NARVA

Information for the practician

High-pressure mercury-vapour lamps

NAVIFLUX®

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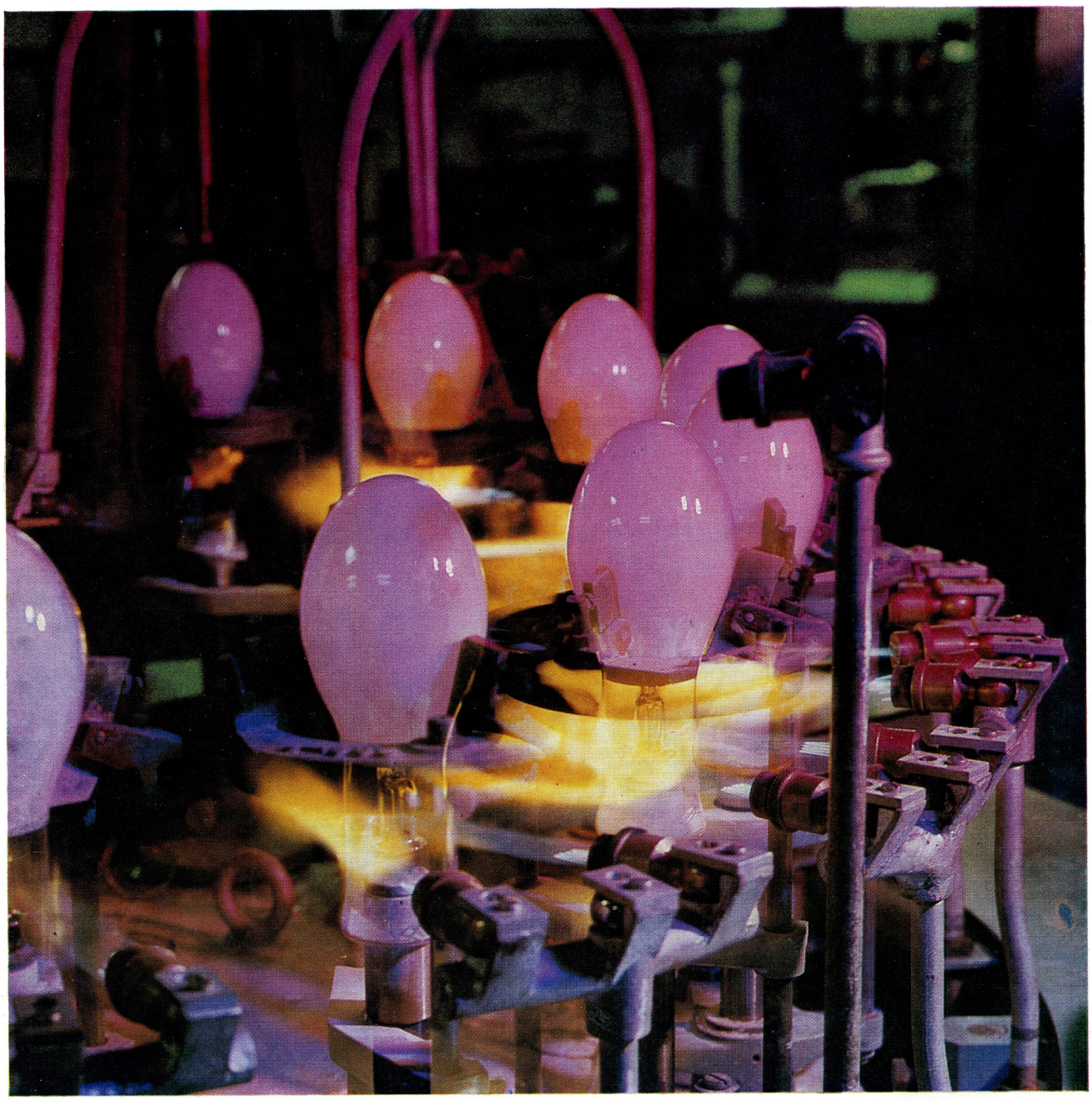
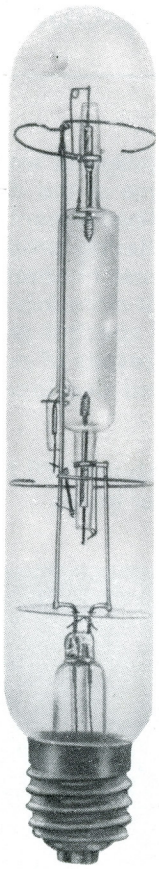
High-pressure mercury-vapour lamps have been employed in general lighting for some decades. A systematic development work led to a constant improvement of the parameters of these lamps. Thus the values of life and luminous efficiency could be improved continuously. Considerable progress was obtained in the course of the different stages of development in the colour rendering properties, too, due to the use of novel luminescent materials with favourable spectral properties. Just these results of purposeful research and development work secured a wide field of application in indoor and outdoor lighting to this kind of lamps, service-proved for years. Not least this wideness of application was also achieved by the high number of available units of luminous flux.

Fig. 1: Modern production equipments in Kombinat VEB NARVA provide for a uniformly high quality of high-pressure mercury-vapour lamps



The years of experience with the development and manufacture of high-pressure mercury-vapour lamps existing in Kombinat VEB NARVA also led to modern production equipment, by means of which an extensive assortment of these lamps with relatively high values of luminous efficiency and favourable spectrum is manufactured now.



High-pressure mercury-vapour lamp from the production about 1950.

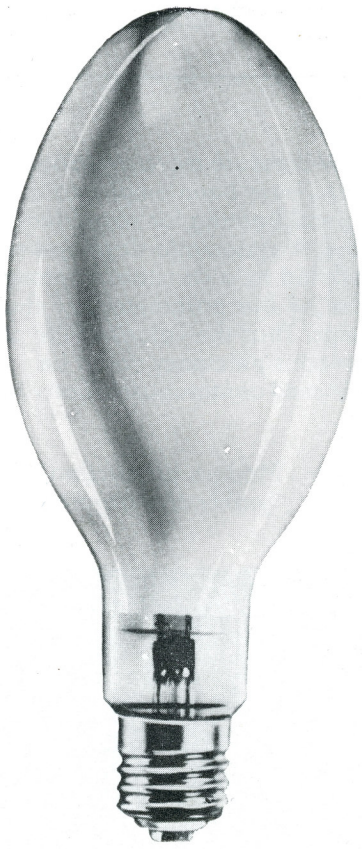


Fig. 2:
High-pressure mercury-vapour lamp 400 W from the modern large-batch production in Kombinat VEB NARVA

What are high-pressure mercury-vapour lamps?

High-pressure mercury-vapour lamps belong to the group of high-pressure discharge lamps. The light is generated by an electric gas discharge in a mercury vapour under high pressure. The spectrum of light is line-shaped, and is – in the visible range – essentially determined by the characteristic mercury lines 404/407, 436, 546 and 577/579. In addition, it also contains a number of lines in the UV range.

Construction and operating principle of high-pressure mercury-vapour lamps

The chief constituents of a high-pressure mercury-vapour lamp are discharge tube (burner) and the outer bulb. The discharge tube consists of quartz glass and has two main electrodes and ignition electrodes poled oppositely. The discharge tube contains a precisely dosed quantity of mercury and a filling of argon to facilitate ignition. The discharge tube is mounted in a rack, by way of which voltage is supplied to the main

electrodes and the ignition electrodes at the same time. The outer bulb enclosing the rack with the discharge tube is designed as clear glass bulb or as bulb with a coating of luminescent material, according to lamp type, and ensures constant service conditions. It is constructed in the thermally favourable ellipsoidal shape, and consists of hard glass, highly resistant to thermal shocks. With part of the high-pressure mercury-vapour lamps with reflector, the hard glass outer bulb is of mushroom shape. The inside of the outer bulb carries a coat of luminescent material, which is excited by the UV radiation of the burner, and emits visible radiation. With lamps with reflector, the mirror coating is applied on the inside of the outer bulb, in addition to the coating of luminescent material. The outer bulb of the high-pressure mercury-vapour lamp is provided with a filling gas to avoid losses due to thermal convection and corrosion phenomena. According to type of lamp, screw caps E 27 or E 40 are used, which are provided with a nickel coating against corrosion. As with all discharge lamps, a ballast unit is required for operation of high-pressure mercury-vapour lamps, which serves for current limitation. The luminous efficiency of high-pressure mercury-vapour lamps reaches values up to 60 lm/W.

Supplied power 100 %			
Convection and thermal conduction 18,5 %	Heat radiation 51,7 %	visual radiation 14,8 %	Infrared radiation 15 %

Fig: 3:
Energy balance of a high-pressure mercury-vapour lamp 400 W

Designation of high-pressure mercury-vapour lamps

High-pressure mercury-vapour lamps from NARVA bear the registered trade-name NAVIFLUX®. From this trade-name NAVIFLUX the letter coding NF for high-pressure mercury-vapour lamps from NARVA is derived. This letter coding is completed by figures placed after it for characterizing the lamp, which represent statements of rated wattage, bulb shape and design version. The composition of the coding is shown in fig. 4 and in table 1.

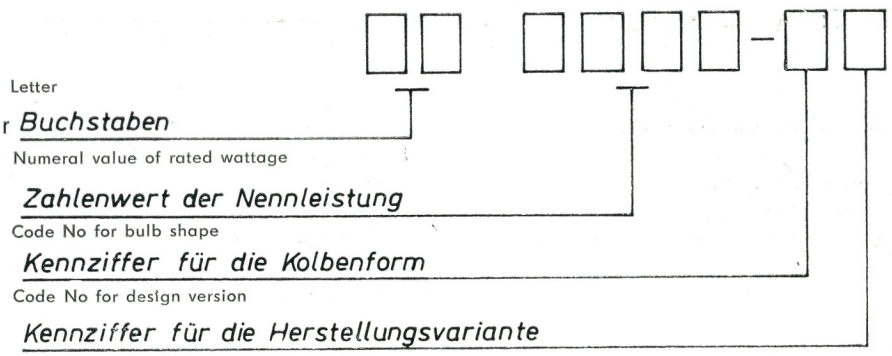


Fig. 4:
Composition of coding

Table 1:
Assignment of figures for bulb shape and design version

1st code number (bulb shape)	2nd code number (design version)
0 ellipsoid shape	0 without luminescent material (clear glass bulb)
2 ellipsoid shape with reflector	1 with luminescent material
3 ellipsoid shape with dome	
5 mushroom shape with reflector	

Examples of designation:
NF 250–01
High-pressure mercury-vapour lamp 250 W with ellipsoidal bulb and luminescent material

NF 125–21
High-pressure mercury-vapour lamp with ellipsoidal bulb, internal reflector and luminescent material

Colour properties (light colour and colour rendering)

The spectrum of high-pressure mercury-vapour discharge comprises very strong lines in the yellow and green colour ranges and somewhat weaker ones in the blue and violet colour ranges. Above the wavelength 580 nm, i. e. in the orange-red colour range, there is no radiation. There are also portions of radiation in the UV range. These fractions of radiation in the UV range are invisible and are used for exciting the luminescent material applied on to the inside of the outer bulb. It converts the UV radiation into predominant radiation in the orange-red colour range. As luminescent material, yttrium-vanadate is employed. This radiaton generated additionally in the visible range corrects the typically blue-white light of the high-pressure mercury-vapour discharge to neutral-white light.

Fig. 5:
Relative spectral radiant density distribution of a high-pressure mercury-vapour lamp without luminescent material

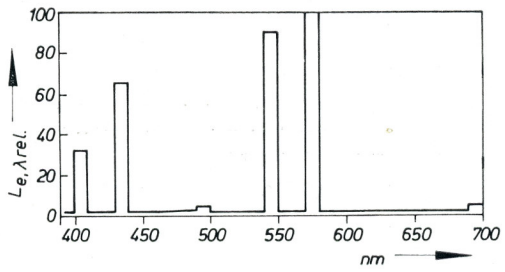
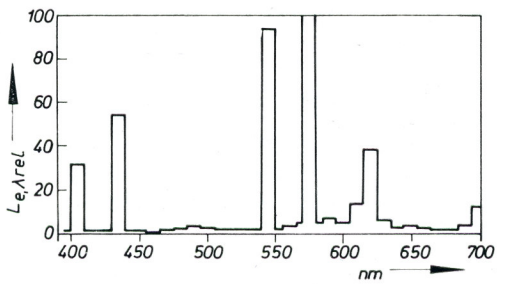


Fig. 6:
Relative spectral radiant density distribution of a high-pressure mercury-vapour lamp with luminescent material yttrium-vanadate



At present, a wide assortment is available at wattages from 50–2,000 W with the corresponding luminous flux units from 1,900–120,000 lm.
The chief field of application of these lamps is outdoor lighting, of that, street lighting having the largest quota.
In this field of application, lamps of wattages from 80 to 250 W are preferably employed. For the great number of applications in indoor lighting in the field of industry, lamps of wattages from 250–1,000 W are used above all.

High-pressure mercury-vapour lamps with reflector and luminescent material are manufactured in the wattage range from 80–400 W.
These lamps are equipped with a highly effective internal reflector, which imparts a preferred direction to the light.
They are especially suited for such lighting installations where strong dust action and contamination prevail.
The loss of light due to dust deposition on the bulb in the course of the operating time is low.
High-pressure mercury-vapour lamps with reflector and luminescent material thus perform part of the duties of light fittings, therefore a fitting may here only provide for the functions of current supply, protection and mount. According to design, a mushroom-shaped bulb (type series NF . . . –51) or an ellipsoidal bulb (NF . . . –21) is employed.
A survey of the assortment is contained in table 2.

Table 2:
Delivery programme of NARVA high-pressure mercury-vapour lamps

High-pressure mercury-vapour lamps without luminescent material (clear glass bulb)	NF 80—00 NF 125—00 NF 250—00 NF 400—00 NF 700—00 NF 1000—00
High-pressure mercury-vapour lamps with luminescent material	NF 50—01 NF 80—01 NF 125—01 NF 250—01 NF 400—01 NF 700—01 NF 1000—01 NF 2000—31
High-pressure mercury-vapour lamps with luminescent material and internal reflector	
ellipsoidal bulb	NF 80—21 NF 125—21 NF 250—21
mushroom-shaped bulb	NF 250—51 NF 400—51

Lamp data
The main parameters of the high-pressure mercury-vapour lamps are compiled in tables 3–5.

Table 3
Dimensions of NARVA high-pressure mercury-vapour lamps

Note:
Type series NF 2000-31, 250-51 and 400-51 for replacement only
Type series NF 700-00 and NF 1000-00 on inquiry

Lamp type	Bulb shape Bulb design	Diameter d mm	Length l mm	Controidal distance of light LSA mm	Cap	Fig.
NF 80–00	ellipsoid shape	70	165	105 ± 5		
NF 125–00	clear glass bulb	75	175	115 ± 5	E 27/30	7
NF 250–00		91	227	145 ± 5		
NF 400–00		121	283	184 ± 5	E 40/45	
NF 700–00		152	339	215 ± 5		
NF 1000–00		162	355	225 ± 10		
NF 50–01	ellipsoid shape	55	130			
NF 80–01	luminescent	70	165		E 27/30	
NF 125–01	material	75	175			
NF 250–01	coating	91	227			7
NF 400–01		121	283		E 40/45	
NF 700–01		152	339			
NF 1000–01		162	355			
NF 2000–31		182	430		E 40/65 x 47	8
NF 80–21	ellipsoid shape with reflector and luminescent material	75	175			
NF 125–21		75	175		E 27/30	9
NF 250–21		121	283		E 40/45	
NF 250–51	mushroom shape with reflector and luminescent material	165	267		E 40/45	
NF 400–51		180	305			10

Table 4
Electrical data of NARVA high-pressure mercury-vapour lamps

Lamp type	Power input w/o ballast W	Power input w. ballast W	Mains voltage [1] V	Lamp voltage V	Lamp current A	Starting current A
NF 50–01	50	60	220	95 ± 10	0.61	appr. 0.9
NF 80–00 NF 80–01 NF 80–21	80	90	220	115 ± 15	0.80	appr. 1.3
NF 125–00 NF 125–01 NF 125–21	125	133	220	125 ± 15	1.15	appr. 1.7
NF 250–00 NF 250–01 NF 250–21 NF 250–51	250	263	220	130 ± 15	2.13	appr. 3.3
NF 400–00 NF 400–01 NF 400–51	400	426	220	135 ± 15	3.25	appr. 5.0
NF 700–00 NF 700–01	700	740	220	140 ± 15	5.40	appr. 8.0
NF 1000–00 NF 1000–01	1000	1055	220	145 ± 15	7.50	appr. 12.0
NF 2000–01	2000	2080	380	270 ± 25	8.00	appr. 13.0

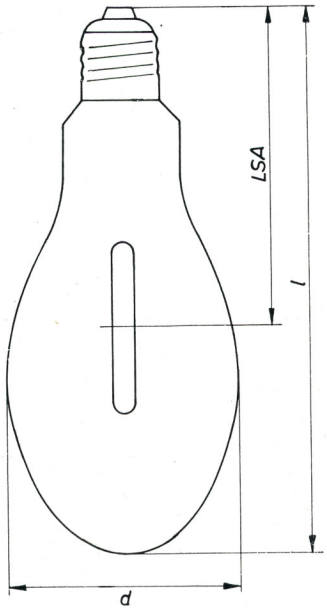


Fig. 7:
Dimensioned drawing of high-pressure mercury-vapour lamps
Ellipsoid shape 50 to 1,000 W

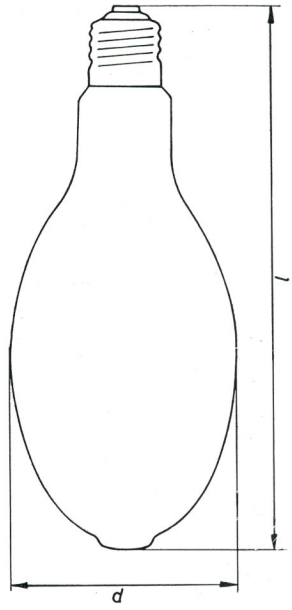


Fig. 8:
Dimensioned drawing of hig-pressure mercury-vapour lamps
Ellipsoid shape 2,000 W

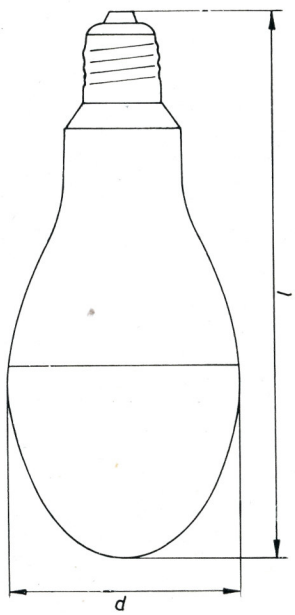


Fig. 9:
Dimensioned drawing of high-pressure mercury-vapour lamps
Ellipsoid shape with reflector and luminescent material

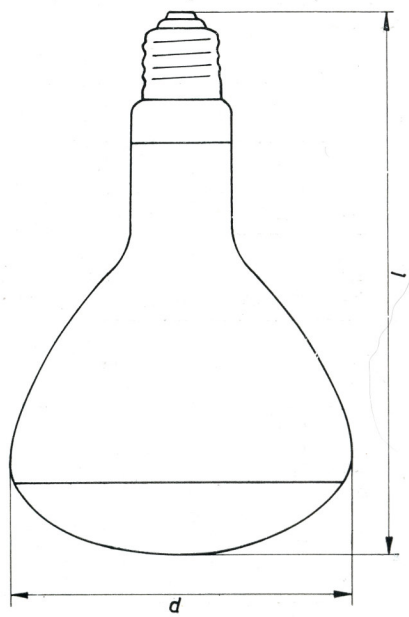


Fig. 10:
Dimensioned drawing of high-pressure mercury-vapour lamps
Mushroom shape with reflector and luminescent material

Table 5
Lighting data of high-pressure mercury-vapour lamps

Lamp type	Luminous flux	Luminous efficiency w/o ballast lm/W	Red portion of radiation [1] %	Life h
NF 50—01	1900	38.0	10	5000
NF 80—00	3000	37.5	—	12000
NF 80—01	3400	42.5	10	12000
NF 80—21	2850	35.6	8	6000
NF 125—00	5250	42.0	—	12000
NF 125—01	6000	48.0	10	12000
NF 125—21	4000	40.0	8	6000
NF 250—00	11500	46.0	—	12000
NF 250—01	13000	52.0	10	12000
NF 250—21	11000	44.0	8	7000
NF 250—51	11500	46.0	8	7000
NF 400—00	20500	51.3	—	12000
NF 400—01	13000	57.5	10	12000
NF 400—51	20000	50.0	8	7000
NF 700—00	37000	52.9	—	10000
NF 700—01	42000	60.0	10	10000
NF 1000—00	52000	52.0	—	6000
NF 1000—01	57000	57.0	10	3000
NF 2000—31	120000	60.0	8	3000

In figs. 10 and 11, the light intensity distribution characteristics of high-pressure mercury-vapour lamps with internal reflector and luminescent material are represented.

[1]) Luminous flux in range 600 to 780 nm in proportion to total luminous flux

Fig. 11:
Light intensity distribution of a high-pressure mercury-vapour lamp NF 250-51 and NF 400-51 related to 1,000 lm

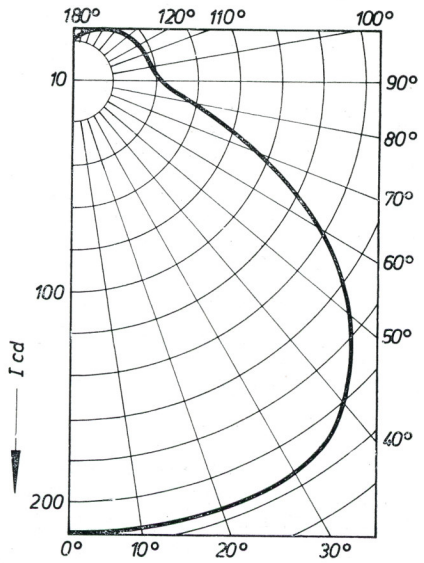
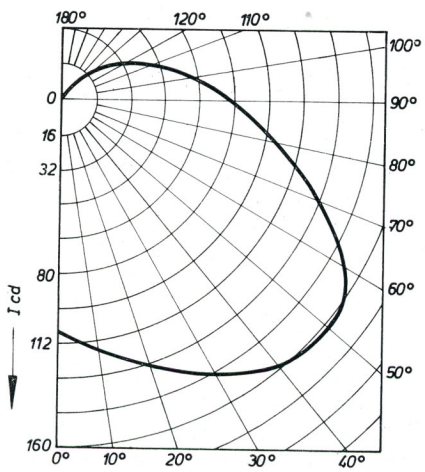


Fig. 12:
Light intensity distribution of a high-pressure mercury-vapour lamp NF 125-21, related to 1,000 lm



Circuit arrangement of high-pressure mercury-vapour lamps

High-pressure mercury-vapour lamps are started by using a ballast, which has to correspond to the electrical data of the lamp.
The ballast undertakes the limitation of the current in the starting phase and the stabilization of the lamp current in operating condition.
High-pressure mercury-vapour lamps ignite at mains voltage directly.
Special ignition devices are not required.
Ballasts for high-pressure mercury-vapour lamps are coordinated in their electrical data internationally so that the lamps can be employed without difficulties everywhere.

Table 6 gives a survey on the data of ballasts and their assignment to the corresponding lamp types.

Table 6:
Data of ballasts for high-pressure mercury-vapour lamps, upright design, degree of protection IP 00

Ballast type [1]	Rated wattage of lamp W	Lamp current A	Max. short-circuit current I_{K110} [3] A	Leakage power W	Weight kg
VHQD 50	50	0.61	1.28	10	1.4
VHQD 80	80	0.8	1.68	10	1.6
VHQD 80/125	80/125	0.8/1.15	1.68/2.42	10/13	1.3
VHQD 125	125	1.15	2.42	13	2.0
VHQD 250	250	2.15	4.52	18	3.9
VHQD 400	400	3.25	6.83	26	5.8
VHQD 700	700	5.40	11.9	40	8.0
VHQD 1000	1000	7.50	16.5	55	10.0
1/2 VHQD 2000 [2]	2000	8.00	17.6	80	10.0

[1]) The type designations refer to ballasts of VEB NARVA Elektrobau Oschatz, DDR – 726 Oschatz

[2]) The ballast is composed of two sub-devices

[3]) Short-circuit current at 100 % mains voltage

For the separate individual arrangement of ballasts, enclosed ballasts in degree of protection IP 54 are available. The assortment comprises unbalanced devices for high-pressure mercury-vapour lamps 80–1000 W and balanced devices for lamps 80–400 W (Manufacturers: VEB Schiffsarmaturen- und Leuchtenbau Finow, DDR – 1302 Eberswalde – Finow). Enclosed ballasts are employed where fittings without built-in ballasts are used (e. g. floodlight fittings, enamel narrow angle light fittings).
The circuit arrangement of NARVA high-pressure mercury-vapour lamps can be learned from the following diagrams.

Fig. 13:
Ballast for high-pressure mercury-vapour lamps, upright design, degree of protection IP 00

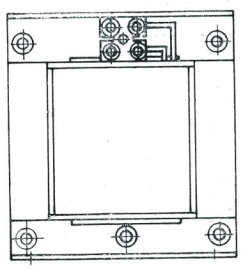
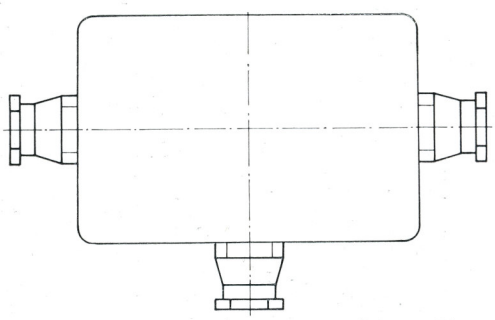


Fig. 14:
Enclosed ballast for high-pressure mercury-vapour lamps, degree of protection IP 54



If ballast and lamp are arranged separately, the distance between lamp and ballast should not exceed 80–100 m.
In any case, the wire cross sections are to be selected such as to keep voltage losses as low as possible.
High-pressure mercury-vapour lamps cause an inductive idle current. The power factor cos φ of a high-pressure mercury-vapour lamp, unbalanced and operated at an inductive ballast is in the range from 0.5–0.6.
For the improvement of cos φ, corresponding capacitors are connected in parallel to the mains. The capacitance value of the capacitor is determined by the lamp wattage P_L and by the desired value of power factor cos φ.

Fig. 17 shows the schematic circuit diagram of such an arrangement.

Fig. 15:
Circuit diagram of high-pressure mercury-vapour lamps 50 – 1000 W
1 – ballast
2 – lamp

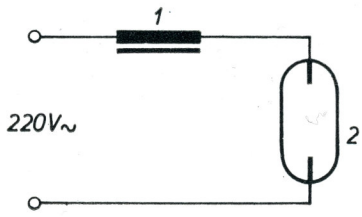


Fig. 16:
Circuit diagram of a high-pressure mercury-vapour lamp 2000 W
1 – ballast
2 – lamp

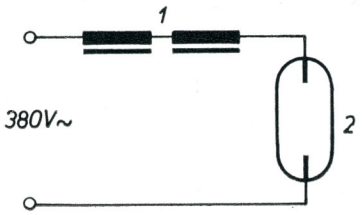
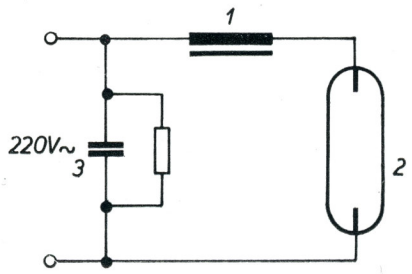


Fig. 17:
Schematic circuit diagram for individual compensation with high-pressure mercury-vapour lamps
1 – ballast
2 – lamp
3 – compensating capacitor with discharging resistor



For the individual compensation of high-pressure mercury-vapour lamps, the statements on the capacitance for the respective mains voltage, contained in table 7, are applicable, i. e. 220 V for the high-pressure mercury-vapour lamp up to 1,000 W, or 380 V for the high-pressure mercury-vapour lamp 2,000 W, respectively.
With the stated capacitance values, a power factor cos φ of approx. 0.9–0.95 occurs. If a capacitor in the corresponding capacitance is not available, the required capacitance value can also be formed by using several capacitors whose added capacitance has to correspond to the scheduled value.

The capacitors are then to be connected in parallel.
Several high-pressure mercury-vapour lamps of an installation can also be jointly compensated by a group capacitor whose capacitance has to be identical with the sum of the capacitors required for individual compensation.
Lamp group and compensating capacitor have to be switched on and off simultaneously.
Central compensation is possible, too. Here the inductive idle power of the complete installation is compensated by means of a capacitor whose capacitance value is rated accordingly, or by connection and disconnection of elements of a battery of capacitors in connection with a power-factor meter.

Table 7
Statements on reactive current compensation with high-pressure mercury-vapour lamps

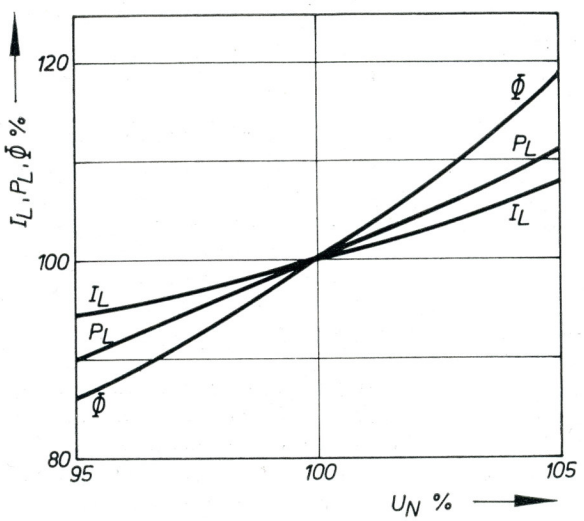
Lamp type	Power factor cos φ	Compensating capacitor μ F/V	Apparent power VA	Lamp current A	Mains current with compensated ballast A
NF 50—01	0.45	7/220	134.2	0.61	ca. 0.30
NF 80—00 NF 80—01 NF 80—21	0.51	8/220	176.0	0.80	ca. 0.43
NF 125—00 NF 125—01 NF 125—21	0.54	10/220	253.0	1.15	ca. 0.68
NF 250—00 NF 250—01 NF 250—21 NF 250—51	0 57	18/220	468.6	2.13	ca. 1.32
NF 400—00 NF 400—01 NF 400—51	0.59	25/220	726	3.25	ca. 2.12
NF 700—00 NF 700—01	0.62	40/220	1188	5.40	ca. 3.64
NF 1000—00 NF 1000—01	0.64	50/220	1650	7.50	ca. 5.22
NF 2000—31	0.68	30/380	3040	8.00	ca. 5.91

Operational behaviour of high-pressure mercury-vapour lamps

Tolerance of mains voltage

In the interest of achieving optimal working conditions of high-pressure mercury-vapour lamps, the mains voltage is always to be 220 V, or 380 V with the lamp 2,000 W, respectively. Mains voltage variations have a bearing on the data of the lamps. They may not be large, however, as with filament lamps. With high-pressure mercury-vapour lamps, the permissible tolerance of the mains voltage is limited to a value of ± 10 %, for the sake of the life of lamp and ballast, however, it ought not to exceed ± 5 %. The influence of mains voltage variations on some parameters of high-pressure mercury-vapour is shown in fig. 18.

Fig. 18:
Luminous flux Φ, lamp current I_L and lamp wattage P_L as a function of mains voltage U_N

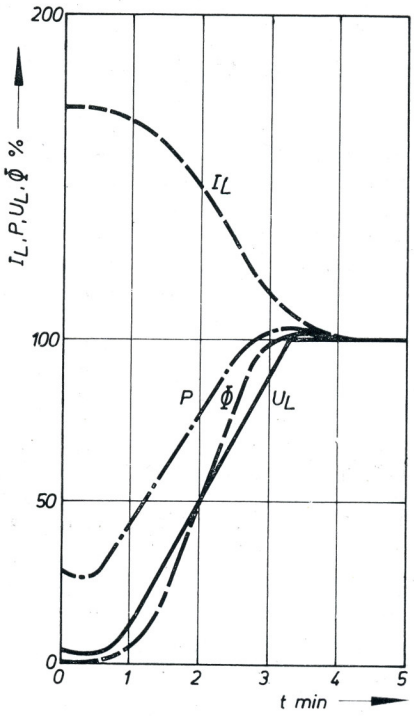


In case of strong voltage drops, the lamp may extinguish. This voltage is termed extinction voltage. It essentially depends on lamp type and operating position. In general, the extinction voltage of high-pressure mercury-vapour lamps is at approx. 185 V. It has also to be considered that a short-time interruption of the mains voltage results in lamp failure already if the mains voltage is interrupted for longer than 10 ms.

Starting time

High-pressure mercury-vapour lamps reach their full luminous flux only some minutes after ignition. At mains voltage, this starting process takes about 4 – 5 min, at undervoltage it takes longer, however. During the starting period, lamp voltage, power input and luminous flux rise whereas the starting current is reduced to lamp current.

Fig 19:
Starting process of high-pressure mercury-vapour lamps
Lamp current I_L, luminous flux Φ, lamp voltage U_L and time t



Reignition time

After disconnection of the lamp or after voltage interruption, an immediate reignition of the high-pressure mercury-vapour lamps is not possible, as the vapour pressure in the discharge tube is too high whereby the ignition voltage is far above mains voltage. When the pressure has sufficiently decreased by condensation of the mercury, the lamp ignites again. In practice, the reignition is at about 4 – 5 min.

Operating position

The operating position of high-pressure mercury-vapour lamps is optional so that a universal employment is rendered possible. The stated value of luminous flux applies to the vertical operating position of the lamps. Service of the lamps in horizontal operating position results in a reduction of the luminous flux by approx. 3 %.

Cold ignition

High-pressure mercury-vapour lamps will ignite safely even at low ambient temperatures. Ignition in the low temperature range is, however, dependent on the height of the mains voltage applied. At a temperature of – 20°C, the mains voltage may not be below 209 V for the types 50 – 10,000 W,or below 360 V for the lamp 2,000 W, respectively. At a temperature of –15°C, the corresponding values for the respective lamps are at 200 or 340 V, respectively.

Temperature independence of luminous flux

The temperature independence of the luminous flux is to be regarded as one of the most important advantages, i. e. the practically occurring ambient temperatures exert next to no influence on the luminous flux. By means of the outer bulb, constant operating conditions are created.

Operation of high-pressure mercury-vapour lamps with damaged outer bulb

The outer bulb of high-pressure mercury-vapour lamps has to fulfil not only service and protective functions for the lamp, but it also represents a protection against intensive ultraviolet radiation and from live parts. From these explanations on the function of the outer bulb follows that it is most inexpedient and also dangerous to operate lamps with damaged outer bulb. In such a case, no protection against touching live parts of the lamp is provided. It may also be referred to the ultraviolet radiation, especially to the fraction of short wave radiation with its harmful effect on the eye.

Lighting installations with high-pressure mercury-vapour lamps

High-pressure mercury-vapour lamps can be employed in the field of indoor lighting from a light point distance of approx. 4 m upwards. The wide lamp assortment with a good graduation of wattage and luminous flux units meets a great number of requirements ranging e. g. from the illumination of plain storage-halls without conveying systems to the lighting of rooms exposed to explosion hazard. Due to the demands on colour rendering, the designs of high-pressure mercury-vapour lamps coated with luminescent material are used exclusively. In indoor lighting, the wattages of 250, 400 and 1,000 W prevail, in connection with wide or narrow-angle light fittings. High-pressure mercury-vapour lamps with reflector are employed, too, the range of light point height being between 5 and 8 m here.
By continuous further development, high-pressure mercury-vapour lamps have secured a firm place in indoor lighting. A high degree of reliability, very high life values and a favourable behaviour of lighting parameters during their lives are superior features of this kind of lamps. Due to the behaviour of high-pressure mercury-vapour lamps at mains voltage interruptions it is necessary to install a certain number of filament lamps or luminescent lamps to provide for a stop-gap up to reignition.
The chief field of application of high-pressure mercury-lamps is outdoor lighting. They have been successfully employed for years for the illumination of open grounds, industrial areas, building sites, factory roads, wharfages and sluices. A wide space is occupied by high-pressure mercury-vapour lamps for the lighting of rail trackages, too. In connection with special trackage fittings, a glarefree illumination of marshalling yards is rendered possible with railway systems.
Within the large complex of outdoor lighting, street lighting takes an important part. Here the great number of advantages of high-pressure mercury-vapour lamps, like e. g. temperature independence of luminous flux, secure ignition at low temperatures, high concentration of luminous flux per lamp, and a well coordinated assortment, take full effect.
As chief types in street lighting, High-pressure mercury-vapour lamps of 80, 125 and 250 W are worth mentioning, out of which the types 80 and 125 W prevail. This is essentially due to the fact that the number of residential streets, by-streets and installations in smaller towns and villages predominate, and there the relatively low demands on light intensity do not require any high luminous flux units. High-pressure mercury-vapour lamps are not employed for traffic lighting only, but also for floodlighting or effective illumination of historic buildings and monuments, greens and parks, as well as for the lighting of traffic signs.
High-pressure mercury-vapour lamps will be used for street lighting in future, too. This applies to the low-wattage types of 80 and 125 W, in particular.

Light fittings for high-pressure mercury-vapour lamps

For the employment of high-pressure mercury-vapour lamps, a number of fittings was designed, which comply with many lighting duties. For indoor lighting, narrow or wide-angle fittings are employed according to light point height and lighting quality. With part of the fittings, the holder is adjustable, which enables the compliance with various lighting requirements. Such light fittings can be employed for high-pressure mercury-vapour lamps 250 – 1,000 W.

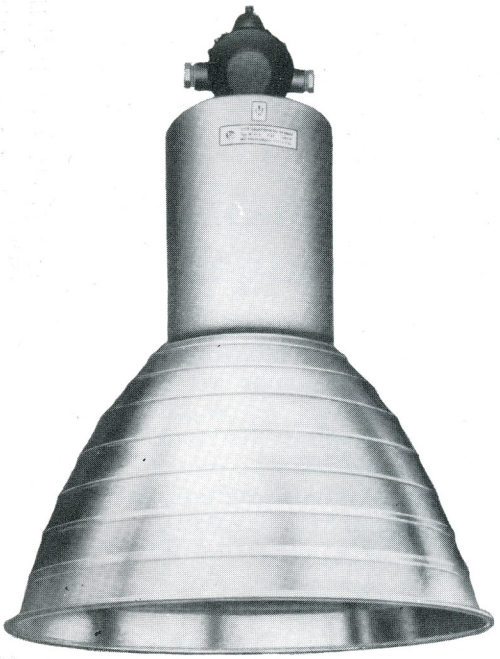


Fig. 20:
Hall floodlights for high-pressure mercury-vapour lamps 250 – 1,000 W
VEB NARVA Leuchtenbau Leipzig

Fig. 21:
Twin-floodlights for high-pressure mercury-vapour lamps 250 – 1,000 W
VEB NARVA Leuchtenbau Leipzig

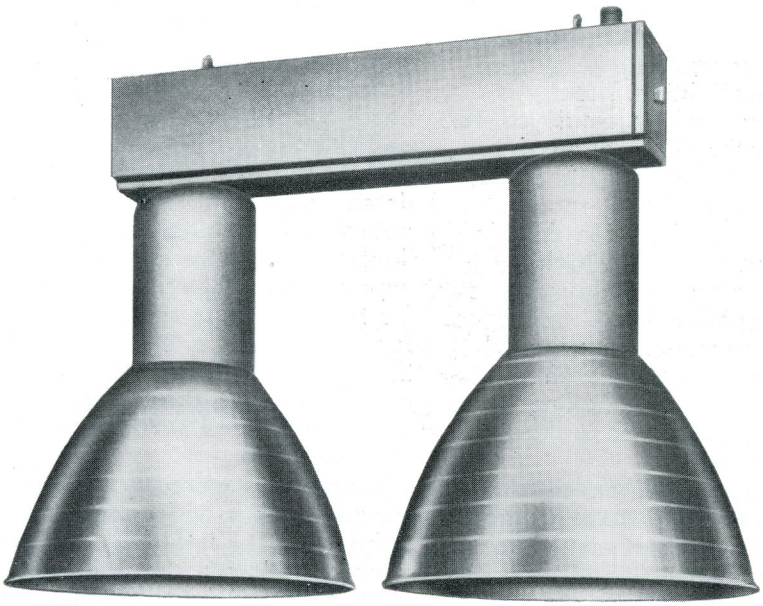


Fig. 22:
Enamel narrow-angle fittings for high-pressure mercury-vapour lamps up to 400 W
VEB Leuchtenbau Döbeln

For the lighting of outdoor sites in industry, narrow-angle floodlights are employed predominantly, with wattage types of 250 and 400 W prevailing. Floodlights have a holder adjustment, too, so that the light intensity can be adapted to the respective lighting duty. For a great number of lighting duties in outdoor lighting, street-light fittings are employed, too, if similar lighting requirements as in street lighting are to be met, and the geometry of the installation corresponds to the data of street lighting.

Fig. 23:
Floodlights for high-pressure mercury-vapour lamps 250 – 1,000 W
VEB NARVA Leuchtenbau Leipzig

Fig. 24:
Railway trackage fitting for high-pressure mercury-vapour lamps 250 – 1,000 W
VEB Feinwerktechnik Leipzig

In the field of street lighting, mast arm fittings and mast top fittings are preferably employed. Mast arm fittings have a corresponding mirror of good surface finish and special construction, by means of which a good luminous density distribution on the roadway is obtained. Fittings of this kind are preferably employed for lighting main streets. Mast top fittings are chiefly met with in residential and by-streets. They provide for sufficient roadway illumination and create due to their light distribution – a good illumination of the whole

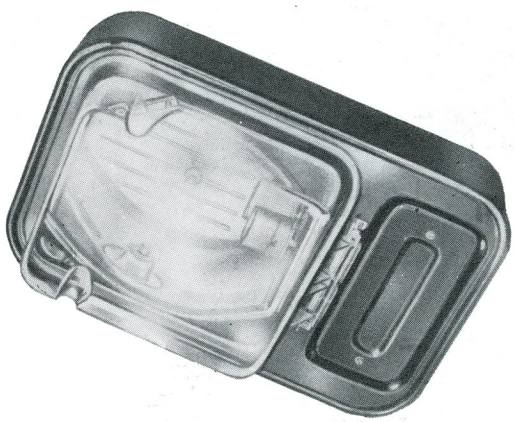


Fig. 25:
Mast arm light fitting for high-pressure mercury-vapour lamps 400 W (KLBL)
VEB NARVA Leuchtenbau Leipzig

street area. For pedestrian areas or pedestrian zones special fittings are employed, which are ball shaped in many cases. They are designed as full globes or two hemispheres with central mount. These light fittings are chiefly fitted with smaller wattage types.

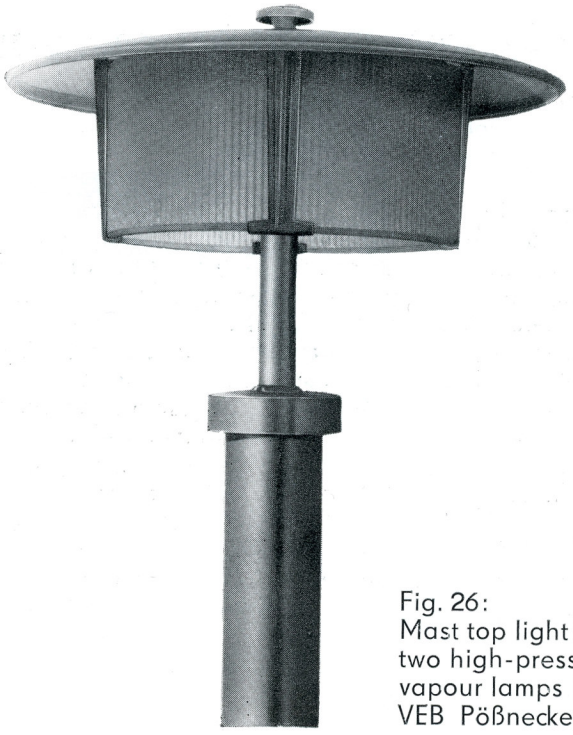


Fig. 26:
Mast top light fitting for two high-pressure mercury-vapour lamps 125 W
VEB Pößnecker Außenleuchten

For the lighting of streets in suburban areas and in rural communities, simple street light fittings are used, too, which are fitted with high-pressure mercury-vapour lamps with reflector of 80 or 125 W. With these fittings, the light-directing function is performed by the lamp with its reflector.

Fig. 27:
Pedestrian zone light fitting for high-pressure mercury-vapour lamps 80 W
VEB Pößnecker Außenleuchten

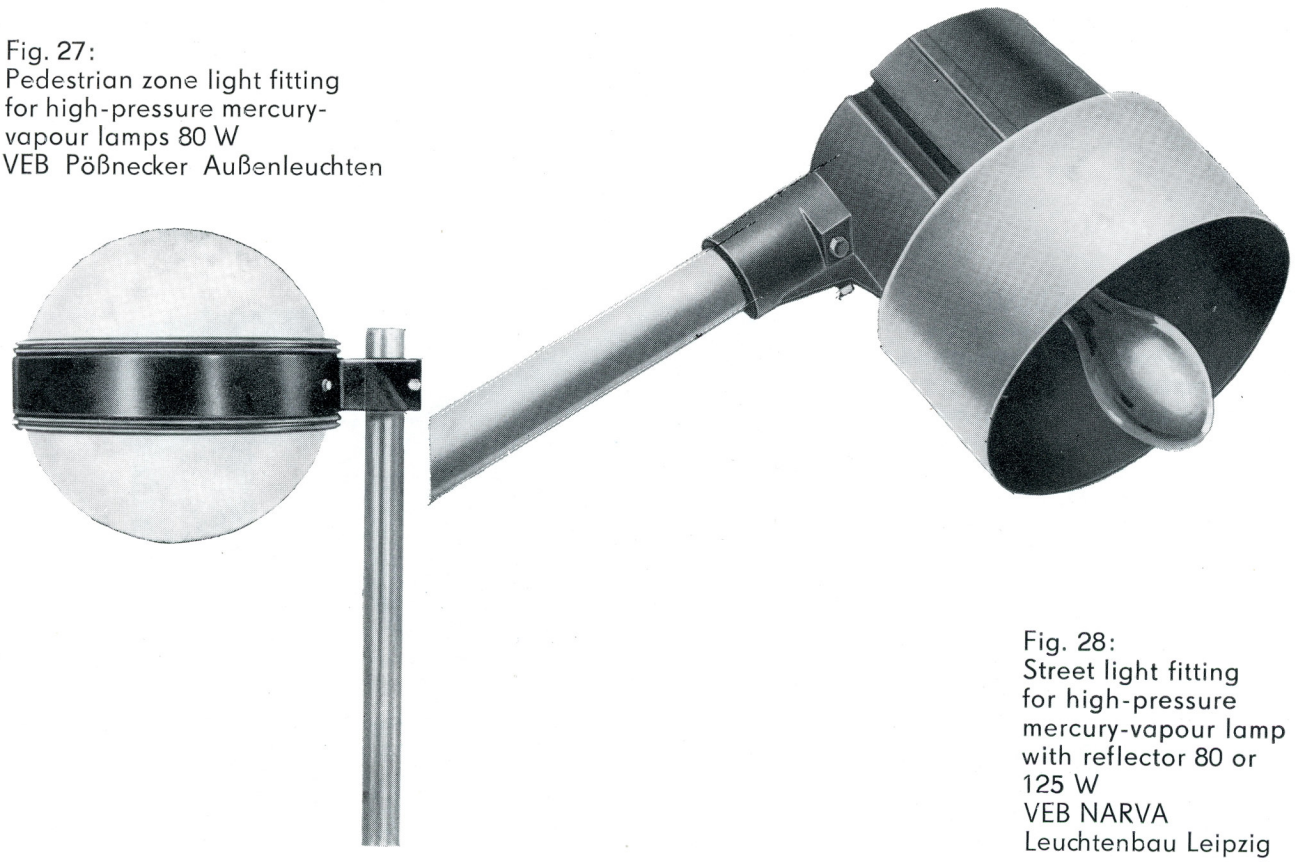


Fig. 28:
Street light fitting for high-pressure mercury-vapour lamp with reflector 80 or 125 W
VEB NARVA
Leuchtenbau Leipzig

Projecting of lighting installations with high-pressure mercury-vapour lamps

For the projection of lighting installations, the corresponding regulations and standards are binding planning documents. According to case of application, the corresponding calculating methods are applied. With indoor lighting, calculation is both on the method of efficiency and on the method of luminous intensity. In outdoor lighting, where floodlight fittings are employed, calculation is on the method of luminous intensity. In street lighting, the lighting of main roads is calculated on luminous density or intensity of illumination. With residential and by-roads, streets in suburban areas, i. e. wherever no special requirements are made on traffic, the calculation is performed on the method of luminous intensity, mostly by application of efficiency characteristics for the medium horizontal luminous intensity for corresponding light fittings or on the method of assigning certain luminous flux units and fitting types with regard to light point height and mast spacing. The latter method is based on calculations, following from certain values for mast spacing, light point height, light distribution of the fitting, medium horizontal luminous intensity and uniformity of luminous intensity. The lamp type to be employed results from the required value for luminous flux per light point.

Examples for lighting with high-pressure mercury-vapour lamps

City motorways and express motor roads require good, stationary street lighting to secure easy flow of traffic in the hours of the night. The city motorway Rostock-Warnemünde is provided with directional lanes, separated by a strip of green in the middle. The overall width of the roadway is 24 m. Two-lamp shielded mast arm fittings were employed with high-pressure mercury-vapour lamps NF 250–01. The fittings are mounted on concrete masts, the light point height is 12.5 m. The masts are arranged on both sides facing one another, mast spacing is 45 m. As medium luminous intensity a value of 13.5 lx was projected at a uniformity g_1 of 1 : 2. The use of a light surfacing secures – in connection with luminous intensity and its uniformity – good conditions of visibility.

Lighting of city motorway Rostock-Warnemünde (fig. 29)

Motorways in urban areas are graded in accordance with traffic occupancy as far as lighting is concerned. The light fittings, are arranged as a function of road width, built-up conditions and other factors.
If a central strip exists for taking up idle traffic or plantations, the fittings will mostly be arranged on both sides due to the overall width.
The selected example represents a lighting solution for a motorway with directional lanes. Two-lamp shielded mast arm fittings were employed with high-pressure mercury-vapour lamps NF 250–01. The light point height was selected at 9.5 m, mast spacing at 27 m. The medium luminous intensity amounts to 16 lx, the uniformity is 1 : 2.8.

Lighting of a secondary motorway in Berlin-Pankow (fig. 30)

Examples for lighting with high-pressure mercury-vapour lamps

When creating pedestrian areas, the illumination is to be regarded in its intensified architectural effect. Fittings and their light action have therefore to be selected from architectural points of view.
The newly created boulevard in Halle with an overall length of 790 m is equipped with 285 light points. Ball-shaped light fittings as reversing brackets on steel masts were used.
Apart from individual arrangement of ball-shaped fittings, multiple arrangements were selected, too, which offer interesting design posign possibilities. The light point height with multipble arrangements is 3.5 m. As lamps, high-pressure mercury-vapour lamps NF 80–01 and NF 125–01 were employed. The medium horizontal luminous intensity is 6 lx.

Lighting of the pedestrian area in Halle/Saale (fig. 31)

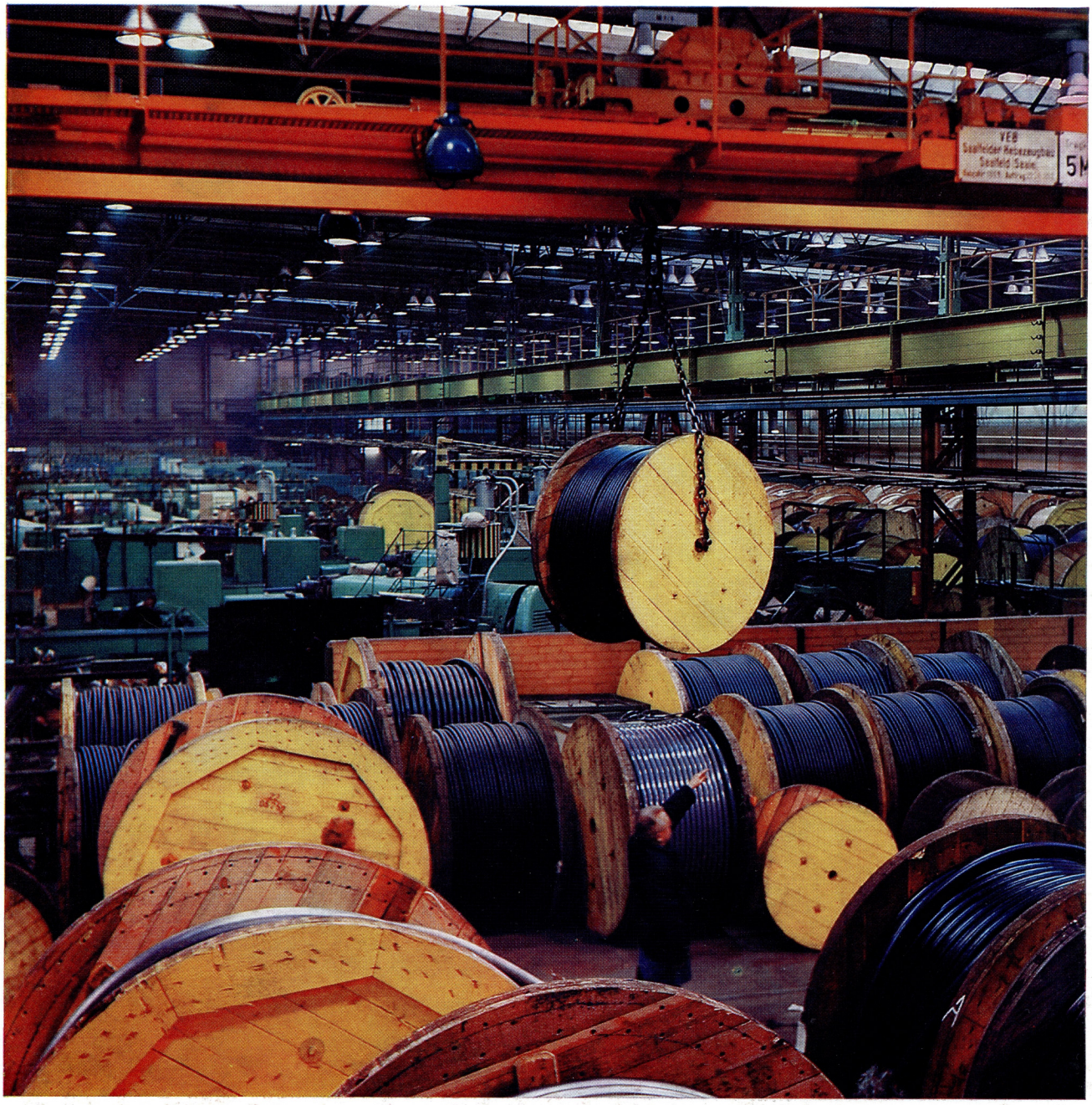
The lighting of residential areas is of architectural relevance. Apart from roadway lighting the question is to illuminate the whole street space. This demand is met by mast top fittings, which have a good decorative effect by day, too. The illumination of residential streets and the pertinent parking places represents a unity. In the example at hand, the lighting of a car park is shown, situated in the residential area of Rostock-Evershagen. Two-lamp mast top fittings were used with high-pressure mercury-vapour lamps on concrete masts. The light point height is 5.3 m, as medium luminous intensity a value of 4 lx was projected.

Lighting of parking places and residential areas in Rostock-Evershagen (fig. 32)

Examples for lighting with high-pressure mercury-vapour lamps

The lighting of high halls requires narrow-angle light fittings fitted with high-pressure discharge lamps. High luminous flux units of the lamps and a small number of fittings secure an economical solution. High-pressure mercury-vapour lamps meet these demands. For many cases of application, the high-pressure mercury-vapour lamp NF 400–01 is employed. In the example of lighting a workshop hall for telecommunication cables selected here, narrow-angle twin fittings were used, fitted with high-pressure mercury-vapour lamps NF 400-01. The light point height is 8 m, the mean value of horizontal luminous intensity amounts to 480 lx. The amount of luminous intensity and the good colour rendering properties of high-pressure mercury-vapour lamps render a good distinction of the vari-coloured and thin cores of telecommunication cable possible.

Lighting of a workshop hall for telecommunication cables in Berlin (fig. 33)



Another hall illumination is shown in the following illustration. Twin narrow-angle light fittings with high-pressure mercury-vapour lamps NF 250-01 are employed for lighting a hall, in which chipless forming of aluminium and copper wires takes place. The spot height is 7.4 m, the mean horizontal illumination level is 520 lx.

Illumination of a factory hall for aluminium and copper wires (fig. 34)

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