Technical information
Electronic ballasts

- Save up to 25% energy consumption
- Increase lifetime on light sources
- Flicker free light
- Rapid start
- Constant output during variable input voltage periods
- Deactivate old light source at end of lifetime
- Minimum of electromagnetic fields
- No stroboscopic effect
- Reduce luminaire weight

General:
Compared to the first HF, which was presented in the mid 80s with rather high prices, the current 5th. generation HF has an acceptable price level. Basically, customers buy HF luminaires to reduce the total operation costs. This will lower both power costs and number of lamp changes. The main beneficiary of HF luminaires however, is the user. Research indicates that HF light reduces tiredness and improves concentration. Some claim that installing a HF is the simplest and least expensive way to improve the internal environment. Glamox uses HF ballasts from European leading producers only. All our HF contains the latest features like warm-start and constant light output under variable input voltage. For areas where vibrations occur (engine room), Glamox do not recommend standard electronic ballasts.

Description of functions:
HF control gear consists of the following:
- A two-way filter first preventing irregularities on the mains to damage the HF and second to prevent disturbances from the ballast to the mains.
- A rectifier transforming from AC to DC power
- A high frequency generator transforming the DC to high frequency lamp current
- Logic control circuits to control correct lamp starting, deactivate light tubes, etc.

Compared to conventional control gear, the ballast itself controls the lamp starting. The cathodes are preheated to the correct temperature, for approx. 0,5-1,2 sec., before a starting pulse generates the recharge process. The high frequency lamp current creates a more efficient light tube. The thin fluorescent layer inside the light tube makes the light constant instead of fluctuating with the frequency of the mains. This again increases the light source's efficiency.

Flicker free
The conventional control gear fluctuates at the same frequency as the mains. This frequency (50 or 60Hz) could give some people both headache and concentration problems. Using a HF ballast operating with a frequency of approx. 40kHz results in a flicker free light tube.

Rapid start
Conventional control gear with a starter will continue restarting the light tube if it fails to start the first time. HF control gear results in a one time controlled start of the light tube.

Warm start
Using warm start, the cathodes are preheated before the actual starting process. This gives the emission materials, which emit electrons, less stress, resulting in a longer lifecycle of the light tube.

Constant light
Constant light means that the HF control gear gives a constant lamp current to the light tube independent of the system main voltage. This means that the light tube gives a constant light level in spite of irregularities on the network.

Deactivated tubes
A conventional control gear will try and try again to start a defect lamp resulting in a flickering light tube. The starter will, after a while, short circuit and leave the lamp in a glowing position. A drastic temperature rise in the ballast follows, which means there could be a fire risk. By using a HF ballast, lamps that can't be started will be automatically deactivated. Note: A two-lamp ballast will disconnect both tubes even if only one of them stops working.

Main Voltage
HF control gear operates at 230V +/- 10% and a frequency of 50-60Hz. Most HF ballasts also operate at DC power. For more details, please contact nearest Glamox office.

Leak current
The network in the HF always contains a capacitor connected between phase and ground. This results in a minor but constant leak current in the luminaires. Use 0,5mA leak-current per HF ballast when dimensioning the number of luminaires on an earth leakage circuit breaker.

Starting current
An electrolytic capacitor in the HF ballast creates the start pulse. It is very high, luckily it is very short, <0,4ms, and carries a lot of current, and the power in it will be kept to an acceptable level.

Operating frequency
The light tube's frequency for a HF varies in the range 30-42kHz. When using dimmable HF ballast, the frequency itself regulates the lamp current with the help of frequency modulator. The frequency will then vary from 45kHz (max light level) to 100kHz (min light level).

Stroboscopic effect
When light fluctuates at a certain frequency and mechanical parts rotate at a speed corresponding to the same frequency, an illusion present the moving parts as "staying still". This is called the stroboscopic effect. By using a HF ballast the frequencies are so different that the problem disappears.

EMC
EMC or Electromagnetic Compatibility refers to European standards regulating the level of electromagnetic pollution from the product to its surroundings (to mains or related areas via electromagnetic field) and the immunity of the product from electromagnetic disturbances from its surroundings. In general, a HF ballast creates less disturbances compared to conventional control gear, but is more sensitive to high voltage pulses, etc.

Lifetime
Increasing lifetime of the HF ballast has been a very high priority for manufacturers the past five years. Initially, the industry produced HF ballasts using low price components since price was the "bottle neck". The result was a short lifetime for some products. Today, the industry knows what type of components that are critical for the lifetime and choose according to that. Glamox uses HF ballasts from producers which have over time proven to produce high quality products. That is why we can claim a lifetime of 50.000 hrs on our luminaires with max. 10% drop out in the period. This requires that the luminaires must be installed in a surrounding temperature of max. 25°C (if no other indication). Temperature is the most critical parameter affecting the HF ballasts lifetime. Therefore we always consider the optimal temperature zone inside the luminaire for the HF ballast.

Technical information
Load table HF

With simultaneous connection of a large number of electronic ballasts, voltage can fall, which can cause individual luminaires not to start. In such circumstances we recommend that the luminaires are split into groups using a contactor that delays the starting point by 1 - 2 seconds.

Type	Watt	Lamp wattage	Ballast loss	Total wattage	Max no. of HF ballasts on 16 amp C fuse*	
		(W)	(W)	(W)	HF	HFDd
T5 HE	1x14	14	3	17	80	86
	2x14	28	4	32	80	84
	3x14	42	5	47	50	40
	4x14	56	5	61	50	40
	1x21	21	3	24	86	64
	2x21	42	4	46	80	42
	1x28	28	3	31	80	62
	2x28	56	4	60	30	32
	3x28	84	7	91	20	20
	1x35	35	4	39	80	62
	2x35	70	5	75	30	32
T5 HO	1x24	24	3	27	44	42
	2x24	48	4	52	44	42
	1x39	39	4	43	44	62
	2x39	78	5	83	30	32
	1x54	54	4	58	44	42
	2x54	108	5	113	24	30
	1x49	49	4	53	44	48
	2x49	98	5	103	30	26
	3x49	147	9	156	19	19
	1x80	80	5	85	30	30
	2x80	160	6	166	15	15
T8	1x18	16	3	19	74	46
	2x18	32	4	36	60	32
	3x18	48	5	53	80	32
	4x18	64	5	69	52	32
	1x36	32	4	36	60	60
	2x36	64	5	69	38	32
	1x58	50	4	54	60	42
	2x58	100	5	105	30	30
T5 Mini	1x8	8	3	11	80	
	2x8	16	4	20	80	
TC-SEL	1x9	8	3	11	80	
	2x9	16	4	20	80	
	1x11	10	3	13	80	86
	2x11	20	4	24	80	62
TC-L	1x18	16	3	19	80	44
	2x18	32	4	36	80	26
	1x24	22	3	25	80	66
	2x24	44	4	48	80	32
	1x36	32	4	36	80	62
	2x36	64	5	69	40	32
	1x40	40	4	44	80	62
	2x40	80	5	85	26	32
	1x55	55	4	59	40	42
	2x55	110	5	115	20	24
TC-DEL	1x10/13	9	3	12	80	86
	2x10/13	18	4	22	80	62
	1x18	16	3	19	80	70
	2x18	32	4	36	80	62
	1x26	23	3	26	80	62
	2x26	46	4	50	80	42
TC-TEL	1x32	32	4	36	80	42
	2x32	64	5	69	30	30
	1x42	42	4	46	80	42
	2x42	84	5	89	30	30

*Using a B type fuse the number should be divided by two.

Technical information
Load table F

The values for starting current are set in relation to automated fuses with C-characteristics. The number of luminaires on a 16Amp circuit with 16C fuses will then be: (16/Is) * 0.8. Factor 0.8 is used as the safety factor.

Load table light tubes, conventional ballast

Type	Lamp wattage (W)	Reactor loss (W)	Total wattage (W)	Ballast loss Low loss (W)	Tot. wattage Low loss (W)	Mains current (A)	Starting current Is (A)	Lamp current (A)
T8	15 18 30 / 2x15 36 / 2x18 58	10 11 11 12 13	25 29 41 48 71	6 7 7 8 9	21 25 37 44 67	0,12 0,13 0,18 0,22 / 0,2 0,32	0,15 0,16 0,23 0,28 0,40	0,31 0,37 0,36 / 0,35 0,43 / 0,4 0,67
TC-S	7 9 11	7 8 7	14 17 18	5 6 6	12 15 17	0,05 0,06 0,07	0,06 0,08 0,09	0,18 0,17 0,16
TC-L	18 24 36 / 2x18	11 11 12	29 35 48	7 7 8	25 31 44	0,13 0,14 0,22 / 0,2	0,16 0,18 0,28	0,37 0,35 0,43 / 0,4
TC-D	10 13 18 26	10 9 11 12	20 22 29 38	7 6 7 8	17 19 25 34	0,07 0,08 0,11 0,15	0,09 0,10 0,14 0,19	0,19 0,17 0,22 0,32
TC-T	18 26	11 12	29 38	7 8	25 34	0,11 0,15	0,14 0,19	0,22 0,32
TC-DD	10 16 28 38	9 10 11 12	19 26 39 50	6 6 7 8	16 22 35 46	0,07 0,1 0,15 0,23	0,09 0,13 0,19 0,29	0,18 0,2 0,32 0,43

Load table high intensity lamps

Type	Lamp wattage (PL) (W)	Ballast loss (Pb) (W)	Tot. wattage (Ptot) (W)	Mains current (Im) (A)	Starter current (Is) (A)	Lamp current (IL) (A)
Natrium HS	50 70 100 150 250 400 1000	14 15 16 22 33 43 96	64 85 116 172 283 443 1096	0,3 0,4 0,54 0,83 1,35 2,2 5,66	0,41 0,54 0,73 1,12 1,82 2,97 7,64	0,76 1 1,2 1,8 3 4,6 10,3
Metal halogen HI	35 70 150 250 400 1000 2000	13 15 22 30 33 51 80	48 85 172 280 433 1051 2080	0,22 0,43 0,8 1,3 1,9 5,1 6,0	0,30 0,58 1,08 1,76 2,57 6,9 8,1	0,53 1 1,8 3 3,5 8,9 10,3

The values for starting current are set in relation to automatic fuses with C characteristics. The number of luminaires on a 16 Amp circuit with 16C fuses is then: (16/Is) * 0.8. Factor 0.8 is used as the safety factor.