HAMANAKA CHAIN

Company Profile

TECHNOLOGY

Only one company in Japan for manufacturing of large size chain

Joint Development of Materials with Nippon Steel Corporation

The many years of chain manufacturing experience and the feedback that HAMANAKA CHAIN is constantly receiving from customers have been invaluable in the research and development of the steel materials used in chain manufacturing that has been carried out in conjunction with Nippon Steel Corporation, which has many years of steel-manufacturing expertise. The resulting steel, which is used in the manufacture of R5 chain, is the fruit of much hard work carried out by researchers in both companies.

Flash-butt welding

Flash-butt welding is a welding technique that melts the end face of steel and joins the steel's ends with high pressure. Applying an electric current to both ends of a piece of steel, bent in the shape of the letter "C" and gradually bring it closer. An electric discharge occurs and generating sparks when both ends are lightly touched. After that, this process is repeated several times to melt both ends, and a large force is applied to join the ends of steel. It cannot be welded using standard welding methods since chain links have a wide cross section. For this reason, HAMANAKA CHAIN introduced a flash-butt welding machine for the first time in Asia, which has made it possible to achieve high-quality uniform welding of wide cross-sections. The flash-butt welding is also used as a welding method for railway rails, which require high strength.

Flash-butt welding Enlarged

Flash-butt welding completed

Heat treatment

Heat treatment is an important process that determines the mechanical properties of chains. Strength is increased by the quenching, and the tempering restores the toughness lost by the quenching. In order to make the quality of the entire chain uniform through the heat treatment, HAMANAKA CHAIN have adopted a continuous vertical type heat treatment furnace.
Accessories that cannot be used in the continuous vertical type heat treatment furnace such as shackles, are heat-treated in a batch type heat treatment furnace.
Especially in tempering, very slight differences in temperature can lead to differences in the mechanical properties of the chain. Therefore, HAMANAKA CHAIN have introduced a special electric panel heater that can strictly control the temperature.

Vertical Type Heat Treatment Furnace

Batch Type Heat Treatment Furnace

SAFETY AND SECURITY FOR HAMANAKA CHAIN CUSTOMERS

Conducting a wide range of strict tests to provide safety and security

Stud expansion

The stud expansion is the process of tightening the studs more strongly. By pressing the stud, the stud can be tightly attached to the base material and tightened.

Stud Expansion

After Stud Expansion

FEA analysis
(Finite Element Analysis)

By color-coding the distribution of the load applied to link of chain is clarified when a load is applied to the chains.
It is possible to visually indicate where stress is concentrated.

SN curve

Based on the fatigue test data, the numbers obtained in the test are plotted on a graph showing the force on the vertical axis and the number of cycles to fracture on the horizontal axis. The S-N curve is a line that connects the plotted points.

Fatigue test

The fatigue test is a test to investigate the limit (fatigue strength) that causes the destruction of the specimen. Repeated load is applied to a specimen taken from a steel material and the loading determine the numerical values until it fracture.

SSRT test
(Slow Strain Rate Technique)

The SSRT test is a test in which a specimen is subjected to a tensile load at a constant low strain rate in a corrosive environment. The degree of embrittlement is evaluated by observing the fracture elongation and fracture surface.

CTOD test
(Crack Tip Opening Displacement)

The CTOD test is one of test methods to determine fracture toughness of a material with a crack, and a test to determine crack tip opening displacement to generate unstable fracture (limit CTOD value).

PRODUCT CERTIFICATE

Our manufacturing technology is a proof of quality.

Compliance with the International Organization for Standardization (ISO)

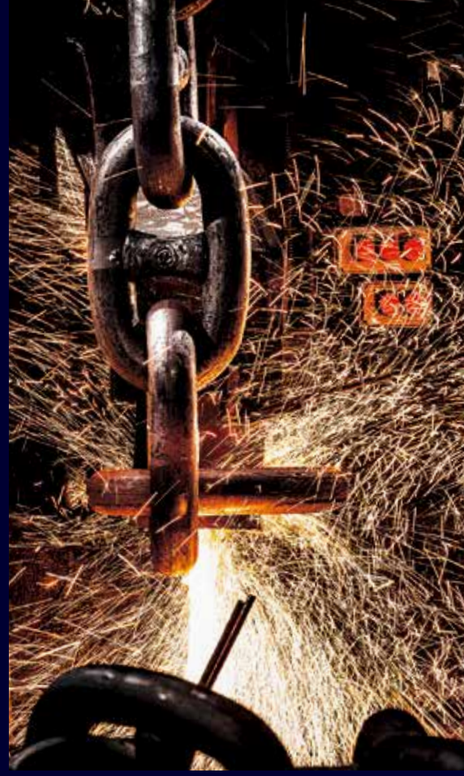
HAMANAKA CHAIN have acquired ISO9001 (Quality), ISO14001 (Environment), and ISO45001 (Health and Safety), and we are sure that we meet and practice the requirements. We gather related departments and conduct an integrated management system meeting twice a month in order to ensure the management system.

Important processes are regulated and managed as "special processes"

HAMANAKA CHAIN position flash-butt welding and heat treatment as special processes such which have a particularly large impact on quality among the various processes. In-house qualified personnel are engaged in the special processes, and work management is carried out using check sheets. We check the mechanical properties of the chains in a daily basis.

Accuracy control of load test equipment

HAMANAKA CHAIN products are manufactured and inspected according to the regulations of classification societies. Accuracy and precision are managed by having a calibration of the load test equipment once a year by external specialized organization.



Issuance of quality certificate

HAMANAKA CHAIN deliver the products with certificates issued by classification societies after product inspection in accordance with classification regulation.

HAMANAKA CHAIN PAY STRICT ATTENTION TO QUALITY CONTROL AND NEVER FAIL TO CARRY OUT THOROUGH QUALITY CHECKS.

Manufacturing Process

1 Material cutting → 2 Pre - heating → Descaling → 3 Carousel → 4 Stud welding → Pre-inspection → 5 Heat treatment (quenching, tempering) → Shot blasting → Load tests → Final inspection → 6 Painting Packing Shipping

Stringent Quality Control

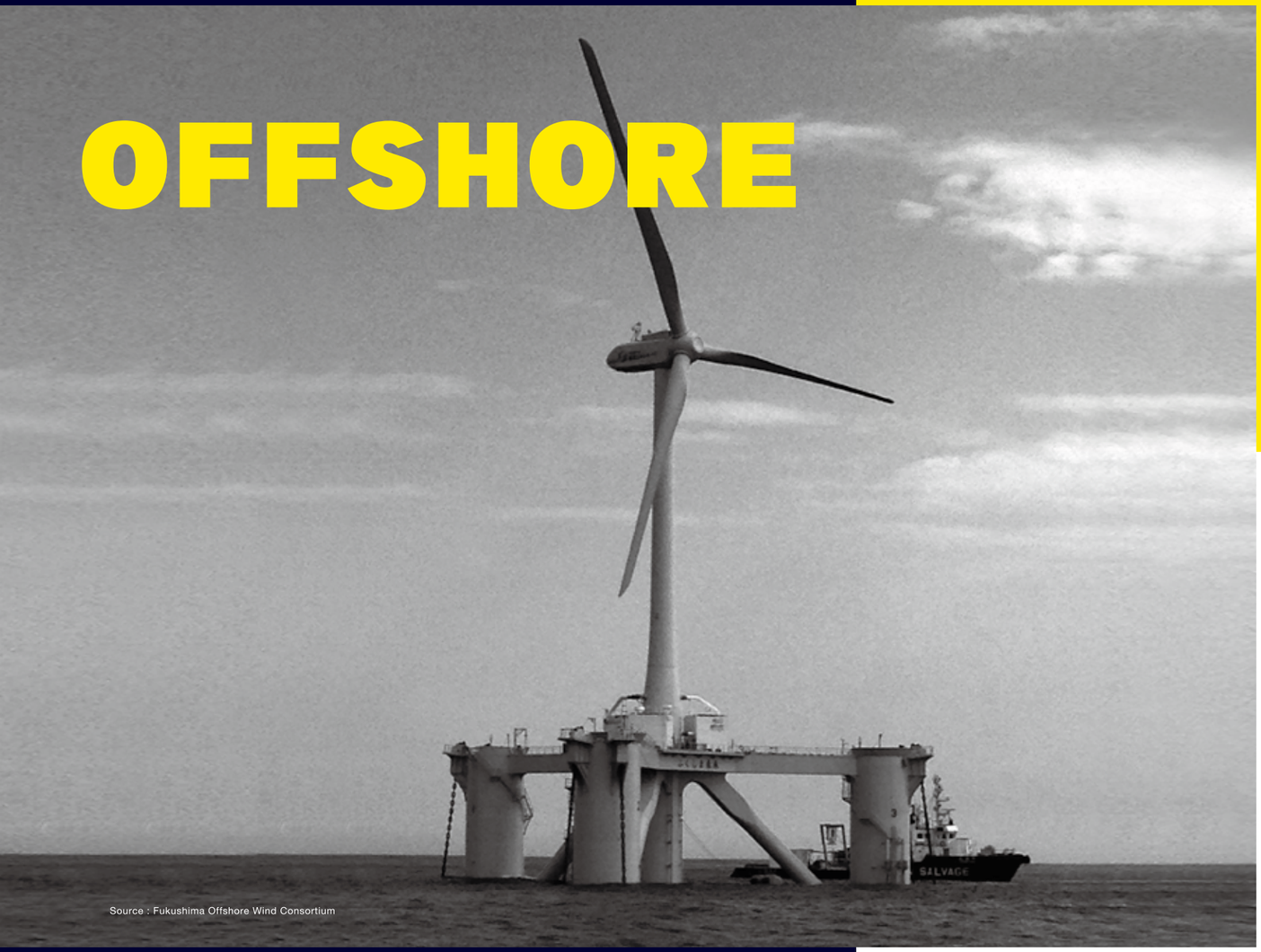
Strict checks are carried out on both raw materials and finished products to ensure that there are no external or internal defects.

Magnetic particle inspection.

Ultrasonic inspection

Mechanical testing

OFFSHORE



Source : Fukushima Offshore Wind Consortium

High-Strength Offshore Mooring Chain

Climate change due to global warming is causing large-scale hurricanes and other natural disasters throughout the world, often causing extensive damage to offshore installations. New laws, ordinances, regulations and standards are being introduced to improve safety and ensure overall strength and interest is rapidly growing regarding ultra-strong chain. There are also calls for super high-performance chain for use in even more extreme environments, such as those found in ultra-deep sea and polar regions.

Source : Japan Drilling Co., Ltd.

Mechanical Properties

Grade	Tensile test				Impact test		
	Yield point (N/mm^2) minimum	Tensile strength (N/mm^2) minimum	Elongation (%) minimum	Reduction of area (%) minimum	Testing Temperature (°C)	Impact Joules(J)	
						Base minimum	Weld minimum
R3	410	690	17	50	0/-20	60/40	50/30
R3S	490	770	15	50	0/-20	65/45	53/33
R4	580	860	12	50	-20	50	36
R4S	700	960	12	50	-20	56	40
R5	760	1000	12	50	-20	58	42

SHIPS

Source : Sumitomo Heavy Industries Marine&Engineering Co.,Ltd.

Expanding chain applications beyond use for ships and floating structures

Anchor chains are installed on all ships. Anchors connected to the chains are dropped into the sea to prevent ship from drifting when the ship is anchored.
Therefore the chains should never be broke off. Furthermore, chains which are used for various purpose other than ships, such as GPS buoys and floating piers, exist to protect people's lives and safety.

Source : Sumitomo Heavy Industries Marine&Engineering Co.,Ltd.

Source : Hitachi Zosen Corporation

Mechanical Properties

Grade	Base						Weld	
	Tensile test				Impact test		Impact test	
	Yield point (N/mm^2) minimum	Tensile strength (N/mm^2)	Elongation (%) minimum	Reduction of area (%) minimum	Testing Temperature (°C)	Average Joules (J) minimum	Testing Temperature (°C)	Average Joules (J) minimum
G2	295 min.	490-690	22 min.	–	0	27	0	27
G3	410 min.	690 min.	17 min.	40 min.	0	60	0	50

Proof & Breaking Test Loads

Chain Diameter	Grade R5			Grade R4S			Grade R4		
	Proof Test Load		Breaking Test Load	Proof Test Load		Breaking Test Load	Proof Test Load		Breaking Test Load
	Stud	Studless		Stud	Studless		Stud	Studless	
Class	—	—	—	—	—	—	—	—	—
mm	kN	kN	kN	kN	kN	kN	kN	kN	kN
50	2,510	2,230	3,200	2,400	2,130	3,040	2,160	1,920	2,740
52	2,704	2,392	3,448	2,586	2,295	3,275	2,327	2,069	2,952
54	2,905	2,569	3,703	2,777	2,465	3,518	2,500	2,222	3,171
56	3,111	2,752	3,966	2,975	2,640	3,768	2,677	2,380	3,396
58	3,324	2,940	4,238	3,178	2,821	4,026	2,860	2,543	3,628
60	3,543	3,133	4,516	3,387	3,006	4,291	3,049	2,710	3,867
62	3,767	3,332	4,803	3,602	3,197	4,563	3,242	2,882	4,112
64	3,998	3,536	5,097	3,823	3,393	4,842	3,440	3,058	4,364
66	4,234	3,745	5,398	4,048	3,593	5,128	3,644	3,239	4,622
68	4,476	3,959	5,706	4,280	3,798	5,421	3,852	3,424	4,886
70	4,723	4,178	6,022	4,516	4,008	5,721	4,065	3,613	5,156
73	5,105	4,515	6,508	4,881	4,332	6,182	4,393	3,905	5,572
76	5,498	4,863	7,009	5,257	4,666	6,659	4,731	4,206	6,002
78	5,767	5,101	7,352	5,514	4,894	6,984	4,963	4,411	6,295
81	6,179	5,465	7,878	5,909	5,244	7,484	5,318	4,727	6,746
84	6,603	5,840	8,418	6,314	5,603	7,997	5,682	5,051	7,208
87	7,037	6,224	8,972	6,729	5,972	8,523	6,056	5,383	7,682
90	7,482	6,618	9,539	7,154	6,350	9,062	6,439	5,724	8,168
92	7,785	6,885	9,924	7,443	6,606	9,428	6,699	5,955	8,498
95	8,246	7,293	10,513	7,885	6,998	9,987	7,096	6,308	9,002
97	8,559	7,570	10,912	8,184	7,263	10,366	7,366	6,547	9,343
100	9,036	7,992	11,520	8,640	7,668	10,944	7,776	6,912	9,864
102	9,360	8,278	11,933	8,950	7,943	11,336	8,055	7,160	10,217
105	9,852	8,714	12,560	9,420	8,361	11,932	8,478	7,536	10,755
107	10,185	9,008	12,985	9,739	8,643	12,335	8,765	7,791	11,118
111	10,862	9,607	13,847	10,386	9,217	13,155	9,347	8,309	11,857
114	11,378	10,064	14,506	10,880	9,656	13,781	9,792	8,704	12,421
117	11,903	10,527	15,174	11,381	10,101	14,416	10,243	9,105	12,993
120	12,434	10,997	15,852	11,889	10,552	15,059	10,700	9,511	13,573
122	12,792	11,314	16,309	12,232	10,856	15,493	11,008	9,785	13,964
124	13,153	11,634	16,769	12,577	11,162	15,931	11,319	10,062	14,358
127	13,700	12,117	17,466	13,100	11,626	16,593	11,790	10,480	14,956
130	14,253	12,607	18,171	13,629	12,095	17,263	12,266	10,903	15,559
132	14,625	12,936	18,646	13,984	12,411	17,713	12,586	11,188	15,965
137	15,566	13,767	19,845	14,884	13,209	18,852	13,395	11,907	16,992
142	16,520	14,611	21,061	15,796	14,019	20,008	14,217	12,637	18,034
147	17,487	15,467	22,294	16,721	14,840	21,179	15,049	13,377	19,089
152	18,465	16,332	23,541	17,656	15,669	22,364	15,890	14,125	20,157
157	19,452	17,205	24,799	18,600	16,507	23,559	16,740	14,880	21,235
162	20,447	18,085	26,068	19,551	17,352	24,765	17,596	15,641	22,321

HAMANAKA CHAIN
Maximum size

Chain Diameter	Grade R3S		Breaking Test Load	Grade R3		Breaking Test Load	API ORQ		Weight	
	Proof Test Load			Proof Test Load			Proof Test Load	Breaking Test Load	Stud	Studless
	Stud	Studless		Stud/Studless	Stud/Studless		Stud			
Class	—	—	—	—	DNV	—	API	API	—	—
mm	kN	kN	kN	kN	kN	kN	kN	kN	kg/m	kg/m
50	1,800	1,740	2,490	1,480	1,560	2,230	1,400	2,110	55	50
52	1,940	1,875	2,683	1,595	1,681	2,403	1,509	2,274	59	54
54	2,083	2,014	2,882	1,713	1,806	2,581	1,620	2,442	64	58
56	2,231	2,157	3,086	1,835	1,934	2,764	1,736	2,616	69	63
58	2,384	2,304	3,297	1,960	2,066	2,953	1,854	2,794	74	67
60	2,541	2,456	3,514	2,089	2,202	3,147	1,976	2,978	79	72
62	2,702	2,612	3,737	2,222	2,342	3,347	2,101	3,167	84	77
64	2,867	2,771	3,966	2,357	2,485	3,552	2,230	3,361	90	82
66	3,036	2,935	4,200	2,497	2,632	3,762	2,362	3,559	95	87
68	3,210	3,103	4,440	2,639	2,782	3,977	2,497	3,763	101	92
70	3,387	3,274	4,686	2,785	2,936	4,196	2,635	3,971	107	98
73	3,661	3,539	5,064	3,010	3,173	4,535	2,847	4,291	117	107
76	3,943	3,812	5,454	3,242	3,417	4,885	3,067	4,622	127	116
78	4,136	3,998	5,721	3,401	3,584	5,124	3,217	4,848	133	122
81	4,432	4,284	6,130	3,644	3,841	5,490	3,447	5,195	144	131
84	4,735	4,578	6,550	3,894	4,104	5,866	3,683	5,551	155	141
87	5,047	4,879	6,981	4,150	4,374	6,252	3,925	5,916	166	151
90	5,366	5,187	7,423	4,412	4,651	6,648	4,174	6,290	177	162
92	5,583	5,397	7,723	4,590	4,838	6,916	4,342	6,544	185	169
95	5,914	5,717	8,180	4,862	5,125	7,326	4,600	6,932	198	181
97	6,138	5,934	8,491	5,047	5,320	7,604	4,774	7,195	206	188
100	6,480	6,264	8,964	5,328	5,616	8,028	5,040	7,596	219	200
102	6,712	6,489	9,285	5,519	5,817	8,316	5,221	7,868	228	208
105	7,065	6,830	9,774	5,809	6,123	8,753	5,495	8,282	242	221
107	7,304	7,061	10,104	6,006	6,330	9,049	5,681	8,562	251	229
111	7,789	7,530	10,775	6,405	6,751	9,650	6,058	9,131	270	246
114	8,160	7,888	11,288	6,709	7,072	10,109	6,347	9,565	285	260
117	8,536	8,251	11,808	7,018	7,398	10,575	6,639	10,006	300	274
120	8,917	8,620	12,335	7,332	7,728	11,047	6,936	10,453	315	288
122	9,174	8,868	12,690	7,543	7,951	11,365	7,135	10,754	326	298
124	9,433	9,118	13,048	7,756	8,175	11,686	7,337	11,057	337	308
127	9,825	9,498	13,591	8,078	8,515	12,172	7,642	11,517	353	323
130	10,222	9,881	14,140	8,405	8,859	12,663	7,950	11,982	370	338
132	10,488	10,139	14,509	8,624	9,090	12,994	8,158	12,295	382	348
137	11,163	10,791	15,442	9,178	9,674	13,829	8,682	13,085	411	375
142	11,847	11,452	16,389	9,741	10,268	14,677	9,215	13,888	442	403
147	12,541	12,123	17,348	10,311	10,869	15,536	9,754	14,700	473	432
152	13,242	12,800	18,318	10,888	11,476	16,405	10,299	15,522	506	462
157	13,950	13,485	19,297	11,470	12,090	17,282	10,850	16,352	540	493
162	14,664	14,175	20,284	12,057	12,708	18,166	11,405	17,189	575	525

Proof & Breaking Test Loads

Chain Diameter	Grade 3		Grade 2		Weight	5 Link Length	
	Proof Test Load	Breaking Test Load	Proof Test Load	Breaking Test Load		Min.	Max.
mm	kN	kN	kN	kN	kg/m	mm	mm
12.5	92	132	66	92	3.7	275	281
14	116	165	82	116	4.4	308	315
16	150	216	107	150	5.6	352	360
18	179	256	127	179	6.8	385	394
19	211	301	150	211	8.0	418	428
21	244	349	175	244	9.3	451	462
22	280	401	200	280	10.6	484	496
24	332	476	237	332	12.6	528	541
26	389	556	278	389	14.8	572	586
28	449	642	321	449	17.1	616	631
30	514	735	368	514	19.6	660	676
32	583	833	417	583	22.3	704	721
34	655	937	468	655	25.1	748	766
36	732	1,050	523	732	28.1	792	811
38	812	1,160	581	812	31.3	836	856
40	896	1,280	640	896	34.7	880	902
42	981	1,400	703	981	38.2	924	947
44	1,080	1,540	769	1,080	41.9	968	992
46	1,170	1,680	837	1,170	45.8	1,012	1,037
48	1,280	1,810	908	1,280	49.8	1,056	1,082
50	1,370	1,960	981	1,370	54.0	1,100	1,127
52	1,480	2,110	1,060	1,480	58.4	1,144	1,172
54	1,590	2,270	1,140	1,590	63.0	1,188	1,217
56	1,710	2,430	1,220	1,710	67.8	1,232	1,262
58	1,810	2,600	1,290	1,810	72.7	1,276	1,307
60	1,940	2,770	1,380	1,940	77.8	1,320	1,353
62	2,060	2,940	1,470	2,060	83.1	1,364	1,398
64	2,190	3,130	1,560	2,190	88.6	1,408	1,443
66	2,310	3,300	1,660	2,310	94.2	1,452	1,488
68	2,450	3,500	1,750	2,450	100.0	1,496	1,533

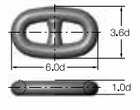
HAMANAKA CHAIN Maximum size

Chain Diameter	Grade 3		Grade 2		Weight	5 Link Length	
	Proof Test Load	Breaking Test Load	Proof Test Load	Breaking Test Load		Min.	Max.
mm	kN	kN	kN	kN	kg/m	mm	mm
70	2,580	3,690	1,840	2,580	106.0	1,540	1,578
73	2,790	3,990	1,990	2,790	115.2	1,606	1,646
76	3,010	4,300	2,150	3,010	124.9	1,672	1,713
78	3,160	4,500	2,260	3,160	131.6	1,716	1,758
81	3,380	4,820	2,410	3,380	142.0	1,782	1,826
84	3,610	5,160	2,580	3,610	152.9	1,848	1,894
87	3,850	5,500	2,750	3,850	164.2	1,914	1,961
90	4,090	5,840	2,920	4,090	176.0	1,980	2,029
92	4,260	6,080	3,040	4,260	184.1	2,024	2,074
95	4,510	6,440	3,230	4,510	196.6	2,090	2,142
97	4,680	6,690	3,350	4,680	205.0	2,134	2,187
100	4,940	7,060	3,530	4,940	218.5	2,200	2,255
102	5,120	7,320	3,660	5,120	227.0	2,244	2,300
105	5,390	7,700	3,860	5,390	241.0	2,310	2,367
107	5,570	7,960	3,980	5,570	250.0	2,354	2,412
111	5,940	8,480	4,250	5,940	269.0	2,442	2,503
114	6,230	8,890	4,440	6,230	284.0	2,508	2,570
117	6,510	9,300	4,650	6,510	299.0	2,574	2,638
120	6,810	9,720	4,860	6,810	314.0	2,640	2,706
122	7,000	9,990	5,000	7,000	326.0	2,684	2,751
124	7,200	10,280	5,140	7,200	335.0	2,728	2,796
127	7,490	10,710	5,350	7,490	351.0	2,794	2,863
130	7,800	11,140	5,570	7,800	367.0	2,860	2,931
132	8,000	11,420	5,720	8,000	378.0	2,904	2,976
137	8,510	12,160	6,080	8,510	408.0	3,014	3,089
142	9,030	12,910	6,450	9,030	437.0	3,124	3,202
147	9,560	13,660	6,840	9,560	470.0	3,234	3,314
152	10,100	14,430	7,220	10,100	500.0	3,344	3,427
157	10,640	15,200	7,600	10,640	530.0	3,454	3,540
162	11,170	15,970	7,990	11,170	570.0	3,564	3,653

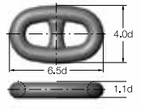
Dimensions

STUD LINK

Common Link [C]



Enlarged Link [EL]



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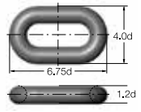
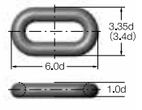


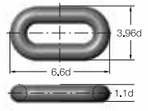
STUDLESS LINK

offshore standards

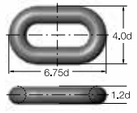
Studless Common Link [SL-C]



Studless Enlarged Link [SL-EL]

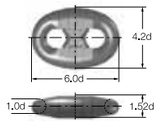


Studless End Link [SL-E]

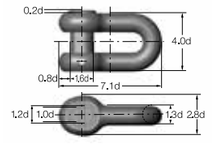


SHACKLE

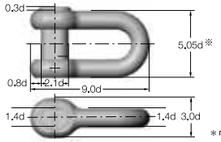
Kenter Shackle [K,S]



Joining Shackle [J,S]



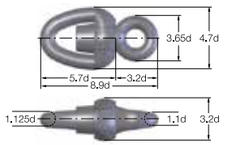
Anchor Shackle (D type) [A,S]



※more than 54mmø

SWIVEL

Swivel [SW]



HAMANAKA CHAIN will make a leap forward with the corporate philosophy and aiming for the100th anniversary of its founding.

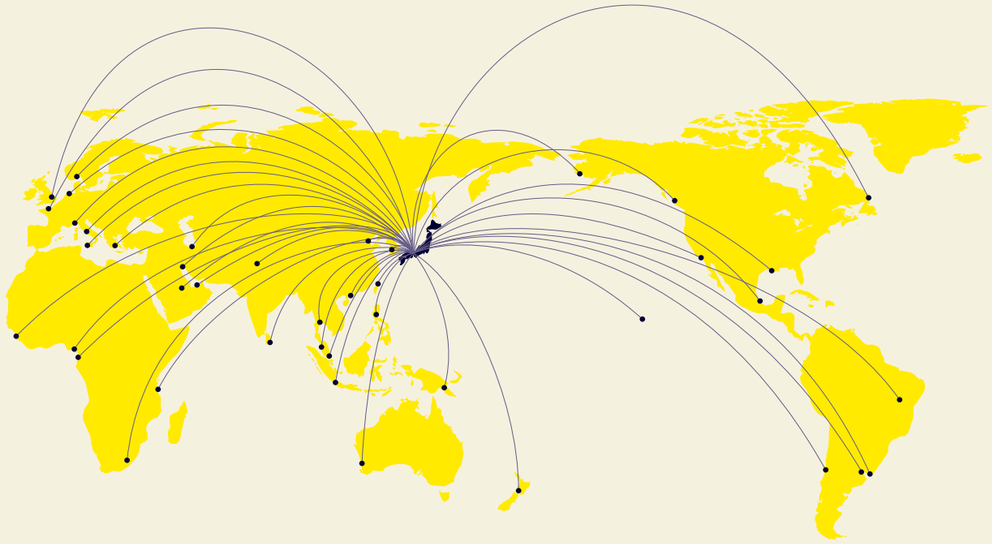
HISTORY

MESSAGE FROM THE PRESIDENT

HAMANAKA CHAIN have been consistently involved in the marine industry since its founding in 1936. The company started out manufacturing anchor chains for ships, and then expanded our activities to mooring chains for offshore structures in offshore oil&gas industry.
Even if the specifications and purposes are different. "Your lifeline in the ocean", the mission of the chain is the same. We will continue to devote ourselves to responding promptly to the needs of our customers, society, and contributing to the development of the world and the solution of environmental problems.

- **1936** Jutaro Hamanaka established HAMANAKA CHAIN Factory as a private concern and started to manufacture forged chain.
- **1942** Constructed a new factory in Shirahama- cho, Himeji.
- **1943** Designated as a Navy supervised factory.
- **1950** Re-organized as HAMANAKA CHAIN Mfg. Co.,Ltd.
  Approved by Lloyd's Register of Shipping for the manufacture of forged chain.
- **1957** Introduced Japan's first flash-butt welding chain making machine.
- **1958** Class approvals granted for the manufacture of G2 & G3 flash -butt welded chain.
- **1967** Supplied first offshore chains.
- **1972** Started construction of new Aboshi Factory.
- **1973** Released Super ORQ chain (higher than Grade K4).
- **1975** API approval obtained.
- **1982** DNV approval for Grade K4 chain obtained.
- **1986** DNV Quality Control System approval obtained.
- **1992** API Spec Q1 Quality Program approval obtained.
- **1993** ABS Quality Assurance Program approval obtained.
- **1994** ABS, DNV and LR approval for Grade R4 obtained.
- **1995** Completed a fully automatic stud welding line operated by computerized robots.
- **1996** DNV ISO 9001 approval obtained.
- **2006** DNV ISO 14001 approval obtained.
  ABS approval for Grade R4S obtained.
- **2007** ABS approval for Grade R5 obtained.
- **2008** DNV approval for Grade R5 obtained.
- **2012** Delivered offshore mooring chains to Fukushima Offshore Wind Consortium Project.
- **2013** Approval for DNV OHSAS 18001 obtained.(migrated to ISO 45001)
- **2016** Updated 20T crane at Aboshi factory.
- **2019** Introduction of stud expansion equipment.
- **2021** Approval for Aramco Quality Management System obtained.
- **2023** Introduced various new facilities of production machines.

Delivery Destination



Main Customer

OVER SEAS

＊ in alphabetal order

- Bardex corporation
- Bluewater
- Cpc corporation
- Daewoo shipbuilding&marine engineering
- Delmar systems
- Diamond offshore drilling
- Dolphin drilling
- Hyundai heavy industries
- Japan drilling co., ltd.
- Keppel offshore&marine
- Modec, inc.
- Mooreast
- Nayara energy limited
- Odfjell drilling
- Petrobras
- Samsung heavy industries
- Saudi aramco
- Seadrill limited
- Technip mayalsia
- Transocean

DOMESTIC

＊ in alphabetal order

- Ministry of Land, Infrastructure, Transport and Tourism
- Hitachi Zosen Corporation
- Imabari Shipbuilding Co.,Ltd
- Japan Marine United Corporation
- Kawasaki Heavy Industries, Ltd.
- Marubeni Corporation
- Mitsubishi Corporation
- Mitsubishi Shipbuilding Co., Ltd.
- Mitsui & Co.,Ltd
- Mitsui E&S Shipbuilding Co., Ltd.
- Naikai Zosen Corporation
- Namura Shipbuilding Co., Ltd.
- Onomichi Dockyard Co., Ltd.
- Oshima Shipbuilding Co., Ltd.
- Shin Kurushima Dockyard Co.,Ltd.
- Sojitz Corporation
- Sumitomo Corporation
- Sumitomo Heavy Industries Marine&Engineering Co.,Ltd.

Certification

HAMANAKA CHAIN Mfg. Co.,Ltd. has been accredited an international quality system, ensuring the quality assurance consistency and authorized world wide by international organizations and classification societies.

Quality assurance system

- ISO 9001　DNV Quality Management System
- ABS Certificate for Quality Assurance Program
- Official API Monogram, Spec Q1
- Aramco Quality Management System

Approval of Classification Society

- American Bureau of Shipping (ABS)
- Bureau Veritas (BV)
- China Corporation Register of Shipping (CR)
- Det Norske Veritas (DNV)
- Korean Register of Shipping (KR)
- Lloyd's Register (LR)
- Nippon Kaiji Kyokai (NK)

Other approvals

- American Petroleum Institute (API)
- The Japanese industrial Standards (JIS)
- ISO14001 DNV Environmental System
- ISO45001 DNV Occupational Health and Safety System

NK manufacturing approval　LR manufacturing approval　DNV manufacturing approval　ABS manufacturing approval

HAMANAKA CHAIN MFG.CO.,LTD.

Head Office

Shirahama Plant

Aboshi Plant

Head office
Ko-770 Shirahama-cho, Himeji 672-8023, Japan
TEL:+81-(0)79-245-5151
e-mail:sa-info@hamanaka-chain.co.jp

Shirahama Plant
Ko-770 Shirahama-cho, Himeji 672-8023, Japan
TEL:+81-(0)79-245-5253

Aboshi Office / Plant
Oheshima 810-1, Aboshi-ku, Himeji 671-1231, Japan
TEL:+81-(0)79-273-7111

Tokyo office
Shin-Kokusai Bldg. 825, 4-1, Marunouchi 3 cho-me, Chiyoda-ku,Tokyo 100-0005, Japan
TEL:+81-(0)3-3213-8681

HAMANAKA INTERNATIONAL.INC
P.O.Box. 19629, HOUSTON,TEXAS 77224, USA
TEL : +1(281)493-9696

HAMANAKA GROUP

HAMANAKA NUT CO., LTD.
Ko-770, Shirahama-cho, Himeji 672-8023, Japan
TEL:+81-(0)79-245-1741

HIMEJI ECOTEC CO., LTD.
Ko-841-49, Shirahama-cho, Himeji 672-8023, Japan
TEL: +81-(0)79-245-3332

GEARTECH CO., LTD.
Mega 1513-10, Shikama-ku, Himeji 672-8031,Japan
TEL:+81-(0)79-247-0113

SESSILE RESEARCH CORPORATION
Ko-770, Shirahama-cho, Himeji 672-8023, Japan
TEL:+81-(0)79-245-3037

HAMANAKA CHAIN MFG.CO.,LTD.

www.hamanaka-chain.co.jp/en/

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