

Induction Heat Treatments (Manchester) Ltd.

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INDUCTION HARDENING DATA SHEET

Induction hardening is a method of heat treatment which is used to heat the surface of components in selected areas. The heat is generated in the surface of components by an alternating magnetic field, which because of the high power density achieves rapid surface heating. The materials used have a hardenability in their own right due to the alloying elements they contain, as opposed to carburising and nitriding processes which chemically enrich the surface with carbon and nitrogen respectively to obtain the required surface properties. The core properties resulting from prior hardening and tempering remain unaffected by the induction process.

Induction heating involves passing a high frequency alternating current through a suitably shaped coil to induce a current flow in the component surface. The depth of hardening is controlled by the parameters of the induction process. Several means of manipulating the coil relative to the workpiece are employed to process components of different shapes. One method is called single shot hardening where the whole of the area required hard is heated simultaneously followed by quenching.

INDUCTION HARDENING PROCESSES

Another method is called progressive hardening. This involves the component being heated whilst the heating coil is being progressed along the workpiece. The moving coil is followed immediately by a quench spray which then hardens the workpiece. Selective hardening of the component can be achieved by a combination of coil design and component manipulation.



SUITABLE COMPONENTS

The following list is typical of the components which are induction hardened though not complete. Induction hardening of gears, shafts, rolls, bearing journals, slide ways, cams, camshafts, chain sprockets, rocker levers, excavator pins, track pins, track rollers, bearing cage pins, ball pins, housings, valves and valve seats, splined shafts and bores, tool holders, rack bars, conveyor rollers, pawls, can be heat treated by the induction process.

COMMON TYPES OF MATERIALS SUITABLE FOR INDUCTION HARDENING

Any material which has sufficient alloying elements to achieve the required properties is suitable for induction hardening. Components which have been carburised prior to induction hardening are also suitable. Induction hardening is most cost effective when the components exceed 0.5 kilo in mass or where "stopping off" would be required if a furnace treatment were to be carried out instead. Sometimes to increase material toughness components are tempered after induction hardening. Other materials can be induction heat treated please enquire if you have a requirement which uses a material not on this list.

BS 970 En Series	BS 970 Oct 1971	As Hardened Range RC
En3A	070M20	20—30 RC
En5A	080A30	35—45 RC
En8	080M35	45—53 RC
En8D	080M45	53—58 RC
En43B	080M47	56—62 RC
En9	080M55	59—64 RC
En16	605M36	57—62 RC
En19	709M40	58—63 RC
En24	817M40	52—58 RC
En26	826M40	56—60 RC
EN31	535A99	60—65 RC
EN56D	420S45	45—52 RC

HARDNESS CONVERSION CHART

The following table is to be used as a guide and there is no accurate substitute for using the actual test required.

Rockwell C	Rockwell A	Vickers	Brinell	Tons/in ²	N/mm ²
70	86.5	1076	-	-	-
69	86.0	1004	-	-	-
68	85.6	940	-	-	-
67	85.0	900	-	-	-
66	84.5	865	-	-	-
65	83.9	832	739	-	-
64	83.4	800	722	-	-
63	82.8	772	706	-	-
62	82.3	746	688	-	-
61	81.8	720	670	-	-
60	81.2	697	654	-	-
59	80.7	674	634	132	2010
58	80.1	653	615	129.5	1990
57	79.6	633	595	126.6	1955
56	79.0	613	577	123.6	1910
55	78.5	595	560	120.6	1865
54	78.0	577	543	117.5	1815
53	77.4	560	525	114.7	1770
52	76.8	544	512	112.3	1735
51	76.3	528	496	110.0	1700
50	75.9	513	481	108.0	1670
49	75.2	498	469	105.0	1620
48	74.7	484	455	102.0	1575
47	74.1	471	443	99.5	1540
46	73.6	458	432	97.3	1505
45	73.1	446	421	96.0	1480
44	72.5	434	409	92.0	1420
43	72.0	423	400	90.0	1390
42	71.5	412	390	87.3	1350
41	70.9	402	381	85.0	1315
40	70.4	392	371	82.0	1265
39	69.9	382	362	80.0	1235
38	69.4	372	353	78.5	1215
37	68.9	363	344	77.0	1190
36	68.4	354	336	75.5	1165
35	67.9	345	327	73.7	1130
34	67.4	336	319	71.9	1110
33	66.8	327	311	70.0	1080
32	66.3	318	301	68.4	1060
31	65.8	310	294	66.6	1030
30	65.3	302	286	64.9	1000
29	64.6	294	279	63.4	980
28	64.3	286	271	62.0	960
27	63.8	279	264	60.5	935
26	63.3	272	258	59.0	915
25	62.8	266	253	58.0	895
24	62.4	260	247	56.6	875
23	62.0	254	243	55.5	860
22	61.5	248	237	54.3	840
21	61.0	243	231	53.0	820
20	60.5	238	226	51.0	790