isolation resistance must be at least 2 MΩ.

As an alternative, IEC 60598-1 Annex Q describes a test of the electrical strength with 1500 V_{AC} (or 1.414 x 1500 V_{DC}). To avoid damage to the electronic devices this test must not be conducted.

Wiring diagrams

- * leads 15, 16 max. 1.0 m (< 100 pF)
- leads 13, 14 max. 2.0 m (< 200 pF)
- Protection class I – luminaires: earth of ballast housing required (according to IEC 508)
- Protection class II – luminaires: no earth required

AES 1x... lp

- * leads 15, 16 max. 1.0 m (< 100 pF)
- leads 11, 12, 13, 14 max. 2.0 m (< 200 pF)
- Protection class I – luminaires: earth of ballast housing required (according to IEC 508)
- Protection class II – luminaires: no earth required

AES 2x... lp