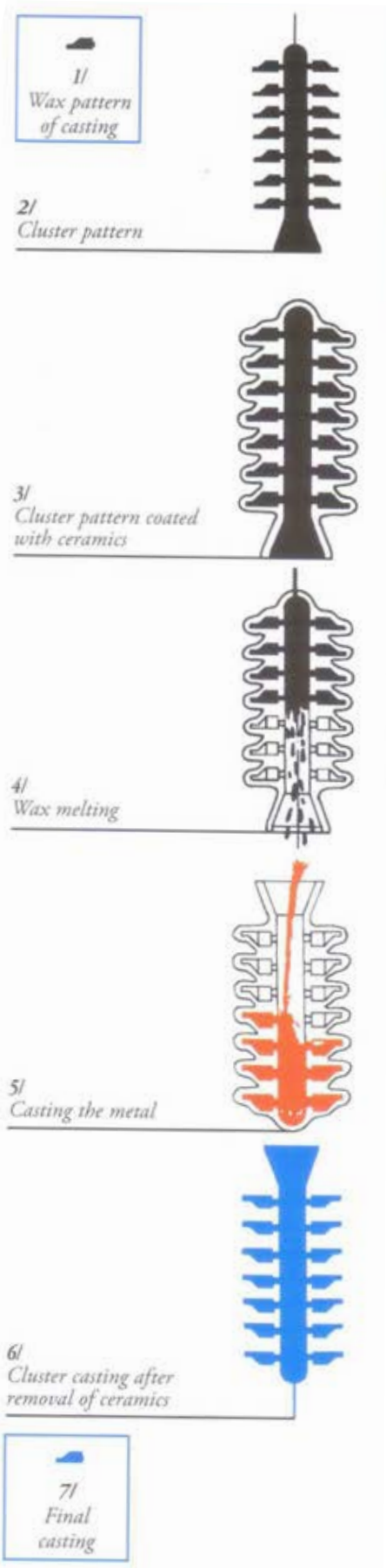
KDYNIUM

Precision casting production

by the investment mould process

Kdynium joint-stock company Kdyně



Kdynium joint-stock company , is engaged in production of casting by investment casting process. The process is based on the wax pattern of an intended final casting being coated with refractory ceramic material.After drying, the wax melts and runs off resulting in a mould. Molten metal is cast into the mould and allowed to cool. Then the ceramic shell is removed and castings separated from the running system and cleaned.

The high quality of the casting surface and dimensional accuracy are the key benefits of this process. The high quality ceramic materials are capable of reproducing the smallest detail and the one piece shell mould ensures precision castings, free of flash risers and mould joints.

The Kdyně foundry has been providing casting for a wide range of customers since 1954.

Experience over the years has shown that full advantage of precision casting can be taken and the best results achieved, if the designers and engineers who are responsible for products, assemblies and systems incorporating the castings, collaborate extensively with our foundry engineers, who are the leading specialists in this field. Extremely intricate and complex castings can thus be manufactured using the full capabilities of the process. Quality castings can be produced at low cost with optimum shapes, appropriate edge radii and ribbing or lightening. Very often a simple modification makes it possible to combine various parts of the product into one unit. Complicated cavities can be created by ingenious design of the investment mould together with various cores. Requirements for castings having thin walls (less than 2 mm), narrow slots and/or deep small diameter holes should however always be discussed with our foundry specialists.

The quality of the casting surface largely depends on the manner the casting is cleaned and finished. The usual surface finish is Ra 3,2-12,5. Requirements for finer surface finish should be discussed with the foundry.

Accuracy of casting is shown in Table 1.

Casting materials are listed in a separate Appendix. Other materials can be cast by agreement with the foundry.

Casting weights range from several grams to approximately 15 kg or exceptionally even more.

We will provide you with a quotation against your enquiry and this will include a casting design. Our foundry is interested in obtaining all the important information associated with the product safety and our responsibility for it under international standards not later than beginning of batch production.

Sample castings will be made after acceptance of your order, and batch production quantities will be manufactured after approval of sample castings.

We will design and manufacture tooling for both sample and batch production. The equipment cost will be calculated separately.

We aim to achieve customer satisfaction by providing castings and component of good quality as well as delivering on time.

Regarding to customer requirements and extending the range we have introduced since 2009 **machining casting.**

The quality control system in use is certificated according to **QMS-ISO/TS16949:2009** , **EMS-ISO14001** , including material certificates.

The KDYNIUM team of skilled specialists are always ready to provide consultancy and assistance in solving technical issures related to design and usage of precision castings.

High volume production steps

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Construction and design	- ProEngineer, AUTOCAD software
Production of tooling	- cast from zinc alloy using a steel model - steel or from aluminium alloys machined on traditional or CNC machines
Manufacture of wax patterns	- 5 kind of injection machines
De-waxing	- semiautomatic autoclaves - boilerclaves
Production of ceramic shells	- 4 continuous lines with conveyor - robot shelling system
Firing of ceramic moulds	- tunnel electric resistance furnaces - gas rotary furnace
Melting and casting	- medium frequency induction melting furnaces, atmospheric air casting from ladle - medium frequency induction roll-over furnaces
Casting removal from runner systems	- vibrators - band saws - cutting machines
Chemical cleaning of castings	- automatic line,NaOH solution
Finishing of castings	- 7 various types of shot blast machines - belt and disc grinding machines
Other services	- machining - heat treatment [subcontracted] - surface finishing [subcontracted]
Inspection and testing equipment	- emission spectrometer - industrial X-ray - hardness testers - tensile testing machine - metallography microscope - NDT equipment [penetrant liquids]

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Wax injection

Wax assembly

Robot shelling system

Melting and casting

Carburizing steels

	Marking	C	Mn	Si	Cr	Ni	Mo	V	W	WNr.	Acronym
x	42 2828	0,11 0,19	0,60 1,00	0,20 0,50	0,90 1,30	max. 0,40	Cu max. 0,30	0,20 0,35			GS-15 CrV 4
	14 220	0,14 0,19	1,10 1,40	0,17 0,37	0,80 1,10					1.7131	GS-16 MnCr 5
	16 220	0,14 0,19	0,70 1,00	0,17 0,37	0,80 1,10	1,30 1,60				1.5919	GS-15 CrNi 6
x	42 2842	0,10 0,20	0,60 0,90	max. 0,60	0,80 1,10		0,20 0,35			1.7242	GS-16 CrMo 4
	42 2603	0,17 0,25	0,50 0,90	0,20 0,50	max. 0,30	max. 0,40	Cu max. 0,30	Cr+Ni+Cu max. 0,90		1.1150	Ck 22.8
	1.7321	0,17 0,22	0,70 1,00	max. 0,40	0,30 0,60		0,40 0,50			1.7321	GS-20 MoCr 4

Heat-treatable steels

	Marking	C	Mn	Si	Cr	Ni	Mo	V	W	WNr.	Acronym
x	42 2809	0,20 0,28	1,20 1,60	0,20 0,50						1.1160	22 Mn 6
	15 230	0,24 0,34	0,40 0,80	0,17 0,37	2,20 2,50			0,10 0,20			30 CrV 8
x	42 2605	0,28 0,38	0,40 0,80	0,20 0,50						1.0528	C 30
x	42 2848	0,28 0,38	0,40 0,70	0,30 0,60	2,8 3,50		0,40 0,70	0,12 0,25		1.8519	33 CrMoV 9
	1.6511	0,32 0,40	0,50 0,80	0,30 0,50	0,90 1,20	0,90 1,20	0,15 0,25			1.6511	GS-36 CrNiMo 4
x	1.7231	0,38 0,45	0,60 1,00	max. 0,60	0,80 1,20		0,15 0,30			1.7231	G 42 CrMo 4
	42 2660	0,40 0,50	0,40 0,80	0,20 0,50						1.1191	GS-Ck 45
x	42 2819	0,45 0,55	0,60 0,90	0,60 0,90						1.1206	Ck 50
x	42 2830	0,45 0,55	0,60 1,00	0,30 0,80	0,80 1,10			0,15 0,25		1.8159	GS-50 CrV 4
	12 060	0,52 0,60	0,50 0,80	0,17 0,37	max. 0,25	max 0,30	Cu max. 0,30			1.0535	C 55
	15 261	0,55 0,62	0,80 1,10	0,17 0,37	0,90 1,20			0,10 0,2		1.8161	58 CrV 4
x	42 2825	0,95 1,05	0,40 0,70	0,20 0,40	1,25 1,50					1.2067	100 Cr 6
	1.0619	0,18 0,23	0,50 1,20	max. 0,60						1.0619	GP 240 GH
x	1.7230	0,30 0,37	0,50 0,80	max. 0,60	0,80 1,20		0,15 0,30			1.7230	G 34 CrMo 4
	42 2855	0,38 0,48	0,60 1,00	0,50 0,80	0,60 0,90	1,80 2,10	0,35 0,45				G 43 NiCrMo 834

Stainless steels austenitic

	Marking	C	Mn	Si	Cr	Ni	Mo	V	W	WNr.	Acronym
x	42 2931	max. 0,15	0,50 1,20	0,50 1,20	18,00 21,00	8,00 11,00				1.4312	G-X 10 CrNi 18-8
x	42 2942	max. 0,20	0,50 1,20	0,75 1,50	18,00 20,00	9,00 11,00	2,00 2,50			1.4410	G-X 10 Cr NiMo 18-9
x	1.4308	max. 0,07	max. 1,50	max. 1,50	18,00 20,00	8,00 11,00				1.4308	G-X 5 CrNi 19-10
	316 L	max. 0,03	max. 2,00	max. 1,00	16,00 18,00	10,00 14,00	2,00 3,00			1.4404	G-X 2 CrNiMo 17-12-2
	1.4408	max. 0,07	max. 1,50	max. 1,50	18,00 20,00	9,00 12,00	2,00 2,50			1.4408	G-X 5 CrNiMo 19-11-2
x	1.4581	max. 0,07	max. 1,50	max. 1,50	18,00 20,00	9,00 12,00	2,00 2,50	Nb min. 8x % C max. 1,8%		1.4581	G-X 5 CrNiMoNb 19-11-3
x	CF3	max. 0,03	max. 1,50	max. 2,00	17,00 21,00	8,00 12,00	max. 0,50			1.4309	304 L

Stainless ferritic / martensitic steels

	Marking	C	Mn	Si	Cr	Ni	Mo	V	W	WNr.	Acronym
	42 2905	max. 0,15	0,30 0,70	0,30 0,70	12,00 14,00	max. 1,00				1.4006	G-X 10 Cr 13
	42 2906	0,15 0,30	max. 0,70	max. 0,70	12,00 14,00	max. 1,00				1.4027	G-X 20 Cr 14
	42 2907	0,30 0,40	0,40 0,90	0,30 0,70	12,00 14,00					1.4028	G-X 30 Cr 13
x	1.4122	0,33 0,43	max. 1,00	max. 1,00	15,50 17,50	max. 1,00	0,90 1,30			1.4122	G-X 35 CrMo 17
x	17 042	0,90 1,05	max. 0,90	max. 0,70	16,00 18,00						98 Cr 17

Austenitic - Ferritic steels (Duplex)

	Marking	C	Mn	Si	Cr	Ni	Mo	Cu		WNr.	Acronym
x	CD4MCu	max. 0,04	max. 1,00	max. 1,00	24,5 26,5	4,75 6,00	1,75 2,25	2,75 3,25		ASTM	A351/A351M

Material
Informative review

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Tool steels

	Marking	C	Mn	Si	Cr	Ni	Mo	V	W	WNr.	Acronym
x	42 2824	0,55 0,65	0,60 0,90	1,50 1,90	0,70 1,00	max. 0,35					58 Cr 4
	42 2992	0,75 0,90	max. 0,50	max. 0,70	3,80 4,50	max. 0,25	0,70 1,00	2,00 2,70	9,50 11,00	1.3316	S-9-1-2
	19 712	1,15 1,30	0,40 0,70	0,15 0,35	1,45 1,80	max. 0,35		0,10 0,20	1,20 1,60	1.2519	110 Wcr V 5
	42 2998	1,80 2,05	0,20 0,45	0,20 0,45	11,00 12,50	max. 0,50				1.2080	X-210 Cr 12
x	42 2999	1,80 2,05	0,20 0,45	0,20 0,45	11,00 12,50	max. 0,50		0,15 0,30	0,60 1,00		192 CrWV 12
	1.3343	0,86 0,94	max. 0,40	max. 0,45	3,80 4,50		4,70 5,20	1,70 2,00	6,00 6,70	1.3343	S-6-5-2

Heat resisting steel

	Marking	C	Mn	Si	Cr	Ni	Mo	V	W	WNr.	Acronym
	1.4873	0,40 0,50	0,80 1,50	2,00 3,00	17,00 19,00	8,00 10,00			0,80 1,20	1.4873	G-X 45 CrNiW 189
	42 2952 M	max. 0,20	max. 1,50	0,45 1,75	24,00 27,00	20,00 22,00	max. 0,50			1.4840	G-X 15 CrNi 25 20
	42 2932	0,15 0,35	max. 1,50	1,00 2,00	17,00 20,00	8,00 11,00				1.4825	G-X 25 CrNiSi 189
	42 2936 M	0,30 0,45	0,50 1,50	0,75 1,75	23,00 26,00	14,00 16,00	max. 0,30			1.4837	G-X 40 CrNiSi 25 12
x	42 2952	0,30 0,45	0,50 1,20	0,75 1,50	24,00 27,00	20,00 22,00	max. 0,50			1.4848	G-X 40 CrNiSi 25 20

Cast irons

Marking	C	Mn	Si	Cr	Ni	Mo	V	W	WNr.	Acronym
EN-GJS-400-15	chemical composition is not prescribed								0,7040	GGG 40
EN-GJS-500-7	chemical composition is not prescribed								0,7050	GGG 50
EN-GJS-600-3	chemical composition is not prescribed								0,7060	GGG 60
EN-GJS-700-2	chemical composition is not prescribed								0,7070	GGG 70

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Material Informative review

Aluminium alloys

	Marking	Si	Mg	Ti	Cu	Fe	Mn	Ni	Zn	AL	Acronym
	424334	6,50 7,50	0,25 0,45	0,10 0,20	max. 0,10	max. 0,25	max. 0,10	max. 0,05	max 0,10	residue	AlSi7Mg0,3

Special alloys

	Marking	C	Mn	Si	Cr	Ni	Mo	W	Cu	Co	Fe
x	REAL 096	1,10 1,40	max. 0,30	0,50 2,50	25,00 28,00			3,50 5,00		61,00 65,00	max. 5,00
x	STELLIT	2,00 2,50	max. 1,00	0,40 2,00	26,00 33,00		max. 1,00	11,00 14,00		48,00 55,00	max. 3,00
	3Cr30	3,00 3,20	1,10 1,30	0,60 0,80	29,00 31,00						
x	Cr21	2,90 3,20	0,30 0,60	0,50 0,80	20,00 22,00						

Certain other materials can be used by prior agreement according to customer requirements and the function of the casting. Similar material under DIN, EN standards is given in the colomn "WNr." and "Acronym".

Note:

Precision of castings according to ČSN EN ISO 8062-3

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Table 1

Linear dimensional casting tolerances - DCT

Nominal size (mm)		Dimensional casting tolerance grade - DCTG					
		DCTG 4	DCTG 5	DCTG 6	DCTG 7	DCTG 8	DCTG 9
-	≤ 10	0,26	0,36	0,52	0,74	1	1,5
> 10	≤ 16	0,28	0,38	0,58	0,78	1,1	1,6
> 16	≤ 25	0,3	0,42	0,58	0,82	1,2	1,7
> 25	≤ 40	-	0,46	0,64	0,9	1,3	1,8
> 40	≤ 63	-	-	0,7	1	1,4	2
> 63	≤ 100	-	-	0,78	1,1	1,6	2,2
> 100	≤ 160	-	-	0,88	1,2	1,8	2,5
> 160	≤ 250	-	-	1	1,4	2	2,8
> 250	≤ 400	-	-	1,1	1,6	2,2	3,2

Table 2

Straightness casting tolerance

Nominal size (mm)		Geometrical casting tolerance grade - GCTG
		GCTG 5
-	≤ 10	0,27
> 10	≤ 30	0,4
> 30	≤ 100	0,6
> 100	≤ 300	0,9
> 300	≤ 400	1,4

Table 3

Flatness casting tolerance

Nominal size (mm)		Flatness casting tolerance grade - GCTG	
		GCTG 4	GCTG 5
-	≤ 10	0,27	0,4
> 10	≤ 30	0,4	0,6
> 30	≤ 100	0,6	0,9
> 100	≤ 300	0,9	1,4
> 300	≤ 400	1,4	2

Table 4

Circularity, parallelism, perpendicularity and symmetry casting tolerance

Nominal size (mm)		Geometrical casting tolerance grade - GCTG		
		GCTG 3	GCTG 4	GCTG 5
-	≤ 10	0,27	0,4	0,6
> 10	≤ 30	0,4	0,6	0,9
> 30	≤ 100	-	0,9	1,4
> 100	≤ 300	-	1,4	2
> 300	≤ 400	-	2	3

Table 5

Coaxility geometrical casting tolerance

Nominal size (mm)		Coaxility geometrical casting tolerance grade - GCTG	
		GCTG 3	GCTG 4
-	≤ 10	0,4	0,6
> 10	≤ 30	-	0,9
> 30	≤ 100	-	1,4
> 100	≤ 300	-	2
> 300	≤ 400	-	3

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Precision of castings according to DIN ISO 2768

General tolerances for straightness and planeness (dimensions in mm)

Accuracy class	Tolerances for straightness and planeness for the range of nominal lengths				
Marking	to 10	over 10 to 30	over 30 to 100	over 100 to 300	over 300 to 400
H	0,02	0,05	0,1	0,2	0,3
K	0,05	0,1	0,2	0,4	0,6
L	0,1	0,2	0,4	0,8	1,2

General tolerance for squareness

Accuracy class	Limit deviations for angles for the range of the shorter arm		
Marking	to 100	over 100 to 300	over 300 to 400
H	0,2	0,3	0,4
K	0,4	0,6	0,8
L	0,6	1,0	1,5

General tolerances for symmetry

Accuracy class	Squareness tolerances for the range of nominal lengths of the shorter side		
Marking	to 100	over 100 to 300	over 300 to 400
H	0,5		
K	0,6		0,8
L	0,6	1,0	1,5

General tolerances for circular runout

Accuracy class	Circular runout tolerance
H	0,5
K	0,2
L	0,5

Limit deviations for longitudinal dimensions, with the exception of edge bevels (dimensions in mm)

Accuracy class		Limit deviations				
Marking	Term	0,5 to 3	over 3 to 6	over 6 to 30	over 30 120	to over 120 to 400
f	Fine	± 0,05	± 0,05	± 0,1	± 0,15	± 0,2
m	Middle	± 0,1	± 0,1	± 0,2	± 0,3	± 0,5
c	Gross	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2
v	Very gross	-	± 0,5	± 1,0	± 1,5	± 2,5

Limit deviations for edge bevels and radii

Accuracy class		Limit deviations		
Marking	Term	0,5 to 3,0	over 3 to 6	over 6
f m	Fine Middle	± 0,2	± 0,5	± 1,0
c v	Gross Very gross	± 0,4	± 1,0	± 2,0

Limit deviations for angle dimensions

Accuracy class		Limit deviations for angles for the range of the shorter arm			
Marking	Term	to 10	over 10 to 50	over 50 to 120	over 120 to 400
f m	Fine Middle	± 1°	± 0° 30´	± 0° 20´	± 0° 10´
c	Gross	± 1°	± 0° 30´	± 0° 20´	± 0° 10´
v	Very gross	± 3°	± 2°	± 1°	± 0° 30´

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KDYNIUM joint - stock company works according to the international standards for quality control meeting customers demands for quality , price , and delivery.

Spectrometer

Tensile test

KDYNIUM has introduced the certified quality control system, which complies with the standards: QMS-ISO/TS16949:2009, EMS-ISO14001, and including material certificates.

Quality control inspection and testing equipment enable the issue of check certificates by ČSN EN 10 204 standard to approve material composition, dimensional check, crack detection tests, mechanical tests, microstructure, and other tests agreed with the customer.

Inspection and testing results are statisti - cally documented and filed in archives. The quality control department continually analyses the quality control system, which include internal audits. Amendments are recorded, analysed and evaluated.

X-ray detection

KDYNIUM management provides periodical lectures and training of all employees engaged in the field of quality. Satisfaction of all our customers is the goal and criterion of our job.

3-Dimension measuring

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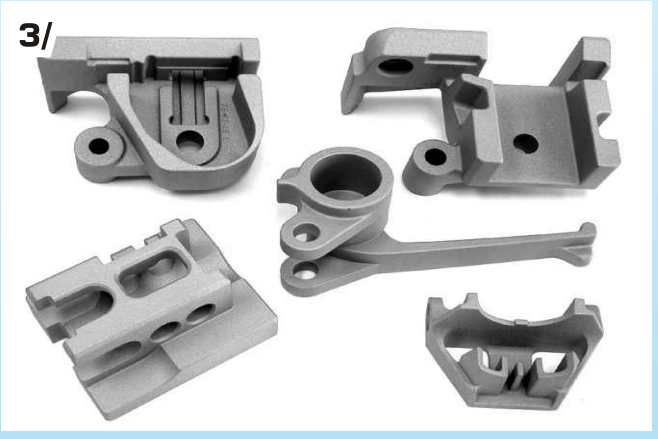
1/ Automotive industry

2/ Pump parts

3/ Special casting

4/ Armaments industry

5/ Special casting



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