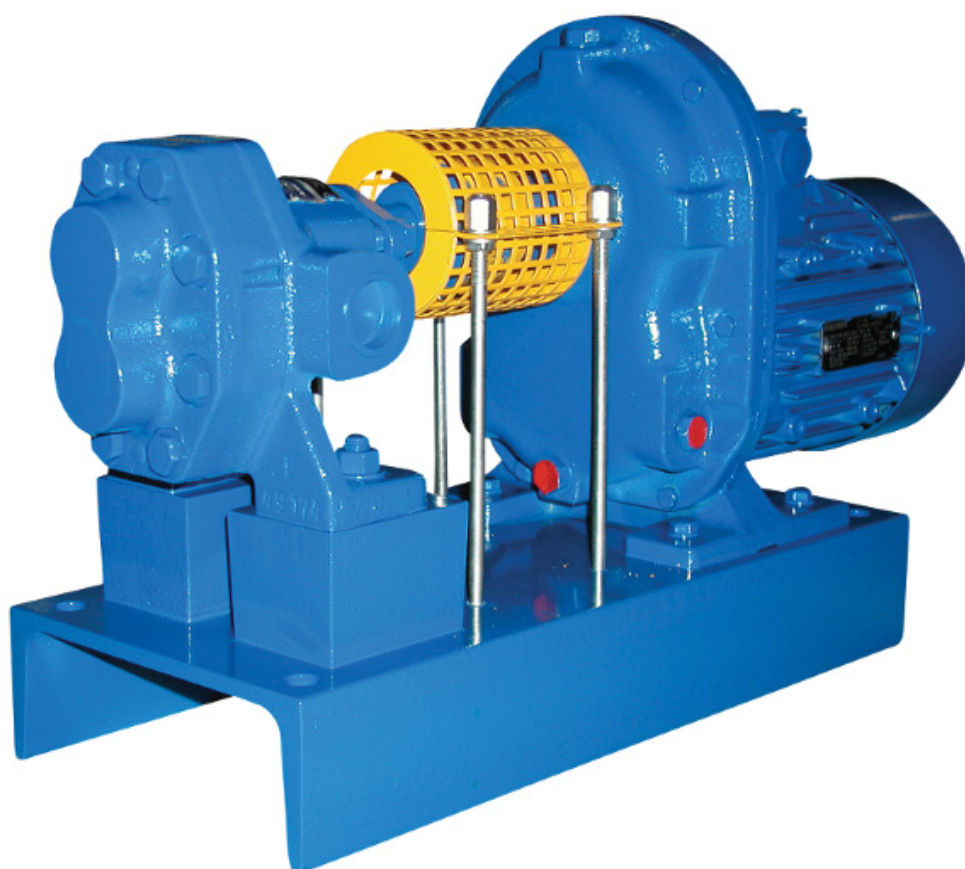




# SIGMA PUMPY HRANICE



GEAR PUMPS

**ZOP, ZOT**

**SIGMA PUMPY HRANICE, s.r.o.**

Tovární 605, 753 01 Hranice, Czech Republic  
tel.: +420 581 661 111, fax: +420 581 602 587  
Email: [sigmahra@sigmahra.cz](mailto:sigmahra@sigmahra.cz)

426	<b>21</b> .04
1.99	

## Application

In general those gear pumps are intended for pumping oils and further viscous liquids and stuffs with lubricating capacity, without mechanical impurities.

## Series ZOP

It represents basic workmanship of pumps for wide field of applications with pumping oils and various non-solidifying and uncrystallizing liquids, e.g. grease, soapsuds, emulsions, lyes, and so on, in mechanical engineering branches, in several chemical plants, etc. Further, it is advantageous to use them as booster ones in hydraulic systems, namely in lubricating and cooling machinery.

Capacity ..... from 0.03 to 17 l.s<sup>-1</sup>  
Max. delivery pressure ..... 2,5 MPa  
Viscosity values ranging ..... from 3 to 3,800 mm<sup>2</sup>.s<sup>-1</sup>  
Speed ..... up to 1,450 min<sup>-1</sup>  
Max. temperature of a pumped liquid ..... 80 °C

## Series ZOT

It represents workmanship **with heating washer or heating shield**, namely intended for pumping viscous faster-solidifying stuffs that require heating-up for their keeping in pumpable fluid state - as soap, grease, paints and varnishes, etc. Heating washer or heating shield should serve for the pump heating-up together with residual stuff in a pump even before its starting-up or within its stillstand.

Capacity ..... from 0.03 to 17 l.s<sup>-1</sup>  
Max. delivery pressure ..... 1 MPa  
Viscosity values ranging ..... from 3 to 3,800 mm<sup>2</sup>.s<sup>-1</sup>  
Speed ..... up to 1,450 min<sup>-1</sup>  
Max. temperature of a pumped liquid ..... 130 °C  
Max. temperature of a heating-up liquid ..... 130 °C  
Max. overpressure of a heating-up liquid ..... 3 bar

## Construction

External gear pumps are of horizontal foot mounted type.

**Branches** with sizes from 3 to 125 are provided with internal pipe thread, with sizes from 250 to 1000 are of flanged types.

**Shafts** are supported on bearing housings, lubricated with a pumped liquid.

**Seal** of driving shaft may be: a) soft cord type one  
b) mechanical one

## Material options

Casing, shields, heating shield - grey cast iron  
Heating washer - grey cast iron  
Gear wheels - carbon steel or hardened alloy steel  
Shaft - carbon hardened steel  
Bearing housings - bronze or bearing steel

## Sense of rotation

Pumps in their standard workmanship rotate **clockwise**, as viewed from the drive side. On the customer request that pump may be modified for counterclockwise rotation - with opposite flow direction of a pumped liquid. The only one pump cannot be used for both directions of rotation.

## Drive

Gear pumps may be supplied as a separate unit or together with an electric motor having been placed on a common bed plate. Torque transmission may be ensured through a flexible coupling. With lower speed, under 720 min<sup>-1</sup>, there both geared motor and barreters may be used.

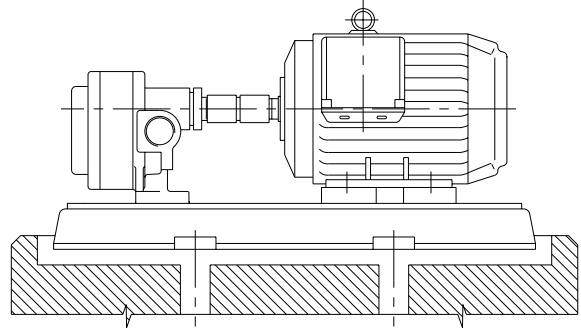
On special request electric motors may be supplied in modifications being suitable for working in explosion-hazard environments (SNV 1, SNV 2).

## Locking device

Pumps ZOP, ZOT are not provided with a locking device preventing the pump max. delivery pressure exceeding. For the pump right operation it is necessary to mount a relief valve on delivery piping, as close-by the pump as possible.

## Working positions

With pumps ZOP and ZOT close-coupled with an electric motor and placed on a common bed plate there the horizontal position is the congenial one. However, they may work reliably even in further positions. With pumps ZOT care of heating-up liquid right draining from a heating shield and/or a washer.



## Pump selection

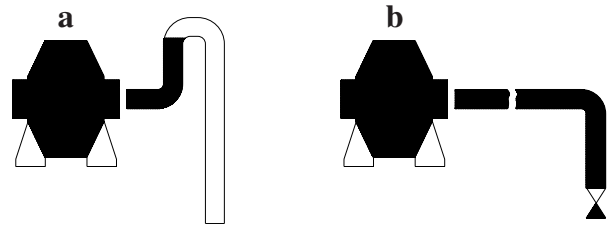
Within selection or design of pumps it is inevitable to respect not only general principles valid for positive displacement pump right functioning but also some of their specific characteristics and working demands.

- Delivery piping** - provided a pump has not been provided by a relief valve it is necessary to equip it with a relief valve, considering real operational conditions.  
Pump must not be started up with closed suction or discharge, e.g. with instantaneous starting-up for right sense of rotation determination.
- With low temperatures** of a pumped liquid there the pump running-in conditions being different considerably compared with steady operating conditions may worsen namely due to a liquid viscosity and temperature rise, lubricating capacity reduction, and so on. All these conditions should be considered with the pump drive dimensioning, speed selection or running-in method to ensure the pump right function even within those transient temporary states.
- In circulating systems** there cooling of a reverse liquid shall be ensured in such a case temperature on the pump suction side could get over a permissible value.
- Return piping** shall be directed under the lowest level being under consideration to prevent oil foaming. Oil being sucked into the pump shall be clean, deaerated thoroughly, and - without foam.

# Gear pumps ZOP, ZOT

5. **Filter in suction piping** must have larger through-flow area than I.D. of suction piping to reach as small hydraulic resistance as possible even within part-clogging, in no case the pump permissible suction pressure may be exceeded there. Filter efficiency shall be selected in such a manner to prevent penetration of greater mechanical impurities than 0.03 - 0.05 mm in suspension into a pump, considering the pump size.
6. **In no case that pump may run dry**, due to possibility of its damage or seizure, so it is necessary to prime the pump with a liquid even before its each and every starting-up. Provided the pump works with inflow into its suction branch, then its flooding would be automatic. However, it works with positive suction, that is with underpressure on the suction side, then it will be necessary to flood the pump otherwise. With a pump **in its horizontal workmanship**, with arrangement of branches on the pump either side and with its location near-by a suction pit there continuous flooding is ensured, and consequently its safe and reliable starting-up. Provided suction piping is longer considerably than minimal possible length (e.g. with a pump location out of an oil reservoir space), it is inevitable to prevent suction piping discharge and lengthening a liquid sucking-in with a liquid temperature rise, cavitation, and so on as a result, using a loop (see Chart „a“) or a non-return valve (see Chart „b“).
7. **With running-in the pump into counterpressure** both partial and nominal, it is necessary to locate the pump in such a manner to reach complete flooding with a pumped liquid both the pump and **suction piping**.

8. **Pump speed** shall be selected according to viscosity and lubricating capacity of a pumped liquid, working pressure and the pump size. In general:
  - a) with thinner liquids and higher working pressure there higher speed should be selected, while with low viscosity values it seems to be necessary to reduce max. permissible operation pressure;
  - b) with thicker liquids and lower working pressure there lower speed and lower working pressure should be selected;
  - c) with lower lubricating capacity there also lower speed and working pressure should be selected;
  - d) the higher the pump size, the lower max. speed.
 It is recommended to select operating conditions very carefully with extremely low or high viscosities of liquids, because relations between particular values may differ essentially; it is necessary to consult those problems with the manufacturer.



## Pump model key

65 - ZOP - 250 - 25 - LO - 010

65 Discharge branch I.D.

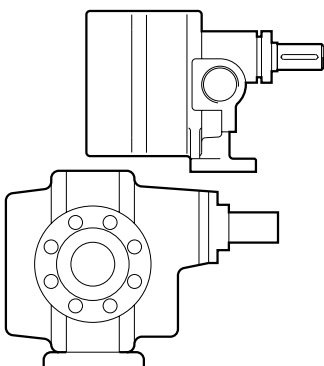
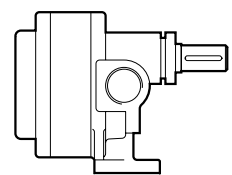
ZOP Series designation

250 Rated through flow (cm<sup>3</sup> a revolution)

25 Tenfold of max. manometric pressure on pump discharge side in MPa

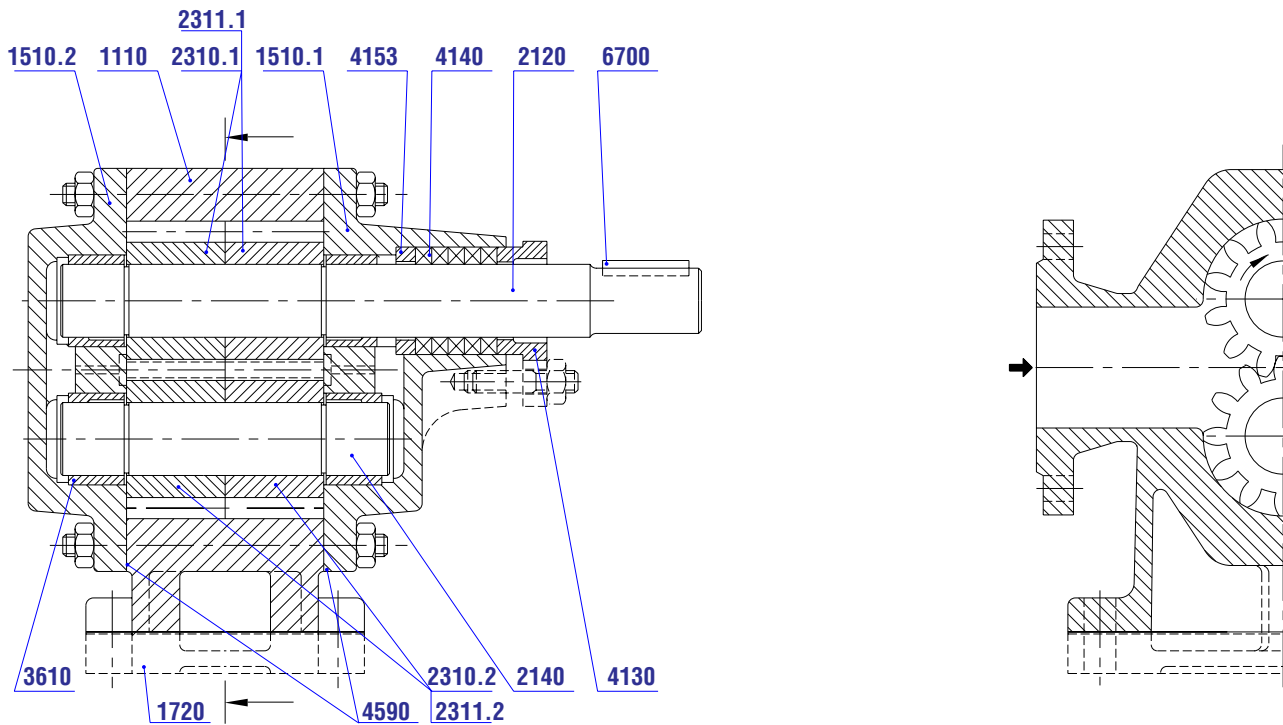
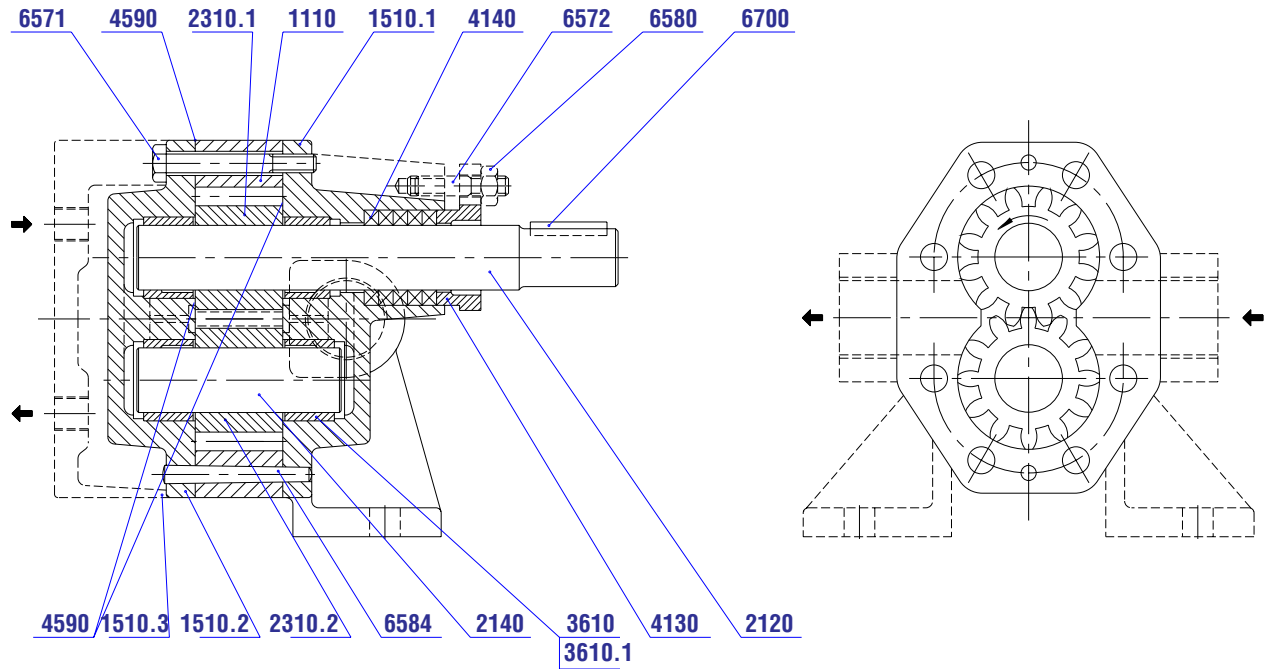
LO Material options  
 LO - cast iron version (chemically inactive liquids)  
 LC - all-metallic version (liquids with pH 7 and more)

010 Number of alteration  
 pump clockwise rotation, soft cord-type packing  
 Number of alteration  
 070 pump counterclockwise rotation, soft cord-type packing



# Gear pumps ZOP, ZOT

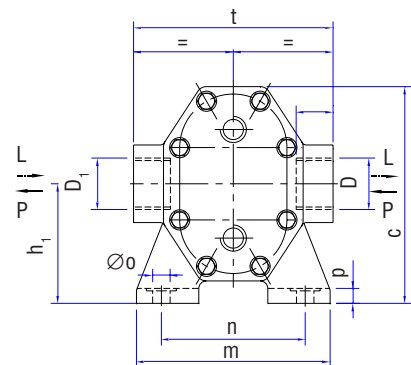
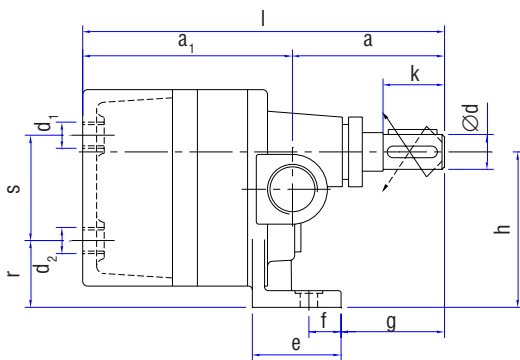
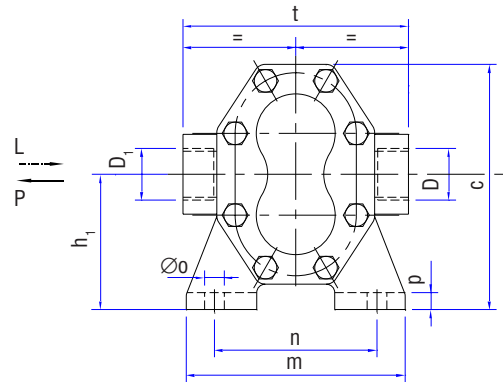
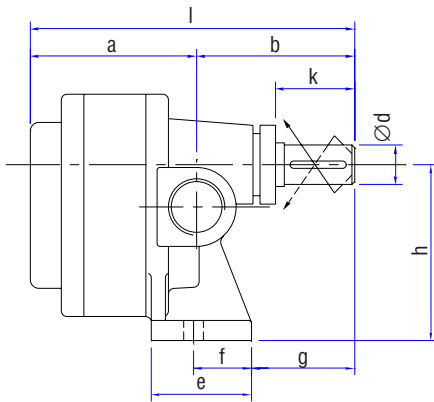
## Informatory section through pump



- |        |                      |      |                    |
|--------|----------------------|------|--------------------|
| 1110   | Pump casing          | 3610 | Bearing bush       |
| 1510   | Seal shield          | 4130 | Gland              |
| 1510.1 | Rear shield          | 4140 | Gland packing      |
| 1510.3 | Heating shield (ZOT) | 4153 | Gland packing ring |
| 1720   | Heating washer (ZOT) | 4590 | Packing            |
| 2120   | Driving shaft        | 6571 | Connection bolt    |
| 2140   | Driven shaft         | 6573 | Seal screw         |
| 2310   | Driving gear wheel   | 6700 | Coupling key       |
| 2310.1 | Driven gear wheel    | 6810 | Centring pin       |

# Gear pumps ZOP, ZOT

## Dimensions of pumps



Dimensions in mm

Pump model	a	a <sub>1</sub>	b	c	d	d <sub>1</sub>	d <sub>2</sub>	e	f	g	h	h <sub>1</sub>	k	l	m	n	o	p	r	s	t	D	D <sub>1</sub>	Weight kg
1/2" -ZOP- 3	61	-	94	113	12	-	-	49	17	64	80	65	30	155	112	80	12	11	-	-	100	1/2"	1/2"	3,0
1/2" -ZOP- 5	66	-												160										3,2
1/2" -ZOP- 8	74	-												168										3,3
1" -ZOP- 12	89	-	128	158	22	-	-	66	26	91	112	88	50	211	150	110	14	14	-	-	150	1"	1"	7,3
1" -ZOP- 20	91	-												219										7,8
1" -ZOP- 32	104	-												232										8,6
1 1/2" -ZOP- 50	118	-	155	223	35	-	-	86	32	102	160	123	58	274	190	140	18	17	-	-	200	1 1/2"	1 1/2"	20
1 1/2" -ZOP- 80	133	-												289										22
1 1/2" -ZOP- 125	142	-												298										24
1/2" -ZOT- 3	-	79	94	113	12	1/4"	1/4"	49	17	64	80	65	30	173	112	80	12	11	40	50	100	1/2"	1/2"	3,9
1/2" -ZOT- 5	-	84												178										4,1
1/2" -ZOT- 8	-	92												186										4,2
1" -ZOT- 12	-	108	128	158	22	3/8"	3/8"	66	26	91	112	88	50	236	150	110	14	14	53	70	150	1"	1"	9,6
1" -ZOT- 20	-	116												244										10,2
1" -ZOT- 32	-	129												257										11,0
1 1/2" -ZOT- 50	-	130	156	223	35	1/2"	1/2"	86	32	102	160	123	58	286	190	140	18	17	53	140	200	1 1/2"	1 1/2"	26,0
1 1/2" -ZOT- 80	-	145												301										29,0
1 1/2" -ZOT- 125	-	154												310										32,0

Values of maximal delivery pressure  $p_{ps \max}$  with individual models (sizes) depend on material options. With all-metallic version and with pumps being provided with a heating washer there  $p_{ps \max}$  is 1 MPa, or 0.6 MPa.

Performance values Q; P have been specified generally, with manometric pressure at the pump inlet section  $p_{s \text{ man}} = -0.02$  MPa

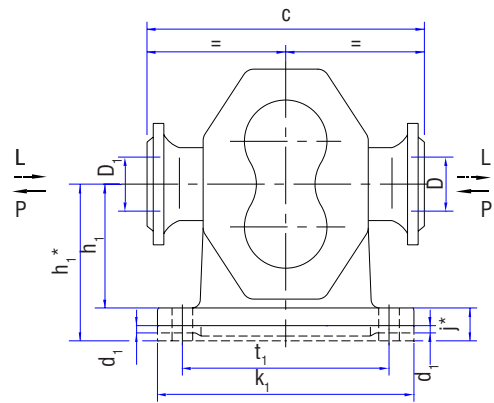
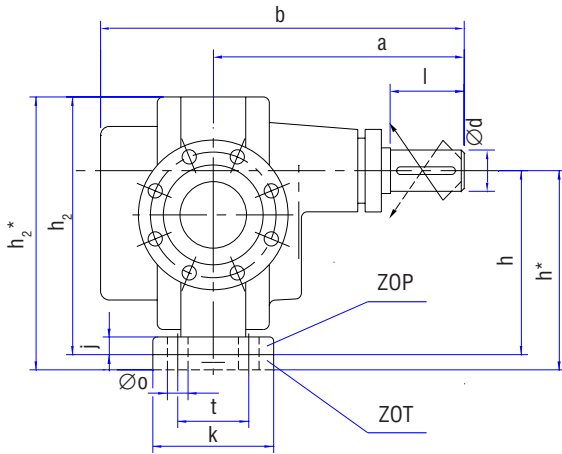
Permissible minimal inlet pressure  $p_{s \text{ man}}$  depends on viscosity, temperature, speed, delivery pressure and pump size. Up to viscosity value of 235 mm<sup>2</sup>.s<sup>-1</sup> it would reach value -0.04 MPa, however with viscosity rise it would drop. With viscosity higher values the pump could require inflow (the manufacturer shall inform you about such a necessity within discussing individual business).

Max. permissible inflow overpressure is 0.5 MPa.

Max. noisiness of the pump itself shall not exceed the value of 90dB(A) with maximum speed 960 min<sup>-1</sup>. With speed reduction the pump noisiness should decrease.

# Gear pumps ZOP, ZOT

## Dimensions of pumps



Dimensions in mm

Pump model	a	b	c	d	d <sub>1</sub>	h	h*	h <sub>1</sub>	h <sub>1</sub> *	h <sub>2</sub>	h <sub>2</sub> *	j	j*	k	k <sub>1</sub>	l	o	t	t <sub>1</sub>	Branches D, D <sub>1</sub> DN/PN	Weight kg
65-ZOP-250	303	432	320	50	-	225	-	174	-	304	-	23	-	130	295	82	14	75	250	65/25	69
80-ZOP-400	325	476	320	50	-	225	-	174	-	304	-	23	-	180	295	82	14	125	250	80/16	84
100-ZOP-630	336	497	450	55	-	280	-	212	-	385	-	30	-	170	380	82	18	105	320	100/16	124
125-ZOP-1000	368	561	450	55	-	280	-	212	-	385	-	30	-	230	380	82	18	165	320	125/16	156
65-ZOT-250	303	432	320	50	G 1/4"	-	250	-	199	-	329	-	48	130	295	82	14	75	250	65/16	73
80-ZOT-400	325	476	320	50	G 1/4"	-	250	-	199	-	329	-	48	180	295	82	14	125	250	80/16	89
100-ZOT-630	336	497	450	55	G 1/2"	-	315	-	247	-	420	-	65	170	380	82	18	105	320	100/16	132
125-ZOT-1000	368	561	450	55	G 1/2"	-	315	-	247	-	420	-	65	230	380	82	18	165	320	125/16	168

## Recommended types of relief valves

Pump model	Valve type	Nominal inside dia. mm	Nominal pressure MPa
1/2" ZOP <sup>3</sup> <sub>25</sub> ZOT <sup>-5</sup> <sub>10</sub> 8	P 11 287-616	15	1,6
	P 16 217-540	25	4
1" ZOP <sup>12</sup> <sub>25</sub> ZOT <sup>-20</sup> <sub>10</sub> 32	P 11 287-616	15	1,6
	P 16 217-540	25	4
1 1/2" ZOP <sup>50</sup> <sub>25</sub> ZOT <sup>-80</sup> <sub>10</sub> 125	P 11 287-616	25	1,6
	P 16 217-616	40	1,6
	P 16 217-540	25	4
	P 16 217-540	40	4

Pump model	Valve type	Nominal inside dia. mm	Nominal pressure MPa
65-ZOP-250-25 65-ZOP/ZOT-250-10	P 16 217-540	40	40
	P 16 217-616	40	16
80-ZOP-400-16 80-ZOP/ZOT-400-6	P 16 217-616	40	16
	P 16 217-616	40	16
100-ZOP-630-16 100-ZOP/ZOT-630-6	P 16 217-616	50	16
	P 16 217-616	50	16
125-ZOP-1000-10 125-ZOP/ZOT-1000-6	P 16 217-616	65	16
	P 16 217-616	65	16

Considering pressure values having been specified there a valve should be set up for value of the pump operating pressure using a spring. That is why it is recommended to give also the pump performance parameters (through-flow and delivery pressure) besides a sort and physical properties of a pumped liquid. Relief valve types mentioned above are produced by „Severočeská armaturka, a.s. Ústí nad Labem. The pump keeper may use further types of relief valves that conform to respective performance parameters.

# Gear pumps ZOP, ZOT

## Performance data

Pump model	Speed n=rev <sup>-1</sup>	Pump delivery pressure p <sub>06</sub> (MPa)												Viscosity mm <sup>2</sup> .s <sup>-1</sup> (cSt)	
		0.1		0.5		1		1.5		2		2.5			
		Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	Q l/s	P kW		
1/2"-ZOP-3-25 1/2"-ZOT-3-10	720	0.048 0.049	0.10 0.10	0.046 0.048	0.12 0.13	0.043 0.047	0.14 0.16	0.040 0.045	0.17 0.18	0.037 0.043	0.20 0.21	0.033 0.042	0.23 0.24	76 228	
	960	0.063 0.067 0.067	0.05 0.08 0.12	0.058 0.065 0.065	0.085 0.120 0.160	0.052 0.063 0.065	0.11 0.18 0.20	0.045 0.063 0.064	0.14 0.22 0.24	0.038 0.062 0.063	0.18 0.27 0.28	0.032 0.061 0.062	0.22 0.33 0.34	21 76 228	
	1450	0.095 0.095 0.096	0.10 0.12 0.18	0.083 0.093 0.095	0.12 0.17 0.22	0.079 0.091 0.094	0.18 0.25 0.29	0.070 0.090 0.092	0.27 0.31 0.36	0.061 0.088 0.092	0.40 0.38 0.42	0.052 0.087 0.092	0.53 0.46 0.50	21 76 228	
1/2"-ZOP-5-25 1/2"-ZOT-5-10	720	0.071 0.071	0.10 0.10	0.068 0.070	0.13 0.13	0.064 0.068	0.16 0.17	0.061 0.067	0.19 0.21	0.057 0.065	0.22 0.26	0.053 0.063	0.26 0.30	76 228	
	960	0.093 0.098 0.098	0.04 0.07 0.15	0.087 0.096 0.097	0.09 0.12 0.19	0.080 0.094 0.097	0.16 0.20 0.25	0.071 0.093 0.096	0.23 0.28 0.30	0.061 0.090 0.094	0.29 0.35 0.35	0.050 0.087 0.093	0.36 0.42 0.42	21 76 228	
	1450	0.130 0.133 0.133	0.05 0.10 0.10	0.125 0.130 0.133	0.14 0.18 0.22	0.118 0.127 0.132	0.26 0.28 0.35	0.113 0.123 0.128	0.37 0.36 0.45	0.107 0.120 0.127	0.49 0.46 0.55	0.100 0.117 0.125	0.61 0.60 0.65	21 76 228	
1/2"-ZOP-8-25 1/2"-ZOT-8-10	720	0.099 0.101	0.06 0.05	0.096 0.099	0.11 0.12	0.092 0.097	0.18 0.20	0.088 0.096	0.25 0.27	0.084 0.093	0.33 0.35	0.081 0.092	0.40 0.42	76 228	
	960	0.145 0.146 0.146	0.10 0.20 0.20	0.141 0.143 0.143	0.18 0.25 0.25	0.138 0.140 0.142	0.26 0.33 0.33	0.133 0.137 0.138	0.37 0.41 0.42	0.129 0.133 0.136	0.48 0.49 0.52	0.125 0.130 0.133	0.61 0.57 0.63	21 76 228	
	1450	0.218 0.222 0.223	0.10 0.10 0.22	0.215 0.218 0.222	0.18 0.26 0.36	0.212 0.217 0.220	0.42 0.44 0.56	0.208 0.213 0.218	0.66 0.62 0.72	0.204 0.212 0.217	0.90 0.80 0.90	0.200 0.208 0.215	1.14 1.00 1.08	21 76 228	
1"-ZOP-12-25 1"-ZOT-12-10	720	0.153 0.153 0.153	0.10 0.15 0.20	0.148 0.150 0.152	0.20 0.25 0.30	0.143 0.147 0.148	0.25 0.30 0.35	0.138 0.143 0.145	0.30 0.40 0.45	0.133 0.140 0.143	0.40 0.45 0.55	0.128 0.137 0.140	0.50 0.55 0.65	76 228 760	
	960	0.218 0.218 0.222	0.10 0.30 0.46	0.210 0.217 0.220	0.20 0.34 0.50	0.202 0.217 0.218	0.35 0.45 0.60	0.193 0.208 0.217	0.50 0.60 0.72	0.183 0.203 0.215	0.67 0.80 0.86	0.175 0.200 0.213	0.86 1.00 1.00	21 76 228	
	1450	0.332 0.333 0.333	0.24 0.42 0.60	0.323 0.330 0.333	0.34 0.50 0.68	0.313 0.323 0.330	0.50 0.66 0.80	0.303 0.317 0.327	0.73 0.84 1.00	0.293 0.310 0.323	0.98 1.04 1.20	0.283 0.306 0.320	1.24 1.25 1.40	21 76 228	
1"-ZOP-20-25 1"-ZOT-20-10	720	0.262 0.262 0.262	0.15 0.20 0.25	0.240 0.242 0.243	0.25 0.30 0.35	0.233 0.238 0.242	0.40 0.45 0.50	0.227 0.235 0.240	0.50 0.55 0.70	0.220 0.232 0.238	0.65 0.70 0.85	0.213 0.227 0.237	0.80 0.85 1.00	76 228 760	
	960	0.370 0.375 0.375	0.30 0.35 0.60	0.357 0.367 0.370	0.30 0.45 0.70	0.338 0.355 0.363	0.50 0.60 0.80	0.322 0.345 0.355	0.80 0.75 0.95	0.307 0.333 0.348	1.05 1.00 1.15	0.290 0.325 0.340	1.30 1.25 1.40	21 76 228	
	1450	0.510 0.517 0.520	0.40 0.50 0.90	0.498 0.510 0.517	0.55 0.65 1.00	0.482 0.500 0.510	0.90 0.85 1.20	0.467 0.492 0.508	1.35 1.15 1.40	0.450 0.483 0.503	1.80 1.35 1.80	0.433 0.473 0.500	2.10 1.75 2.10	21 76 228	
1"-ZOP-32-25 1"-ZOT-32-10	720	0.390 0.390 0.392	0.15 0.20 0.30	0.382 0.387 0.388	0.30 0.40 0.50	0.372 0.380 0.385	0.55 0.60 0.75	0.362 0.373 0.382	0.75 0.80 1.00	0.352 0.368 0.378	1.00 1.10 1.20	0.342 0.362 0.375	1.20 1.30 1.45	76 228 760	
	960	0.575 0.580 0.580	0.30 0.50 1.00	0.563 0.573 0.577	0.45 0.65 1.10	0.550 0.567 0.573	0.75 0.90 1.25	0.533 0.558 0.568	1.07 1.15 1.40	0.517 0.550 0.565	1.50 1.45 1.70	0.500 0.542 0.560	2.05 1.90 2.00	21 76 228	
	1450	0.795 0.800 0.800	0.30 0.60 1.00	0.773 0.783 0.788	0.60 0.85 1.20	0.747 0.762 0.772	1.05 1.20 1.50	0.718 0.742 0.757	1.55 1.50 1.90	0.692 0.720 0.738	2.00 2.00 2.35	0.663 0.700 0.723	2.50 2.40 2.90	21 76 228	
11/2"-ZOP-50-25 11/2"-ZOT-50-10	280	0.225 0.228 0.230 0.230 0.231	0.45 0.65 0.70 0.80 1.00	0.191 0.218 0.220 0.225 0.228	0.60 0.75 0.90 1.05 1.20	0.151 0.206 0.210 0.220 0.223	0.85 1.00 1.15 1.30 1.40	0.110 0.193 0.198 0.215 0.218	1.05 1.25 1.35 1.50 1.65	0.071 0.180 0.186 0.208 0.213	1.30 1.45 1.60 1.75 1.90	0.033 0.166 0.175 0.205 0.208	1.50 1.70 1.85 2.00 2.15	76 228 760 2280 3800	
		450	0.383 0.388 0.390 0.390 0.390	0.60 0.75 0.90 1.00 1.15	0.353 0.378 0.383 0.388 0.390	0.80 1.00 1.15 1.25 1.40	0.315 0.363 0.378 0.385 0.388	1.10 1.25 1.40 1.50 1.70	0.276 0.350 0.371 0.381 0.386	1.35 1.55 1.65 1.80 1.97	0.238 0.336 0.365 0.378 0.385	1.60 1.80 1.90 2.10 2.25	0.200 0.325 0.358 0.375 0.383	1.80 2.00 2.15 2.30 2.50	76 228 760 2280 3800
			720	0.586 0.593 0.603 0.608	0.60 0.75 0.95 1.20	0.500 0.550 0.600 0.603	0.80 1.00 1.20 1.45	0.408 0.508 0.585 0.596	1.10 1.35 1.50 1.75	0.333 0.470 0.570 0.585	1.40 1.65 1.85 2.10	0.258 0.441 0.558 0.575	1.70 1.98 2.15 2.40	0.191 0.416 0.541 0.566	2.00 2.30 2.50 2.70
	960			0.750 0.786 0.805 0.813	0.55 0.60 0.80 0.85	0.550 0.696 0.780 0.808	0.70 0.85 1.12 1.20	0.383 0.606 0.741 0.763	0.90 1.20 1.57 1.65	0.250 0.526 0.706 0.725	1.40 1.60 1.95 2.05	- 0.458 0.666 0.690	- 1.95 2.40 2.50	- 0.396 0.630 0.650	- 2.30 2.80 2.90
		1450		1.150 1.190 1.208 1.216	1.00 1.20 1.30 1.80	0.950 1.090 1.090 1.208	1.50 1.65 1.80 2.30	0.766 1.000 1.166 1.190	2.05 2.25 2.42 2.90						

## Performance data

Pump model	Speed n=min <sup>-1</sup>	Pump delivery pressure p <sub>do</sub> (MPa)												Viscosity mm <sup>2</sup> .s <sup>-1</sup> (cSt)
		0.1		0.5		1		1.5		2		2.5		
		Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	
11/2"-ZOP-80-25 11/2"-ZOT-80-10	280	0.370	0.65	0.343	0.80	0.311	1.00	0.280	1.20	0.250	1.40	0.216	1.60	76
		0.373	0.75	0.363	0.95	0.351	1.15	0.340	1.40	0.328	1.60	0.316	1.80	228
		0.373	0.90	0.365	1.05	0.355	1.30	0.345	1.60	0.335	1.80	0.325	2.00	760
		0.374	1.00	0.368	1.20	0.361	1.50	0.353	1.75	0.346	2.00	0.340	2.25	2280
		0.374	1.20	0.370	1.45	0.363	1.80	0.358	2.10	0.351	2.45	0.346	2.75	3800
	450	0.585	0.80	0.563	1.00	0.533	1.30	0.506	1.55	0.478	1.90	0.450	2.15	76
		0.588	0.90	0.578	1.15	0.566	1.45	0.556	1.75	0.545	2.05	0.533	2.35	228
		0.590	1.00	0.583	1.25	0.575	1.60	0.566	1.90	0.558	2.25	0.550	2.55	760
		0.590	1.20	0.586	1.45	0.581	1.80	0.575	2.15	0.571	2.50	0.566	2.80	2280
		0.591	1.45	0.590	1.75	0.588	2.10	0.586	2.50	0.585	2.85	0.583	3.20	3800
	720	0.925	1.15	0.841	1.40	0.770	1.80	0.716	2.15	0.666	2.50	0.616	2.80	21
		0.933	1.30	0.891	1.60	0.845	2.00	0.813	2.40	0.783	2.75	0.758	3.15	76
		0.941	1.50	0.938	1.80	0.930	2.20	0.918	2.65	0.908	3.10	0.900	3.50	228
	960	0.950	1.60	0.946	2.00	0.941	2.50	0.941	3.00	0.935	3.50	0.933	4.00	760
		1.181	0.70	1.083	1.00	0.983	1.50	0.891	1.95	-	-	-	-	3
		1.200	0.90	1.153	1.25	1.103	1.75	1.066	2.30	1.033	2.80	1.000	3.30	21
		1.208	1.10	1.180	1.60	1.146	2.20	1.108	2.80	1.075	3.40	1.041	4.00	76
	1450	1.213	1.40	1.200	1.80	1.185	2.40	1.175	3.00	1.158	3.60	1.150	4.20	228
		1.808	1.40	1.733	2.00	1.633	2.70	-	-	-	-	-	-	3
		1.817	1.55	1.750	2.15	1.666	2.90	-	-	-	-	-	-	21
11/2"-ZOP-125-25 11/2"-ZOT-125-10	280	0.493	0.85	0.475	1.05	0.450	1.25	0.425	1.45	0.400	1.65	0.375	1.85	76
		0.495	1.00	0.483	1.20	0.458	1.45	0.441	1.70	0.416	1.90	0.396	2.10	228
		0.496	1.10	0.486	1.35	0.475	1.60	0.458	1.90	0.450	2.20	0.436	2.40	760
		0.498	1.15	0.491	1.50	0.483	1.90	0.475	2.30	0.466	2.70	0.458	3.00	2280
		0.500	1.25	0.495	1.60	0.491	2.15	0.486	2.60	0.483	3.10	0.478	3.50	3800
	450	0.876	1.35	0.851	1.50	0.820	1.70	0.788	1.90	0.756	2.05	0.725	2.25	76
		0.876	1.45	0.856	1.60	0.830	1.85	0.803	2.10	0.776	2.30	0.750	2.50	228
		0.878	1.65	0.860	1.85	0.836	2.10	0.813	2.35	0.790	2.60	0.766	2.80	760
		0.880	1.90	0.868	2.15	0.853	2.40	0.838	2.75	0.823	3.00	0.808	3.30	2280
		0.881	2.15	0.873	2.40	0.863	2.75	0.853	3.10	0.843	3.45	0.833	3.80	3800
	720	1.316	1.45	1.263	1.85	1.191	2.30	1.125	2.75	1.050	3.25	0.983	3.70	21
		1.320	1.60	1.280	2.00	1.225	2.50	1.168	3.00	1.116	3.50	1.066	4.00	76
		1.326	1.85	1.300	2.25	1.275	2.75	1.248	3.25	1.216	3.80	1.183	4.30	228
		1.330	2.10	1.316	2.50	1.300	3.00	1.283	3.55	1.266	4.10	1.250	4.60	760
	960	1.708	1.10	1.533	1.60	1.350	2.25	1.191	3.00	-	-	-	-	3
		1.750	1.35	1.633	1.85	1.603	2.65	1.533	3.50	1.458	4.35	1.383	5.10	21
		1.758	1.60	1.742	2.35	1.717	3.23	1.691	4.20	1.666	5.10	1.650	6.00	76
	1450	1.767	2.10	1.750	2.75	1.742	3.50	1.725	4.50	1.716	5.50	1.708	6.40	228
		2.617	1.00	2.467	1.80	2.292	3.15	-	-	-	-	-	-	3
		2.650	1.30	2.603	2.40	2.553	3.70	-	-	-	-	-	-	21
2.658		1.70	2.642	2.85	2.616	4.28	-	-	-	-	-	-	76	
	2.667	2.50	2.650	3.70	2.633	5.30	-	-	-	-	-	-	228	

Values of maximal delivery pressure p<sub>ps max</sub> depend on material options. With all-metallic version and with pumps being provided with a heating shield there p<sub>ps max</sub> is 1 MPa.

Performance values Q; P have been specified generally, with manometric pressure at the pump inlet section p<sub>s man</sub> = -0.02 MPa.

Permissible minimal inlet pressure p<sub>s man</sub> depends on viscosity, temperature, speed, delivery pressure and pump size and it may range from -0.04 MPa to -0.05 MPa.

With viscosity higher values the pump could require inflow - the manufacturer shall inform you about such a necessity in individual business.

Max. permissible inflow overpressure is 0.5 MPa.

Max. noisiness of the pump itself shall not exceed the value of 80dB(A) with maximum speed 1,450 min<sup>-1</sup>. With speed reduction the pump noisiness should decrease.



## Performance data

Pump model	Speed n min <sup>-1</sup>	Pump delivery pressure p <sub>60</sub> (MPa)										Viscosity mm <sup>2</sup> .s <sup>-1</sup> (cSt)
		0.2		0.6		1		1.6		2.5		
		Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	Q l/s	P kW	
65-ZOP-250-25	280	(1.22)	(0.7)	(1.12)	(1.3)	(1.03)	(1.6)	(0.82)	(2.4)	-	-	76
		1.28	0.8	1.23	1.5	1.20	2.1	1.12	3.1	1.01	4.7	190
		1.30	0.9	1.27	1.6	1.24	2.3	1.20	3.4	1.12	5.2	380
		1.30	1.0	1.29	1.7	1.27	2.5	1.25	3.7	1.19	5.7	760
		1.32	1.6	1.31	2.3	1.30	3.2	1.28	3.9	1.25	5.9	1520
		1.33	2.0	1.32	2.7	1.31	3.7	1.30	4.5	1.30	6.4	3820
65-ZOP-250-10	450	(2.09)	(1.2)	(1.98)	(2.2)	(1.86)	(3.0)	(1.70)	(4.2)	-	-	76
		2.12	1.4	2.05	2.4	1.98	3.3	1.88	4.7	1.72	7.0	190
		2.13	1.6	2.08	2.6	2.04	3.8	1.97	4.9	1.86	7.5	380
		2.14	1.9	2.11	2.8	2.08	4.2	2.05	5.6	1.98	8.3	760
		2.15	2.9	2.13	4.0	2.12	5.0	2.10	6.3	2.05	9.3	1520
		2.16	3.7	2.15	4.7	2.14	5.8	2.13	7.4	2.12	10.1	3820
65-ZOT	720	3.17	1.4	3.08	3.0	2.98	4.3	2.80	6.4	-	-	37.4
		3.20	1.7	3.10	3.2	3.05	4.8	2.94	6.7	2.76	10.3	76
		3.23	2.0	3.16	3.6	3.10	5.2	3.00	7.5	2.88	11.4	190
		3.35	2.3	3.28	3.0	3.22	5.9	3.14	8.5	3.00	12.8	380
		3.43	3.0	3.39	4.8	3.36	6.7	3.30	9.4	3.21	14.1	760
		4.30	1.7	4.20	3.8	4.05	6.0	3.87	9.0	(3.58)	(14.1)	37.4
		4.30	2.1	4.23	4.2	4.13	6.5	4.00	9.5	3.75	14.6	76
		4.40	2.6	4.30	4.7	4.22	7.0	4.10	10.0	3.93	15.0	190
		4.46	3.6	4.39	5.7	4.31	7.9	4.20	11.1	4.02	16.5	380
80-ZOP-400-16	280	(1.76)	(1.00)	(1.56)	(1.60)	(1.33)	(2.15)	(1.00)	(3.0)	-	-	76
		1.85	1.25	1.70	1.90	1.56	2.50	1.35	3.5	-	-	190
		1.88	1.40	1.77	2.15	1.66	2.90	1.50	4.0	-	-	380
		1.92	1.55	1.82	2.40	1.73	3.30	1.60	4.6	-	-	760
		1.94	2.10	1.88	3.10	1.80	4.10	1.73	5.5	-	-	1520
		1.97	3.00	1.96	4.00	1.95	5.00	1.90	6.5	-	-	3820
80-ZOT	450	(2.90)	(1.60)	(2.58)	(2.60)	(2.28)	(3.55)	(1.80)	(5.0)	-	-	76
		3.00	2.00	2.80	3.15	2.60	4.30	2.33	6.0	-	-	190
		3.03	2.30	2.90	3.50	2.75	4.80	2.50	6.6	-	-	380
		3.08	2.75	2.98	4.10	2.88	5.50	2.75	7.5	-	-	760
		3.12	3.75	3.06	5.20	3.02	6.60	2.93	8.7	-	-	1520
		3.15	5.00	3.13	6.60	3.11	8.20	3.10	10.7	-	-	3820
		4.40	2.00	3.80	3.40	3.25	4.80	(2.40)	(7.0)	-	-	37.4
		4.55	2.40	4.17	4.20	3.80	5.90	3.23	8.5	-	-	76
		4.72	2.90	4.52	5.00	4.33	7.10	4.03	10.2	-	-	190
		4.78	3.40	4.63	5.60	4.48	7.85	4.26	11.2	-	-	380
		4.85	4.25	4.73	6.65	4.60	9.00	4.43	12.6	-	-	760
		6.00	3.0	5.53	5.7	5.00	8.4	-	-	-	-	37.4
		6.25	3.5	5.93	6.2	5.62	8.9	5.17	13.0	-	-	76
		6.33	3.8	6.16	6.8	5.96	9.9	5.70	14.5	-	-	190
		6.43	5.0	6.33	8.3	6.20	11.5	6.00	16.4	-	-	380
100-ZOP-630-16	280	(2.16)	(1.2)	(1.75)	(2.1)	(1.33)	(2.8)	-	-	-	-	76
		2.50	1.4	2.16	2.3	1.83	3.1	-	-	-	-	190
		2.83	2.0	2.53	2.9	2.25	3.7	1.83	5.0	-	-	380
		3.00	2.7	2.96	3.8	2.90	4.9	2.85	6.5	-	-	760
		3.12	3.4	3.10	4.7	3.06	6.0	3.03	8.0	-	-	1520
		3.15	5.0	3.14	6.3	3.13	7.6	3.10	9.5	-	-	3820
100-ZOT	450	(4.37)	(2.0)	(4.13)	(4.0)	(3.88)	(6.0)	(3.50)	(9.0)	-	-	76
		4.58	2.5	4.42	4.6	4.25	6.8	4.00	10.0	-	-	190
		4.75	3.0	4.65	5.3	4.56	7.6	4.42	11.0	-	-	380
		4.82	3.5	4.75	6.0	4.68	8.4	4.48	12.0	-	-	760
		4.86	5.0	4.81	7.5	4.75	10.0	3.03	13.5	-	-	1520
		4.90	6.5	4.86	9.0	4.83	11.5	4.75	15.0	-	-	3820
		7.55	3.5	7.10	7.1	6.66	10.7	(6.00)	(16.0)	-	-	37.4
		7.78	4.0	7.48	7.6	7.18	11.1	6.75	16.5	-	-	76
		7.96	5.0	7.76	8.6	7.56	12.2	7.25	17.5	-	-	190
		8.13	6.0	8.00	10.0	7.86	13.8	7.66	19.5	-	-	380
		8.30	7.0	8.20	11.2	8.13	15.3	8.00	21.5	-	-	760
		10.00	5.8	9.60	10.1	9.16	14.5	(8.50)	(21.1)	-	-	37.4
		10.33	6.5	10.00	11.0	9.76	15.4	9.33	22.0	-	-	76
		10.53	7.7	10.30	12.2	10.00	16.7	9.75	23.5	-	-	190
		10.66	9.2	10.38	14.0	10.28	19.0	10.00	26.0	-	-	380
125-ZOP-1000-10	280	(3.17)	(1.8)	(2.42)	(2.6)	(1.66)	(3.5)	-	-	-	-	76
		(3.66)	(2.0)	(3.00)	(3.0)	(2.33)	(4.0)	-	-	-	-	190
		4.08	2.8	3.60	3.8	3.13	4.8	-	-	-	-	380
		4.33	3.6	4.00	4.8	3.66	6.0	-	-	-	-	760
		4.50	4.8	4.16	6.0	3.83	7.2	-	-	-	-	1520
		4.66	5.5	4.33	6.8	4.00	8.1	-	-	-	-	3820
125-ZOT	450	(5.83)	(2.6)	(5.25)	(4.8)	(4.66)	(7.0)	-	-	-	-	76
		6.33	3.5	5.75	5.7	5.25	7.8	-	-	-	-	190
		6.75	4.4	6.16	6.6	5.66	8.8	-	-	-	-	380
		7.00	5.3	6.50	7.6	6.00	10.0	-	-	-	-	760
		7.33	7.5	6.83	10.0	6.33	12.4	-	-	-	-	1520
		7.58	10.0	7.08	12.5	6.50	15.0	-	-	-	-	3820
		12.35	6.5	11.73	12.5	11.10	18.5	-	-	-	-	37.4
		13.25	7.5	12.70	13.2	12.15	19.9	-	-	-	-	76
		13.85	10.0	13.30	15.7	12.80	21.3	-	-	-	-	190
		14.20	12.0	13.75	18.0	13.30	23.7	-	-	-	-	380
		14.70	14.7	14.20	20.3	13.70	26.3	-	-	-	-	760
		15.80	9.3	15.40	17.2	15.00	24.2	-	-	-	-	37.4
		16.40	10.0	16.00	17.5	15.60	24.8	-	-	-	-	76
		16.95	12.3	16.60	19.9	16.25	27.0	-	-	-	-	190
		17.45	15.2	17.02	22.7	16.60	30.0	-	-	-	-	380