# **Standard Linear Types**

STANDARD SERIES



EXAMPLE: ORDERING INFORMATION Flashtube VC

Xenon X

Quartz envelope

Ref N° 6

Tube end E

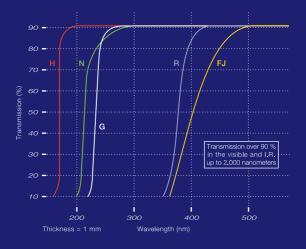
### DIFFERENT TYPES OF SILICA TUBING

R: Cerium doped silica. Even after extensive use there is pratically no violet coloured absorbtion center near 540 nanometers.

This silica filters pratically all the UV, no deterioration of doped glass rods or reflectors, no ozone formation, and has no damaging effect on the eyes.

Considerable conversion of UV into fluorescence centered at 435 nanometers: particularly recommended for pumping Yag crystals.

- N: Natural fused silica with little fluorescence (selection of quartz crystals). After long use, coloured centers appear near 540 nanometers. Robust material.
- **H**: Pure synthetic non-fluorescent silica. No appearance of absorption at 540 nanometers. This silica is mainly used for optical pumping of rubies and for distant UV flash sources.
- **G:** Titanium doped silica (germicidal) absorbing UVC. No ozone formation. Very rapid appearance of coloured absorbtion centers around 540 nanometers.
- FJ: Yellow filters stopping all UV, correcting filter for colour photography. Withstands more than 600°C in permanent use, in air. Coated on R silica. No immersion.





## **Standard Linear Flashtubes Shapes**





#### MC E2/3



#### ΡМ



#### RC E



#### SC M





#### PM



#### RC E



### **Standard Plugs**

### SC M





#### РМ

#### RC E2/3



### Calculation of maximum critical damping operation energy for linear flash-tubes as a function of their structure and environment.

(Mounting equivalent to that provided by "FLASH-LAMPS Verre & Quartz" W type tube ends, ceramic with silicone 0 rings on supporting plate, at ambient temperature of 20°C to 80°C).

### Maximum energy in joules = $\sqrt{T} \times t \times d \times A \times B$

T = total duration (1/3 peak) in  $\mu$ s.  $\ell$  (arc length) and

Coefficient A (strength of tube depending on envelope material used)

### silica thickness = 1 mm

A = 0,085 for N silica A = 0.084 for G and H silica A = 0.078 for R silica (A = 0.021 for borosilicate)

silica thickness = 0,5 mm

A = 0.051 for N silica

A = 0.05 for G and H silica

A = 0.047 for R silica

Coefficient B (strength of tube end environment).

#### Air with reflector:

Tube end E3 - WE3 - WDE3 : B = 1 Tube end E1 - E2 - M - WE2 - WDE2 - WE1 O.D. < 8,5 mm : B = 0,9 8,5 < O.D. < 11 mm : B = 0,70 O.D. > 11 : B = 0,45

Water in laser cavity with very tight coupling : Tube end E3 - WE3 - WDE3 : B = 0.45Tube end E1 - E2 - M - WE2 - WDE2 - WE1

O.D. < 11 mm : B = 0,44 O.D. > 11 mm : B = 0.39

#### MC E2/3





#### Calculation of parameters for obtaining flash duration with critical damping.

(rise time = decay time)

$$C = 10^2 \sqrt[3]{\frac{2E\alpha^4 t^2}{Ko^4}}$$
  $L = \frac{t^2}{C}$ 

$$Ko = \frac{Kc l}{d}$$

With: Kc = 1,225 for E3, WE3, WDE3 tube ends Kc = 1,279 for other tube ends

$$V = 10^3 \sqrt{\frac{2E}{C}}$$
.  $T = 3t$ 

T = total duration (1/3 peak) in μs. E in joules. V in volts. C in  $\mu$ F. L in  $\mu$ H.  $\hat{l}$  (arc length) and  $\hat{d}$ . in mm. Ko in  $\Omega$  A<sup>1/2</sup>

For different operating energies, modify parameters values as shown. (with \( \pi \) unchanged):

Parameters of previous calculation (same time)	E (j)	U (V)	C (µF)	L (µH)
Value of energy requiered	E'	U'=YxU	C'=YxC	$L' = \frac{L}{Y}$
$\left(Y = \sqrt{\frac{E'}{E}}\right)$				

Example: VQX R 1320 E3: 500μs

E = 1320 J U = 2441 V  $C = 443 \mu\text{F}$  $L = 63 \mu H$  $E' \! = \; 660 \; J \quad \quad U' \! = 1937 \; V \quad \quad C' \! = 352 \; \mu F$  $L = 79 \, \mu H$ 

Operation above calculated maximum energy can bring about fast deterioration of flashtubes (explosion). Maximum operating temperature for lamps not fitted with W type ends at 50% of recommended typical energy, in non-oxidizing atmosphere: 400°C.

Maximum operating temperature for continuous use in oxidizing atmosphere (dry air) for all types of tube end: 200°C.

### Note 1 .....

Operating parameters for obtaining a critical damping discharge for 500 µs, (at 1/3 peak light intensity), with recommended typical energy and standard tube ends.

Maximum operating frequency: 1 Hz in air, 2 Hz in water. For higher frequencies please see section : "Stroboscopic Xenon Flashtubes".

In water: use only demineralized, or preferably distilled water, at maximum temperature of 40°C.

a) GAS FILL (third letter of flashtube reference). Standard: XENON (X)

On request: KRYPTON (K) or ARGON (A) Pressure of pure gas in standard flashtubes varies, according to length, from 300 to 600 torr. Other

pressures on request. b) TUBE MATERIAL (fourth letter of flashtube refe-

rence). Standard: R

On request : N - H - G

c) OPTIONAL TUBE ENDS DEPENDING ON TUBE DIAMETER (last letter and figure of flashtube refe-

O.D. > 11 mm : E2 - E1 - E3 - M - WD WE3 - WDE3 - WDE2

WE1 (standard E3). O.D. < 11 mm : E2 - E1 - M - WE2 - WDE2 WE1 (standard E2)

d) OTHER TUBE DIAMETERS

Non standard, on request: I.D. from 7 mm to 19 mm. High voltage insulation flexible leads with specific lengths

- Ø 3mm ext : Temperatures -70°C +250°C, Insulation 22 kV

- Ø 6mm ext : Temperatures -70°C +250°C, Insulation 37 kV

Specifications are subject to change without notice

STANDA SERIES ORDERING													
	VQX R	63	65	6P3	7P3	7P4	85	88	8P4	815	820	1010	10P8
Т	ube end	E2	E2	E2	E2	E2	E2	E2	E2	E2	E2	E2	E2
d (I.D. ± 0,2 O.D. (Outer Diam			4 6		5 7			6 8			8 10		
<b> </b>	(mm)	30	50	76	76	101	50	80	101	150	200	100	203
∆ <b>(± 0,1)</b> ( <b>F</b> (mm	(mm) a)	3	3	3	3	3	3	3	3	3	3	3,5	3,5
C (± 0,1 r	nm)	7,7 8	7,7 8	7,7 8	7,7 8	7,7 8	8,7 9	8,7 9	8,7 9	8,7 9	8,7 9	10,2 11	10,2 11
Max.	Air	40	60	90	110	150	90	140	180	270	360	240	490
Average Power (W)	Forced Air	110	180	270	340	460	270	430	550	810	1080	720	1460
Note 2	Water Note 3	250	400	560	700	940	550	900	1120	1700	2200	1500	3000
M-11 0.0	Min.	400	450	600	600	700	450	600	700	850	1050	650	1100
Voltage (V)	Max.	1200	1350	1800	1800	2100	1350	1800	2100	2550	3150	1950	3300
Max. Peak Cu		500	500	500	800	800	1100	1100	1100	1100	1100	2000	1100
Trigger Volta Typical Trans	age (kV) sformer	15-22 TB2	15-22 TB2	15-22 TB2	15-22 TB2	15-22 TB2	16-22 TB2	16-22 TB2	16-22 TB2	18-22 TB2	18-22 TB2	17-22 TB2	18-22 TB2
Flash	<b>C</b> (µF)	575	342	225	327	247	667	421	335	224	173	548	274
Duration	<b>L</b> (µH)	48	81	123	85	113	42	66	83	124	161	51	101
500 μsec. 1/3 peak	<b>V</b> (Vdc)	527	871	1332	1236	1635	774	1213	1544	2274	3003	1376	2766
Note 1	<b>E</b> (J)	80	130	200	250	330	200	310	400	580	780	520	1050
		:					:						
STANDA	PD.												
STANDA SERIES ORDERING	RD Note 4 code												
SERIES ORDERING	Note 4	1310 E3	1315 E3	1320 E3	13P9 E3	13P15 E3	13P30 E3	1515 E3	1520 E3	15P12 E3	2015 E3	2020 E3	2030 E3
SERIES ORDERING	Note 4 CODE VQX R ube end			E3 1				:			:		
SERIES ORDERING T	Note 4 CODE  VQX R ube end  meter) (mm)			E3 1	E3 1			:	E3		:	E3	
SERIES ORDERING  T  d (I.D. ± 0,2 O.D. (Outer Diam  Arc length $\Delta (\pm 0,1) ($	Note 4 C 0 D E  VQX R  ube end  R mm) neter) (mm) (mm)	E3	E3	E3 1	E3 1 3	E3	E3	E3	13 15	E3	E3	17 20	E3
SERIES  0 R D E R I N G  T  d (I.D. ± 0.2  0.D. (Outer Dian	Note 4 C O D E  VQX R  ube end  meter) (mm)  (mm)  (mm)  (mm)	100 4 13,2	150 4 13,2	200 4 13,2	229 4 13,2	381 4 13,2	762 4 13,2	150 4 15,2	E3 13 15 200 4 15,2	305 4 15,2	150 4 15,2	200 4 15,2	300 4 15,2
SERIES ORDERING  T $d(l.D. \pm 0.2)$ O.D. (Outer Diam $Arc length$ $\Delta (\pm 0.1) (F (mm)$ $C (\pm 0.1) R$ Ø of hole in flashtube s	Note 4 C O D E  VQX R  ube end  meter) (mm)  (mm)  (mm)  (mm)	100 4	150 4	200 4	E3 1 3 229 4	<b>E3</b> 381 4	<b>E3</b> 762 4	<b>E3</b> 150	E3 13 15 200	305 4	<b>E3</b> 150	17 20 200 4	300 4
SERIES ORDERING  T  d (I.D. $\pm$ 0,2 0.D. (Outer Diam $ \Delta (\pm 0,1) (F (mm) $ C ( $\pm$ 0,1 r Ø of hole in flashtube s  Max.  Average	Note 4 CODE  VQX R ube end  Cmm) neter) (mm) (mm) (mm) supporting plate	100 4 13,2 14	150 4 13,2 14	200 4 13,2 14	229 4 13,2 14	381 4 13,2 14 1260	762 4 13,2 14	150 4 15,2 16 580	200 4 15,2 16	305 4 15,2 16	150 4 15,2 16	200 4 15,2 16	300 4 15,2 16 1530
SERIES ORDERING  T $d(I.D. \pm 0.2)$ O.D. (Outer Diam) $Arc$ length $\Delta (\pm 0.1)$ $F (mm)$ $C (\pm 0.1)$ $Ø$ of hole in flashtube $Max$ .	Note 4     C 0 D E  VQX R  ube end  R mm) neter) (mm)  (mm) (mm) supporting plate  Air  Forced Air  Water	100 4 13,2 14 330	150 4 13,2 14 500	200 4 13,2 14 660	229 4 13,2 14 760	381 4 13,2 14	762 4 13,2 14 2510	150 4 15,2 16 580 1750	200 4 15,2 16 780	305 4 15,2 16 1190	150 4 15,2 16 770	200 200 4 15,2 16 1020	300 4 15,2 16
SERIES ORDERING  I  d (I.D. ± 0,2 O.D. (Outer Diam  A (± 0,1) ( F (mm) C (± 0,1) r Ø of hole in flashtube s  Max. Average Power (W) Note 2	Note 4	100 4 13,2 14 330 990	150 4 13,2 14 500 1490	200 4 13,2 14 660 1980	229 4 13,2 14 760 2270	381 4 13,2 14 1260 3770	762 4 13,2 14 2510 7540	150 4 15,2 16 580 1750	200 4 15,2 16 780 2340	305 4 15,2 16 1190 3570	150 4 15,2 16 770 2300	200 4 15,2 16 1020 3060	300 4 15,2 16 1530 4590
SERIES  ORDERING  T  d (I.D. ± 0,2  O.D. (Outer Diam  Arc length  A (± 0,1) ( F (mm)  C (± 0,1 r Ø of hole in flashtube s  Max.  Average  Power (W)	Note 4 C O D E  VQX R ube end  Rmm) neter) (mm) (mm) (mm) supporting plate  Air Forced Air Water Note 3	100 4 13,2 14 330 990 2020	150 4 13,2 14 500 1490 3040	200 4 13,2 14 660 1980 4050	229 4 13,2 14 760 2270 4630	381 4 13,2 14 1260 3770 7710	762 4 13,2 14 2510 7540 15420	150 4 15,2 16 580 1750 3590	200 4 15,2 16 780 2340 4780	305 4 15,2 16 1190 3570 7300	150 4 15,2 16 770 2300 4700	200 4 15,2 16 1020 3060 6300	300 4 15,2 16 1530 4590 9400
d (l.D. ± 0,2 0.D. (Outer Diam  Arc length  ∆ (± 0,1) ( F (mm  C (± 0,1) r Ø of hole in flashtube s  Max. Average Power (W) Note 2  Voltage (V)  Max. Peak Cu	Note 4     C 0 D E  VQX R  ube end  R mm) neter) (mm)  (mm) (mm) supporting plate     Air  Forced Air     Water Note 3     Min.     Max.  urrent (A)	100 4 13,2 14 330 990 2020 650 1950 3000	150 4 13,2 14 500 1490 3040 850 2550 3000	200 4 13,2 14 660 1980 4050 1050 3150 3000	229 4 13,2 14 760 2270 4630 1200 3600 3000	381 4 13,2 14 1260 3770 7710 1800 5400 3000	762 4 13,2 14 2510 7540 15420 3300 9900 3000	150 4 15,2 16 580 1750 3590 850 2550 3000	200 4 15,2 16 780 2340 4780 1050 3150 3000	305 4 15,2 16 1190 3570 7300 1500 4500 3000	150 4 15,2 16 770 2300 4700 850 2550 3000	200 4 15,2 16 1020 3060 6300 1050 3150 3000	300 4 15,2 16 1530 4590 9400 1450 4350 3000
d (I.D. ± 0,2 O.D. (Outer Diam  Arc length  ∆ (± 0,1) ( F (mm)  C (± 0,1 r Ø of hole in flashtube s  Max. Average Power (W) Note 2  Voltage (V)	Note 4	100 4 13,2 14 330 990 2020 650 1950	150 4 13,2 14 500 1490 3040 850 2550	200 4 13,2 14 660 1980 4050 1050 3150	229 4 13,2 14 760 2270 4630 1200 3600	381 4 13,2 14 1260 3770 7710 1800 5400	762 4 13,2 14 2510 7540 15420 3300 9900	150 4 15,2 16 580 1750 3590 850 2550	200 4 15,2 16 780 2340 4780 1050 3150	305 4 15,2 16 1190 3570 7300 1500 4500	150 4 15,2 16 770 2300 4700 850 2550	200 200 4 15,2 16 1020 3060 6300 1050 3150	300 4 15,2 16 1530 4590 9400 1450 4350
SERIES ORDERING  I  d (I.D. ± 0,2 O.D. (Outer Diam  A (± 0,1) ( F (mm) C (± 0,1) r Ø of hole in flashtube s  Max. Average Power (W) Note 2  Voltage (V)  Max. Peak Cu Trigger Volta Typical Trans	Note 4	100 4 13,2 14 330 990 2020 650 1950 3000 20-22	150 4 13,2 14 500 1490 3040 850 2550 3000 19-22	200 4 13,2 14 660 1980 4050 1050 3150 3000 20-25	229 4 13,2 14 760 2270 4630 1200 3600 3000 20-22	381 4 13,2 14 1260 3770 7710 1800 5400 3000 25-30	762 4 13,2 14 2510 7540 15420 3300 9900 3000 25-30	150 4 15,2 16 580 1750 3590 850 2550 3000 20-25	200 4 15,2 16 780 2340 4780 1050 3150 3000 20-25	305 4 15,2 16 1190 3570 7300 1500 4500 3000 25-30	150 4 15,2 16 770 2300 4700 850 2550 3000 23-30	200 4 15,2 16 1020 3060 6300 1050 3150 3000 23-30	300 4 15,2 16 1530 4590 9400 1450 4350 3000 25-30
SERIES ORDERING  I  d (I.D. ± 0,2 O.D. (Outer Plan	Note 4	100 4 13,2 14 330 990 2020 650 1950 3000 20-22 TB2	150 4 13,2 14 500 1490 3040 850 2550 3000 19-22 TB2	200 4 13,2 14 660 1980 4050 1050 3150 3000 20-25 TB4	229 4 13,2 14 760 2270 4630 1200 3600 3000 20-22 TB4	381 4 13,2 14 1260 3770 7710 1800 5400 3000 25-30 TB4	762 4 13,2 14 2510 7540 15420 3300 9900 3000 25-30 TB4	150 4 15,2 16 580 1750 3590 850 2550 3000 20-25 TB4	200 4 15,2 16 780 2340 4780 1050 3150 3000 20-25 TB4	305 4 15,2 16 1190 3570 7300 1500 4500 3000 25-30 TB4	150 4 15,2 16 770 2300 4700 850 2550 3000 23-30 TB4	200 4 15,2 16 1020 3060 6300 1050 3150 3000 23-30 TB4	300 4 15,2 16 1530 4590 9400 1450 4350 3000 25-30 TB4
SERIES ORDERING  I  d (I.D. ± 0,2 O.D. (Outer Diam  A (± 0,1) ( F (mm) C (± 0,1) r Ø of hole in flashtube s  Max. Average Power (W) Note 2  Voltage (V)  Max. Peak Cu Trigger Volta Typical Trans  Flash	Note 4	100 4 13,2 14 330 990 2020 650 1950 3000 20-22 TB2 1060	150 4 13,2 14 500 1490 3040 850 2550 3000 19-22 TB2 712	200 4 13,2 14 660 1980 4050 1050 3150 3000 20-25 TB4 538	229 4 13,2 14 760 2270 4630 1200 3600 3000 20-22 TB4 470	381 4 13,2 14 1260 3770 7710 1800 5400 3000 25-30 TB4 286	762 4 13,2 14 2510 7540 15420 3300 9900 3000 25-30 TB4 148	150 4 15,2 16 580 1750 3590 850 2550 3000 20-25 TB4 941	200 4 15,2 16 780 2340 4780 1050 3150 3000 20-25 TB4 711	305 4 15,2 16 1190 3570 7300 1500 4500 3000 25-30 TB4 471	150 4 15,2 16 770 2300 4700 850 2550 3000 23-30 TB4 1372	200 4 15,2 16 1020 3060 6300 1050 3150 3000 23-30 TB4 1037	300 4 15,2 16 1530 4590 9400 1450 4350 3000 25-30 TB4 697