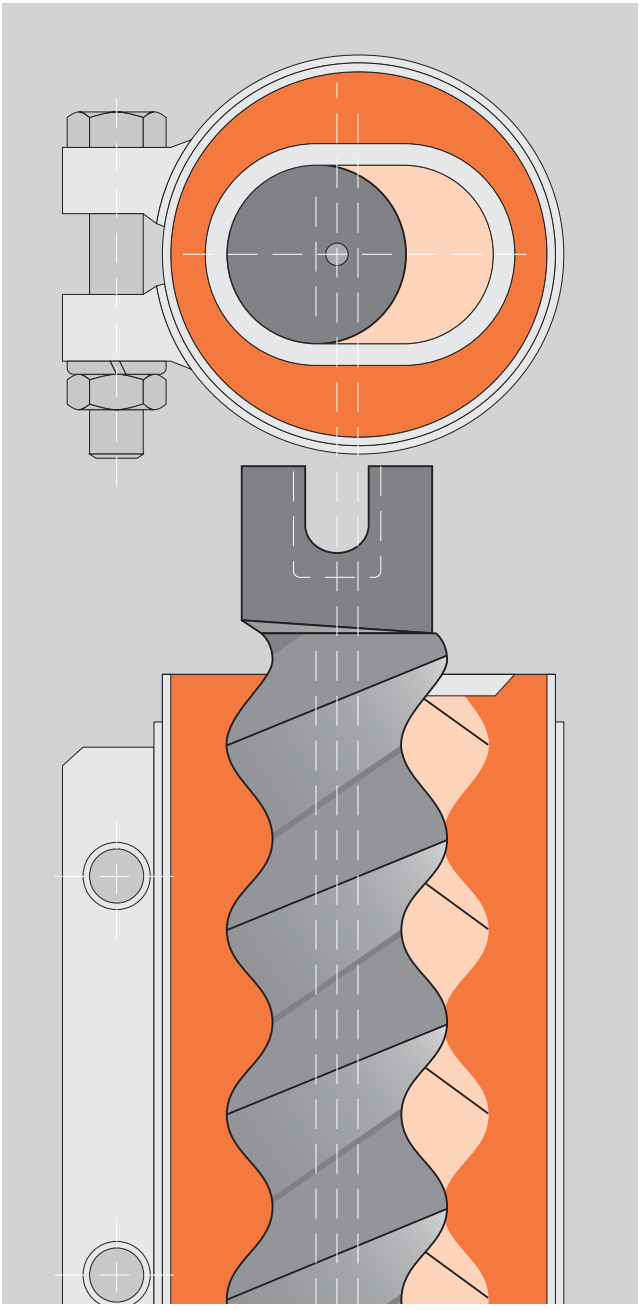
PFT ECCENTRIC-SCREW PUMPS-PROGRAM



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PFT

THE PFT RANGE OF ECCENTRIC PUMPS

In Germany, eccentric pumps were first used with machine-applied gypsum plaster in 1963. This type of positive-displacement pumps was invented by the french professor Moineau. Today, its usability with pumpable mortar or thick-matter compounds is indisputable.

THE PRINCIPLE

A wear-resistant steel rotor turns in a rubber-lined housing (stator). The eccentric motion of the rotor creates conveying chambers between the inside of the stator and the surface of the rotor, which open and close from the inlet side to the discharge side in an almost pulsationfree process.

THE TECHNICAL PARAMETERS

Eccentric screw pumps have the following geometric dismensions:
Rotor diameter d [dm], eccentricity e [dm] and stator pitch s [dm]
– see Figure 1.

The pumping capacity (Q_{th}) is proportionally dependent on the rotational speed n (1/min); the theoretical capacity of the pumps is therefore:

$$\mathbf{Q_{th} = 4 \cdot e \cdot d \cdot s \cdot n}\ [\text{l/min}].$$

Today, 70 % of all stators are available in a retensionable design. In this version, the outer casing of the stator is either a slotted steel tube or a hard plastic tube. The remaining 30 % have unslotted steel tubes as outer casings and are sold under the designation "maintenance-free".

An advantage of the use of eccentric screw pumps in combination with three-phase motors is the fact that if the conveying line is obstructed, the pump can be run in reverse to reduce the mortar pressure.

The maximum conveying pressure of an eccentric screw pump is limited by the effectivensess of the sealing line. The hardness of the rubber mixture of the stator and the type of sealing line, which are virtually "sealing surfaces" in the case of pretensioned stators, play an important role in this respect. The pretension of the PFT eccentric screw pumps amounts to approx. 2 mm.

The number of conveying stages is regarded as a measure of the potential nominal conveying pressures. The PFT pump range includes both single-stage and five-stage eccentric screw pumps. The maximum nominal conveying pressure range from approx. 10 bar to 40 bar.

The special rubber mixture of the PFT stators is designed to offer a long service life and to resist considerable wear.

The exceptionally high wear resistance of the PFT rotors results from the fact that tightly packed chromium carbides are embedded in an austenitic/ martensitic matrix. The surface hardness is approx. 65 HRC – see Figure 2. Although a PFT rotor is extremely robust, a special hardening process is used to make the driving head insensitive to sudden stresses.

The PFT eccentric screw pumps are operated at various driving powers and speeds. Diagram 1 shows the dependence between the motor driving power [kW], the motor speed [1/min], the pumping capacity [l/min] and the maximum operating pressure [bar].

Single-stage pumps, e.g. the type D 8–1.5, should be used up to a maximum pressure of 15 bar, two-stage pumps, e.g. D 7–2.5, up to a maximum of 25 bar, and three-stage pumps, e.g. D 6–3, up to maximum of 30 bar. Diagram 1 shows additional data.

DESIGNATIONS OF THE PFT ECCENTRIC SCREW PUMPS

The first letter of the designation stands for the outside diameter of the PFT stator. "D" designates an outside diameter of approx. 90 mm, "R" means approx. 114 mm, and "T" approx. 125 mm.

The first number of the designation indicates the eccentricity of the PFT eccentric pump. Seven, for example, stands for an eccentricity of approx. 7 mm.

The second number, e.g. three, is the number of eccentric pump stages. The pump type D 6–3, for instance, has three stages, which indicates that the operating pressure is approx. 30 bar. So the number 1.5 stands for a pump that has only one complete stage. Table 1 (see page 6) shows the technical data of the PFT eccentric pumps.

When PFT eccentric screw pumps are employed, the question as to how far a certain mortar can be conveyed often arises. The conveying distance depends on the diameters of the mortar hoses used. Experience shows that the coefficients of friction given in Table 2 (see page 7) are to be expected, depending on the mortar consistency. The operating pressure of the mortar pump depends on the cross-section and length of the hose and the speed and flow behavior of the mortar. In the case of vertical conveyance, the static mortar pressure has to be added to the frictional resistance of the hose: For a height of 10 m that has to be overcome in vertical conveyance, a static pressure of approx. 2 bar is to be added.

Diagram 1 (see page 9) depicts the various PFT pump types in terms of speed and driving power of the mortar pump.

Diagram 2 (see page 10) shows the conveying pressures in dependence on the hose length and cross-section.

If the conveying capacity is raised by the installation of suitable PFT pumps or a change in the rotational speed, the conveying resistance will increase. For instance, if approx. 35 l/min of machine-applied plaster are conveyed (e.g. with a D 8–1.5 mortar pump) instead of the usual 20 l/min (e.g. with a D 6–3 pump) under the same conditions, as far as conveying distance and hose cross-section are concerned, the conveying pressure will increase by 30 %.

Experience shows that, in the case of most mortar types and the common mortar hoses, the conveying resistance will be approx. 1.4 times as high as before if the conveying capacity doubles.

If the hose lenght is changed, the frictional resistances values will be directly proportional to the hose length.

Example: If the pressure is approx. 10 bar at a conveying distance of 10 m, it will be approx. 30 bar when a hose 30 m in length is used.

TABLE 1 Technical Data of the PFT Eccentric Pumps

Pump code designation	Colour	Part no. Stator	Part no. Rotor without tang	Part no. Rotor with tang	Length (mm)	Diameter (mm)	Grain size max. (mm)	Capacity l/min at 400 rpm	Capacity l/min at 200 rpm	Working pressure bar
A 3–2 L	silver	00 04 78 93	00 04 78 92	–	160	42	2	4	–	20
B 4–1,5 L	grewwhite	00 04 85 66	00 04 85 65	–	160	50	2	8	–	15
B 4–2	bloodorange	00 00 84 62	00 00 84 63	–	210	51	2	–	4	20
C 4–2	bloodorange	00 03 71 86	00 03 71 87	–	270	59	2	–	8	20
D 3–4	black	20 11 61 00	20 11 49 30	20 11 49 20	273	90	2,5	8	–	30
D 4–2 LP	black	20 11 52 20	20 11 40 00	20 11 42 10	270	90	3,5	20	–	20
D 4–2	blue	20 11 52 00	20 11 40 00	20 11 42 10	270	90	3,5	20	–	20
D 4–3	green	20 11 53 10	20 10 43 10	20 11 43 20	273	90	3,5	12	–	30
TWISTER D 4–3	green	00 01 09 03	20 11 43 10	20 11 43 20	270	90	3,5	12	–	30
TWISTER D 4–3 P	green	00 01 05 43	20 11 43 10	20 11 43 20	270	90	3	12	–	30
D 5–2,5 wf	silver	00 00 20 71	00 02 13 99	00 00 20 70	270	90	3	22	–	25
TWISTER D 5–2,5	silver	00 01 05 45	00 02 13 99	00 00 20 70	270	90	3	22	–	25
TWISTER D 5–2,5 P	silver	00 01 09 04	00 02 13 99	00 00 20 70	270	90	3	22	–	20
D 6–3	white/blue	20 11 55 00	20 11 30 00	20 11 30 10	273	90	3	20	10	30
D 6–3 wf	orange	20 11 55 10	20 11 30 00	20 11 30 10	270	90	3	20	10	30
D 6–3 P wf	pink	20 11 55 12	20 11 30 00	20 11 30 10	270	90	3	20	10	30
TWISTER D 6–3	orange	00 00 88 62	20 11 30 00	20 10 30 10	273	90	3	20	10	30
TWISTER D 6–3 P	orange	00 00 78 99	20 11 30 00	20 11 30 10	273	90	3	20	11	30
D 6–2 L	white/blue	20 11 55 01	20 11 30 13	–	200	90	3	20	10	15
D 6–2 L wf	blue	20 11 55 07	20 11 30 13	–	200	90	3	20	10	15
D 7–2,5	mouve	20 11 55 50	20 11 35 00	20 11 35 10	273	90	3	25	13	25
D 7–2,5 wf	mouve	20 11 55 51	20 11 35 00	20 11 35 10	273	90	3	25	13	25
D 7–2 wf	ruby-red	20 11 55 20	20 11 30 16	00 00 16 20	273	90	4	35	17	20
D 8–1,5	yellow	20 11 64 00	20 11 47 00	20 11 47 20	270	90	4	35	15	15
D 8–1,5 wf	yellow	20 11 64 10	20 11 74 00	20 11 74 20	273	90	4	35	15	15
TWISTER D 8–1,5	yellow	00 01 05 44	20 11 47 00	–	270	90	4	35	15	15
TWISTER D 8–1,5 P	yellow	00 01 09 05	20 11 47 00	20 11 47 20	270	90	4	35	15	15
R 7–3 S wf	orange	00 04 28 45	20 11 48 21	–	540	114	7	60	30	30
R 7–3 S	ocker	20 11 63 01	20 11 48 21	–	540	114	7	60	30	30
R 7–2,5	brown	20 11 63 50	20 11 48 51	20 11 48 50	270	114	7	40	20	25
R 7–1,5	ocker	20 11 62 00	20 11 48 00	20 11 48 10	270	114	7	60	30	15
R 8–3	black	20 11 63 10	20 11 48 30	–	540	114	8	–	40	30
R 8–1,5	black	20 11 62 20	20 11 48 40	20 11 48 60	270	114	8	80	40	15
T 10–1,5	orange	20 11 66 00	20 11 49 70	–	540	125	9	–	135	15
2 L 6	yellow	20 11 56 01	20 11 44 20	–	540	100	6	60	30	30
50/7R	green	00 01 92 97	00 01 92 98	–	535					

TABLE 2 Coefficients of Friction

Inside diameter (mm) – mortar hose	Interior/exterior plastering [1])	Floor screed [2])
25	9 – 11 bar	13 – 18 bar
35	5 – 7 bar	7 – 11 bar
50	3 – 4 bar	4 – 6 bar

[1]) Friction coefficients for a mortar hose 10 m in length and a pumping capacity of 20 l/min

[2]) Friction coefficient for a mortar hose 26 m in length and a pumping capacity of 100 l/min

TABLE 3 PFT RONDO

Art. No.	Inside Ø (mm)	Length (m)	Max. operating pressure	Special features
00 02 11 00	25	10.0	40	ID 24 free passage through coupling
00 02 11 02	25	20.0	40	ID 24 free passage through coupling
00 02 11 03	25	5.0	40	ID 24 free passage through coupling
00 02 11 19	35	13.3	40	ID 35 free passage through coupling
00 02 11 06	35	4.4	40	ID 35 free passage through coupling
00 02 12 73	35	20.0	40	only with V-part as pouring hose
00 02 11 23	35	13.3	40	35 mm M-part and 50 mm V-part
00 02 11 04	35	10.0	40	ID 35 free passage through coupling
00 02 11 05	35	20.0	40	ID 35 free passage through coupling
00 02 11 10	50	13.3	40	50 mm M-part and 50 mm V-part

FIGURE 1 Design of a mortar pump (screw pump) with the most important geometric dimensions.

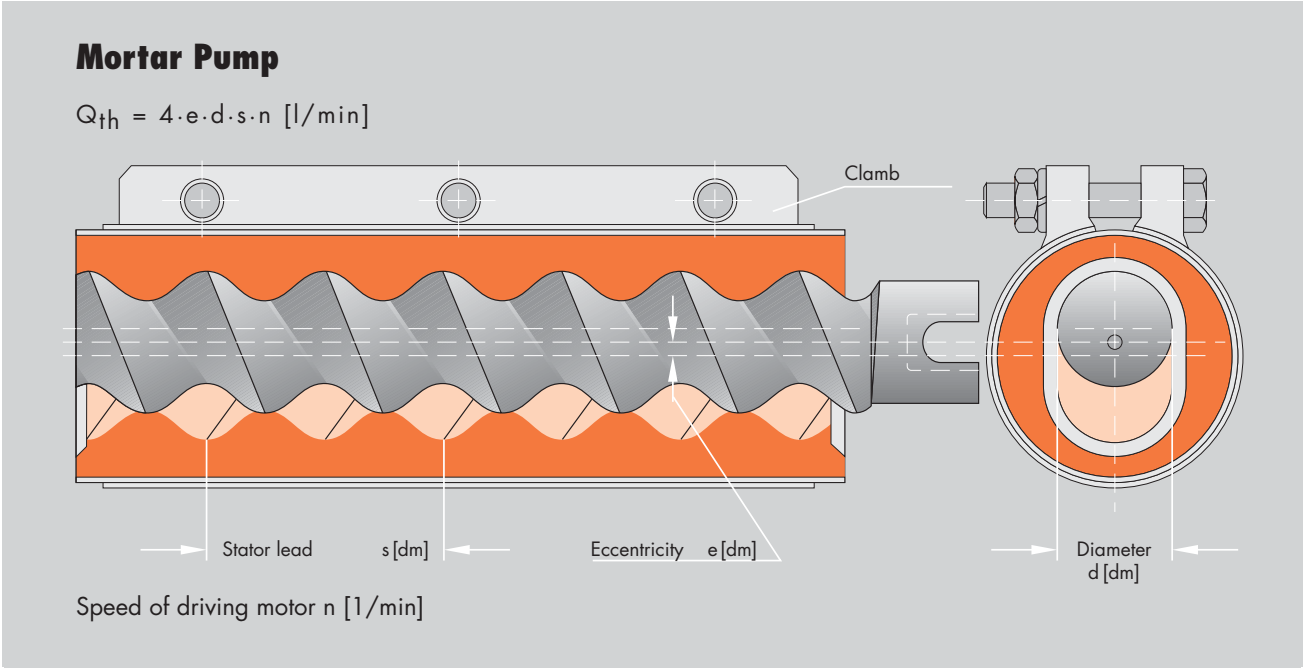


FIGURE 2 Microphotograph of a section through a PFT rotor. The white areas are tightly packed chromium carbides.

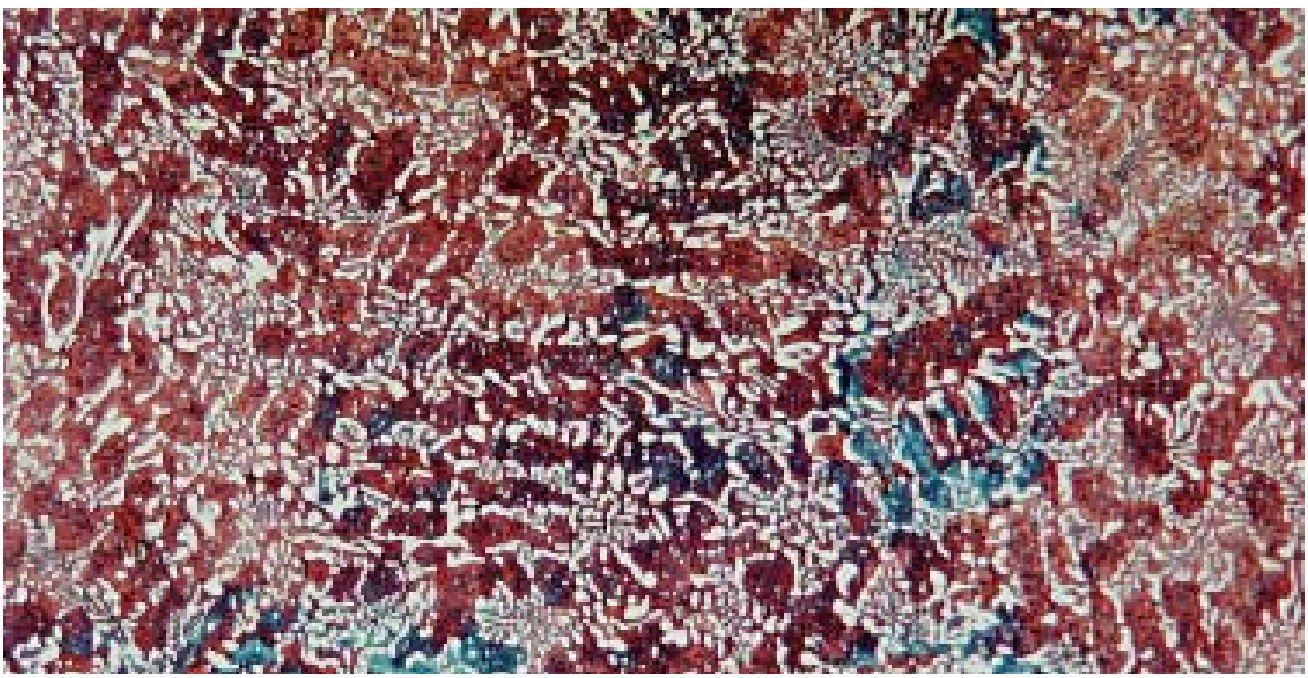
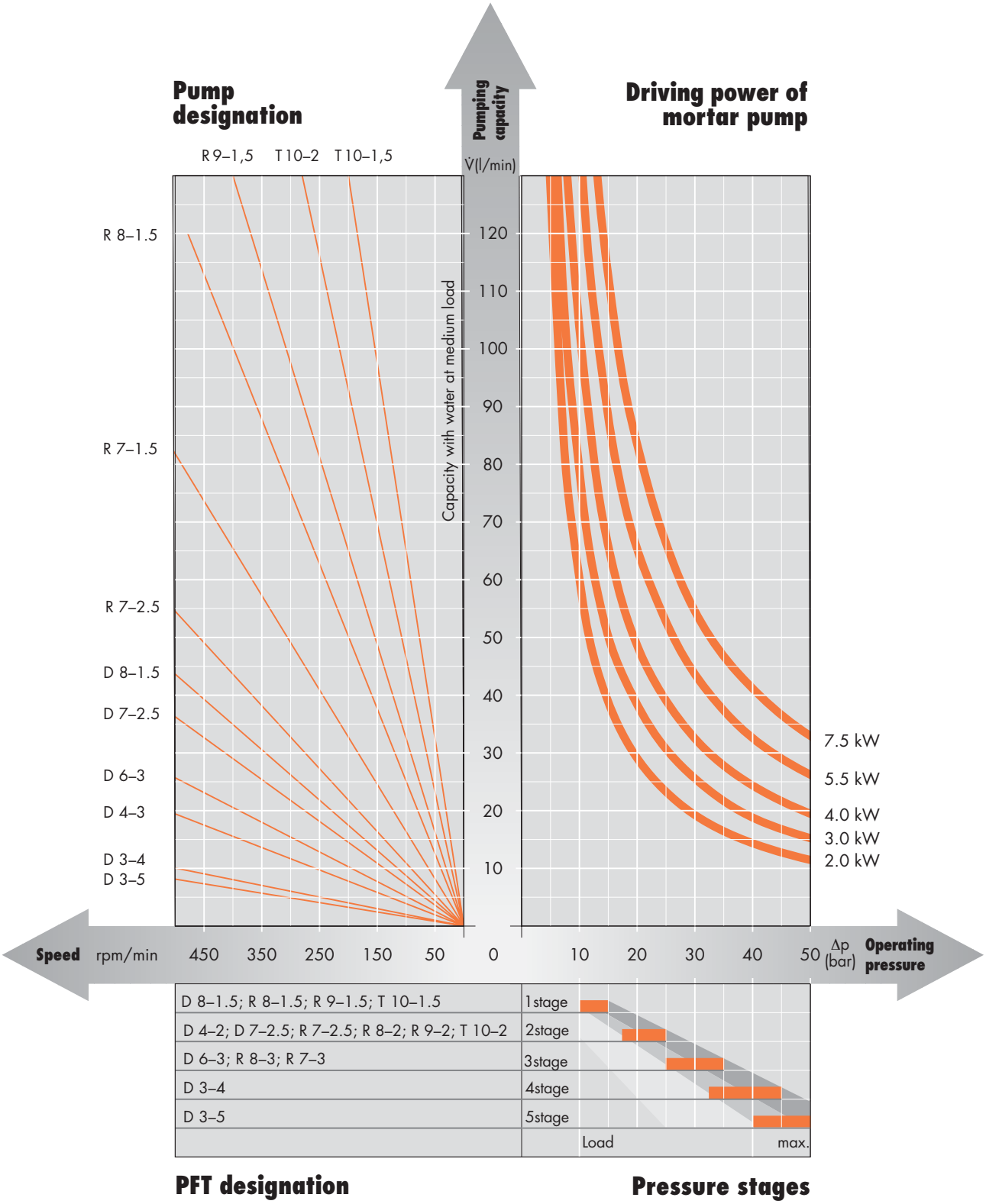
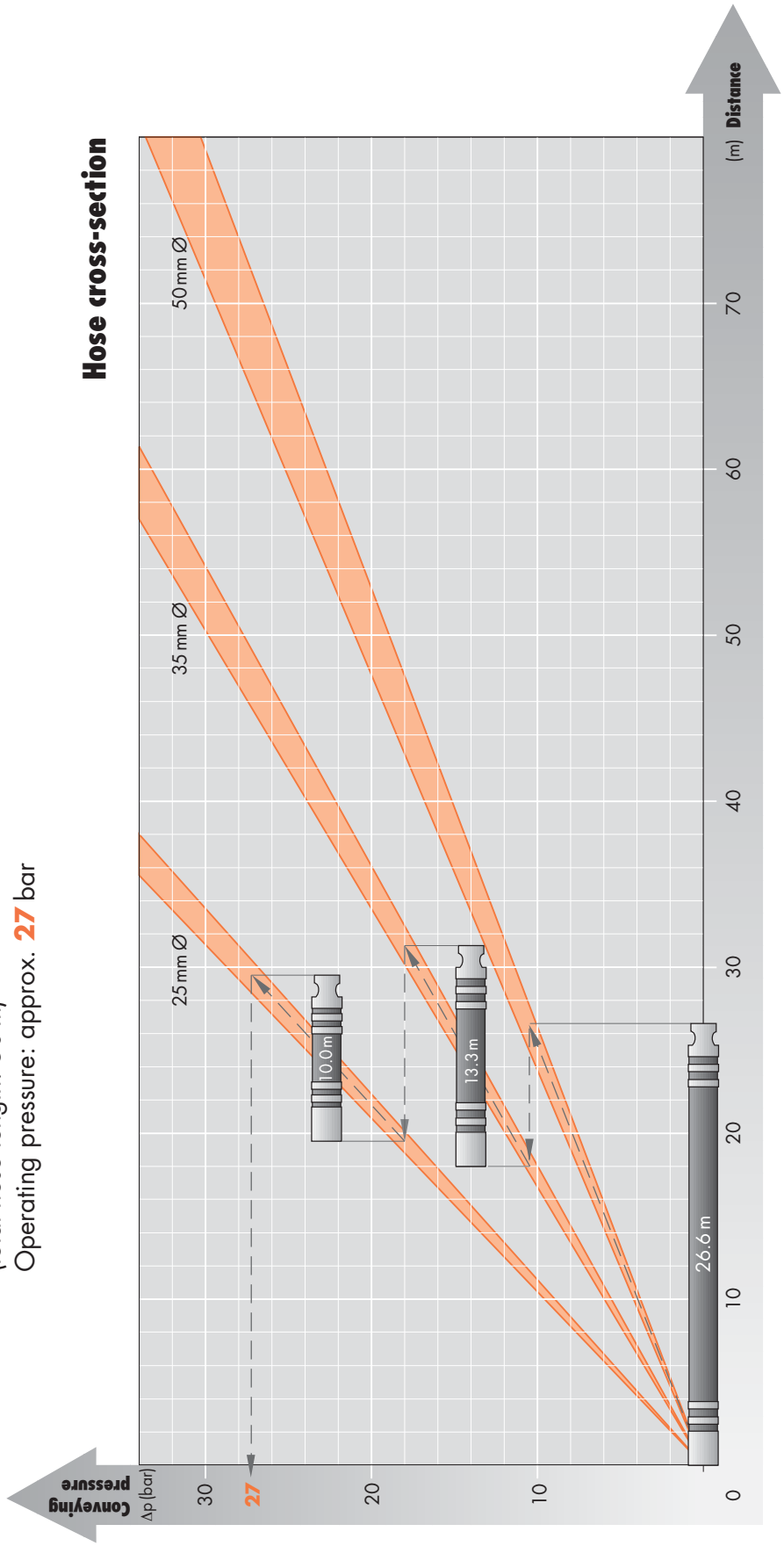


DIAGRAM 1 Speed-related volume capacity of various eccentric screw pumps and pressure and capacity-related driving power in conjunction with the usual operating pressures of multistage pumps.



More PFT Eccentric Screw Pumps – see page 6

DIAGRAM 2 Frictional resistance of 20 l/min of interior or exterior plaster.



Example: MG 40,5.5 kW 400 rpm with D 6–3 pump
and 10 m 25-mm, 13.3 m 35-mm, 26.6 m 50-mm mortar hose
(total hose length: 50 m)
Operating pressure: approx. **27** bar

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