

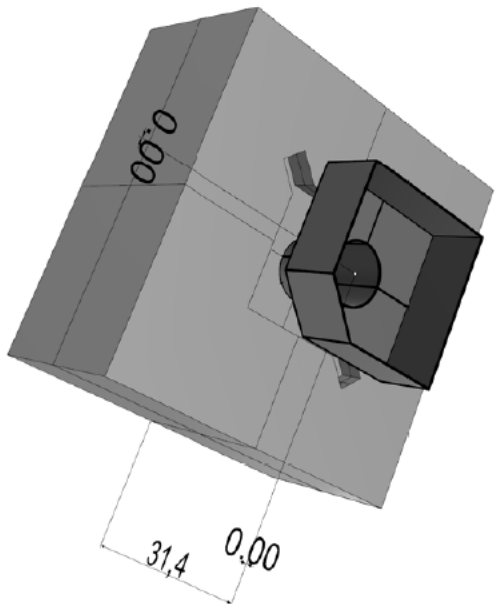
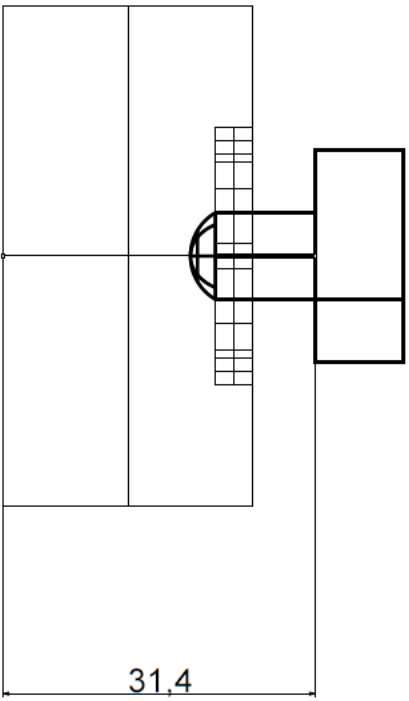
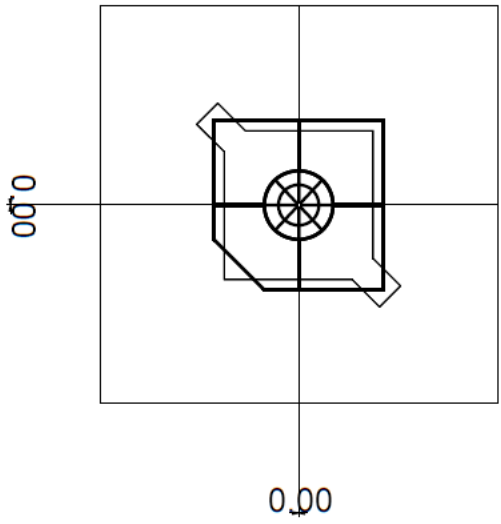
Zakazka: **2018-000**
 Elektroda: **000-A01**
 Pali dili: **diplomka**
 Pali: **tvar**
 Sestava: S:\Nastrojarna\Zakazky\2017
 \2017-001\5.MFG

Grafit:	Měď	ks: 1	M-0.2
Grafit:	EDM160	ks: 1	M-0.2
Grafit:	EDM180	ks: 1	M-0.2
Grafit:	EDM200	ks: 1	M-0.2
Grafit:	EDM1	ks: 1	M-0.2

Vypracoval: Lukl 19.4.2018

Vyrobil:	Kontroloval:
----------	--------------

Attachment 2



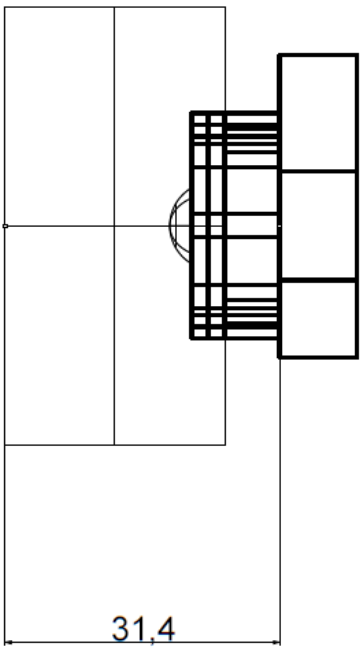
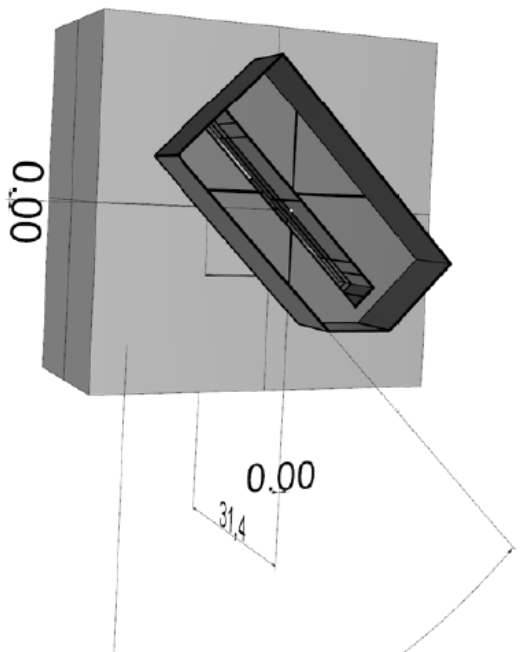
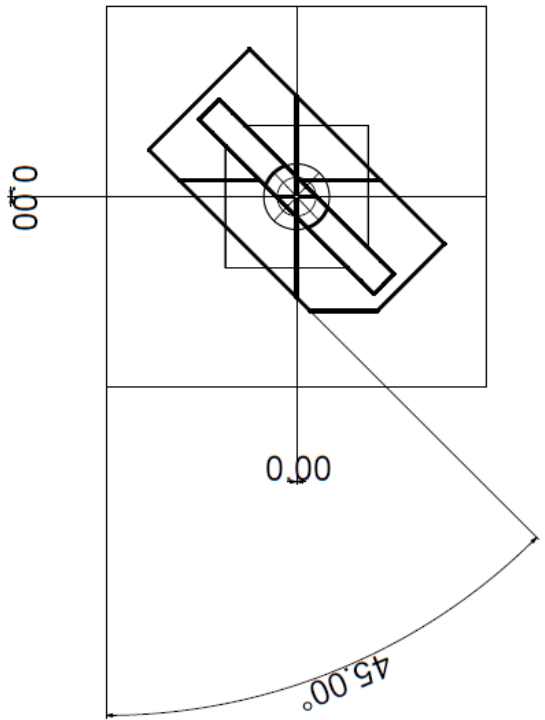
Zakazka: **2018-000**
Elektroda: **000-A02**
Pall dili: **diplomka**
Pall: **tvar**
Sestava: S:\Nastrojarna\Zakazky\2017
12017-001\5.MFG

Grafit:	Měď	ks: 1	M-0.2
Grafit:	EDM160	ks: 1	M-0.2
Grafit:	EDM180	ks: 1	M-0.2
Grafit:	EDM200	ks: 1	M-0.2
Grafit:	EDM1	ks: 1	M-0.2

Vypracoval: **Lukl 19.4.2018**

Vyrobil: | Kontroloval:

Attachment 3





Zakazka: **2018-000**
Elektroda: **000-A03**
Pali dili: **diplomka**
Pali: **tvar**
Sestava: S:\Nastrojarna\Zakazky\2017
V2017-001\5.MFG


Grafit:	Měď	ks: 1	M-0.2
Grafit:	EDM160	ks: 1	M-0.2
Grafit:	EDM180	ks: 1	M-0.2
Grafit:	EDM200	ks: 1	M-0.2
Grafit:	EDM1	ks: 1	M-0.2

Vypracoval: Lukl 19.4.2018
Vyrobil: Kontroloval:

Attachment 4

	Polotovár		000-A01						Lukl		
	Xmin -12,5	Xmax 12,5	Datum		2018-04-19		Čas celkový 0:06:56				
	Ymin -12,5	Ymax 12,5	Project		000-A01						
	Zmin -7	Zmax 8,001	Part								
NC Program	Název dráhy nástroje		Min Z	DFr	TipR	L / Vyrož	Držák	Přidavek XY;Z		Postup	Čas
000001	a1+0.2	Hrubování konturováním 3-osy	0	10	0	50 / 0	1	X;Y 0,2	Z 0,2	4000	0:00:22
000001	b1-0.2	Oádkování 3-osy	7,61	11,98	1	50 / 0	1	X;Y -0,2	Z -0,2	2500	0:01:45
000001	b2-0.2	Hladina Z 3-osy	-6,999	11,98	1	50 / 0	1	X;Y -0,2	Z -0,2	2500	0:04:33
000001	b3-0.2	Plošný offset 3-osy	-0,2	11,98	1	50 / 0	1	X;Y 0	Z -0,2	2500	0:00:15

	Polotovár		000-A02						Lukl		
	Xmin -8,5	Xmax 8,5	Datum		2018-04-19		Čas celkový 0:04:24				
	Ymin -8,5	Ymax 8,5	Project		000-A02						
	Zmin -7	Zmax 10	Part								
NC Program	Název dráhy nástroje		Min Z	DFr	TipR	L / Vyrož	Držák	Přidavek XY;Z		Postup	Čas
000002	a1+0.2	Hrubování konturováním 3-osy	0	10	0	50 / 0	1	X;Y 0,2	Z 0,2	4000	0:00:20
000002	b1-0.2	Oádkování 3-osy	8,648	11,98	1	50 / 0	1	X;Y -0,2	Z -0,2	2500	0:00:34
000002	b2-0.2	Hladina Z 3-osy	-6,999	11,98	1	50 / 0	1	X;Y -0,2	Z -0,2	2500	0:03:17
000002	b3-0.2	Plošný offset 3-osy	-0,2	11,98	1	50 / 0	1	X;Y 0	Z -0,2	2500	0:00:12

	Polotovár		000-A03						Lukl		
	Xmin -14,5	Xmax 14,5	Datum		2018-04-19		Čas celkový 0:06:16				
	Ymin -7,5	Ymax 7,5	Project		000-A03						
	Zmin -7	Zmax 8,002	Part								
NC Program	Název dráhy nástroje		Min Z	DFr	TipR	L / Vyrož	Držák	Přidavek XY;Z		Postup	Čas
000003	a1+0.2	Hrubování konturováním 3-osy	0	10	0	50 / 0	1	X;Y 0,2	Z 0,2	4000	0:00:26
000003	b1-0.2	Oádkování 3-osy	7,611	11,98	1	50 / 0	1	X;Y -0,2	Z -0,2	2500	0:01:20
000003	b2-0.2	Hladina Z 3-osy	-6,999	11,98	1	50 / 0	1	X;Y -0,2	Z -0,2	2500	0:04:17
000003	b3-0.2	Plošný offset 3-osy	-0,2	11,98	1	50 / 0	1	X;Y 0	Z -0,2	2500	0:00:12



1.2343



Quality	X37CrMoV5-1	Supply conditions:
According to standards	UNI EN ISO 4957: 2002	Annealed or
Number	1.2343	Quenched and Tempered

Chemical composition

C%	Si%	Mn%	P% max	S% max	Cr%	Mo%	V%
0,33-0,41	0,80-1,20	0,25-0,50	0,030	0,020	4,80-5,50	1,10-1,50	0,30-0,50
± 0.02	± 0.05	± 0.04	+ 0.005	+ 0.005	± 0.10	± 0.05	± 0.04

Product deviations are allowed

Temperature °C

Hot-forming	Quenching	Tempering see table	Stress-relieving	Stress-relieving must be done after machining and before quenching
1050-900	heating up to 800, pause, then 1000-1040 oil, polymer, s.b.	immediately after quenching minimum 2 cycles	600-650 furnace cooling to 350 after, air	
Soft annealing		Stress-relieving ¹⁾	Pre-heating welding	Stress-relieving after welding
800-810 furnace cooling max 25°/h to 600, then air (HB max 229)		50° under the temperature of tempering	350	¹⁾
			Ac1	Ac3
			830	890
				Ms
				310
				Mf
				80

s.b. = salt bath (450-500 °C)

Mechanical properties

Tempering table after quenching at 1020 °C in oil. Values on test Ø 20 mm

HB	543	525	518	512	512	518	534	550	568	577	512	432	362	286	
HRC	54	53	52.5	52	52	52.5	53.5	54.5	55.5	56	52	46	39	30	
R	N/mm ²	2010	1950	1915	1880	1880	1915	1980	2040	2115	2160	1880	1520	1220	950
Tempering at °C	50	100	150	200	250	300	350	400	450	500	550	600	650	700	

Thermal expansion	10 ⁻⁶ • K ⁻¹	11.5	12.0	12.2	12.5	12.9	13.0	13.2		
Modulus of elasticity long.	GPa	215				183	176	165		
Modulus of elasticity tang.	GPa	82				70	68	63		
R hardened and tempered for	N/mm ²	1600				1400	1300	1100		
Rp 0.2	N/mm ²	1450				1200	1100	900		
R hardened and tempered for	N/mm ²	1200				1120	1000	850		
Rp 0.2	N/mm ²	1060				900	800	650		
Testing at	°C	20	100	200	300	400	500	600	650	700

Testing at C	Specific heat capacity J/(Kg•K)	Density Kg/dm ³	Thermal conductivity W/(m•K)	Specific electric resist. Ohm•mm ² /m	Electrical conductivity Siemens•m/mm ²
20	460	7.80	25.0	0.52	1.92
500	550	7.64	28.5	0.86	1.16
600	590	7.60	29.3	0.96	1.04

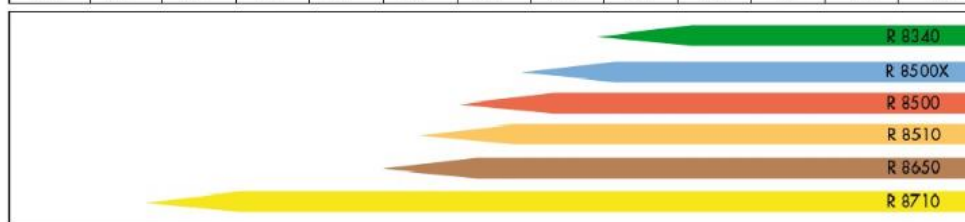
Chrome-molybdenum-vanadium alloyed tool steel (designed for matrix, moulds and punches for high-working temperatures)

- high resistance to thermal shock and to hot cracking
- good mechanical characteristics and toughness in hot condition
- good resistance to tempering
- very low segregation and excellent machinability
- applications: dies for aluminium die-casting, dies subject to low pressure, chill moulds for gravity casting, containers and dies for extrusion, dies for aluminium extrusion, extrusion press blocks, injection moulds

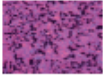


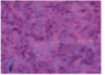
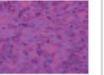

Attachment 6

Fyzikální vlastnosti	Jednotky	R 8340	R 8500	R 8510	R 8650	R 8710
Hustota	g/cm ³	1.72	1.77	1.83	1.84	1.88
Pórovitost	%	15	13	10	10	10
Zrnitost	μm	15	10	10	7	3
Velikost pórů μm		2	1.5	1.5	0.8	0.6
Magnetic. vodivost	x10 ⁻² cm ² /s	15	10	4	3	1
Tvrdost	Rockwell B	HR 10/100	HR 5/100	HR 5/100	HR 5/100	HR 5/100
	Shore	50	65	70	75	80
Pevnost v ohybu	N/mm ²	45	50	60	65	85
E modul	kN/mm ²	10,5	10,5	11,5	12,5	13,5
Specifický elektrický odpor	μΩm	12	14	13	14	13
Tepelná vodivost	W/mK	90	80	100	90	100
Teplot.roztažnost (20-200° C)	x 10 ⁻⁶ /K	2,9	3,9	4,0	3,9	4,7
Maximální obsah nečistot	%	0.02	0.02	0.02	0.02	0.02

Ra max (μm)	0.4	0.56	0.80	1.12	1.6	2.24	3.15	4.5	6.30	9.00	12.5	18.0
VDI	12	15	18	21	24	27	30	33	36	39	42	45



Material Type	Avg Density (g/cc)	Specific Resistance (μΩm)	Flexural Strength (MPa)	Hardness (Shore)	Avg Grain Size (μm)
HK-0	1.8	12	39	56	13
HK-1	1.85	11	50	58	11
HK-10	1.84	12	52	54	9
HK-15	1.83	12.5	54	62	7
HK-20	1.86	12	66	60	6
HK-2	1.82	13.5	64	64	7
HK-75	1.82	16.5	66	72	4
HK-3	1.84	15.5	88	78	2
HK-6	1.86	12	85	68	3
HK-2C	2.79	2.3	77	67	7
HK-6C	2.68	3.1	110	70	3

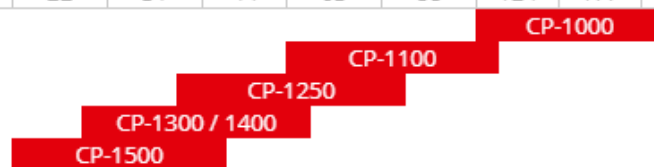
Feature	Unit	Rough CP-1000®	Universal CP-1100®	Universal CP-1250®	Fine CP-1300®	Fine CP-1400®	Superfine CP-1500®
Grain size	μØ	12	7	5	4	3	3
Bulk density	g/cm³	1,80	1,83	1,85	1,87	1,93	1,88
Hardness	shore	60	66	76	68	83	75
Elect. resistivity	μΩm	13,0	15,0	18,0	14,5	15,0	17,5
Flexual strength	MPa (N/mm²)	50	54	63	61	74	95
Compr. strength	MPa (N/mm²)	103	114	118	137	176	190
Tensile strength	MPa (N/mm²)	33	35	51	40	48	n/a
Coeff. of thermal expansion (cte)	k x 10-6 / °C	5,0	5,0	5,6	5,6	6,0	5,3
Thermal conductivity	W/mK	105	105	70	90	90	n/a
Ash content	%	0,05	0,05	0,10	0,10	0,10	0,10
Max. bloc size	mm	1020x 630x 350mm	1020x 630x 350mm	1020x 630x 350mm	950x 380x 155mm	620x 305x 70mm	1000x 350x 140 mm
Structure	x100						

The values of physical properties shown above are approximate. Producer of the graphite grades is the oldest Japanese producer. CP-Handels is the exclusive dealer within Europe.

CP-1250 is the follow up grade of CP-1200. CP is a registered trade mark of CP-Handels GmbH.

Surface finishing

VDI 3400	12	15	18	21	24	27	30	33	36	39	42	45
Ra μm	0,40	0,56	0,80	1,12	1,60	2,24	3,15	4,50	6,30	9,00	12,50	18,00
Ra μin	16	22	31	44	63	88	124	177	248	354	492	709



hint:

Latest generators of EDM sinking machines reduced the wear of electrodes significant. Also with universal grades are sharp edges and smoother surfaces possible. Please call us for further advice. All EDM machine producers have experience with our graphite grades.

