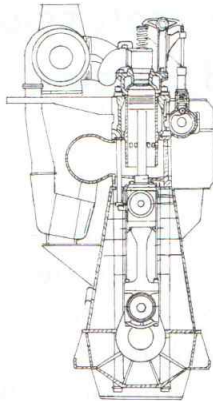


87

Machinery Equipment

Main
Engine
Diagrams



P. 87-1 ~ 2

Anti-splashing Tape
for Ship's Engine
Room



P. 87-2 ~ 3

M/E Scavenging Drain Analysis
Onboard Test Kits



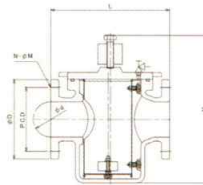
P. 87-3

Ultra High Pressure Product
for Main Engine



P. 87-4 ~ 5

Marine Can
Water Filters



P. 87-5 ~ 6

DIN Strainers



P. 87-6

DIN Mud
Boxes



P. 87-6 ~ 7

Air Vent Heads



P. 87-7 ~ 8

Emergency
Shut-off
Valves

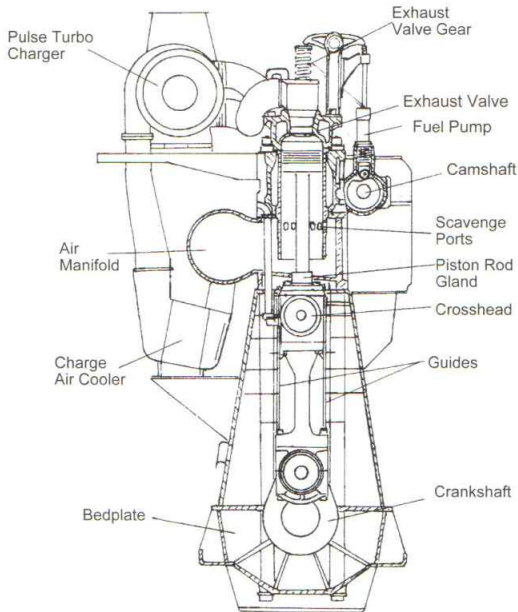


P. 87-9 ~ 11

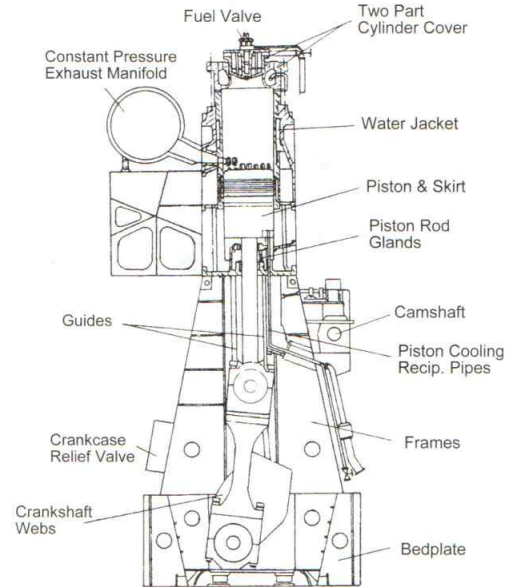
Main Engine Diagrams

There are various types of main engine with a range of cylinder sizes from various manufacturers in the world. Basically, marine diesel engines can be divided into two main types; Large, slow-running direct drive engines with limited numbers of cylinders (Two-stroke cycle), or Medium to high speed engine driving through reduction gears (Four-stroke cycle).

Below are shown basic cross sections of common two-stroke cycle engines as a reference. Two-stroke engines are commonly used as the main engine for oil tankers, bulk carriers, or container vessels which must carry a large payload. Four-stroke engines are commonly used of car carriers, Ro-Ro vessels and ferries where a low set, medium speed engine is preferable to allow space for additional car deck space or accommodations above the engine room.



MAN – B & W KEF Engine

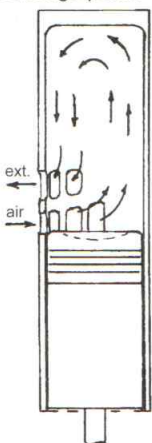


SULZER RND Engine

The Basic Method of Scavenging within the Cylinder

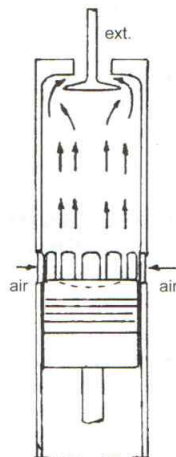
Loop Scavenge:

Air passes over the piston crown and rises to form a loop within the cylinder, expelling gas through exhaust ports cut in the same side of the liner above the scavenge ports.

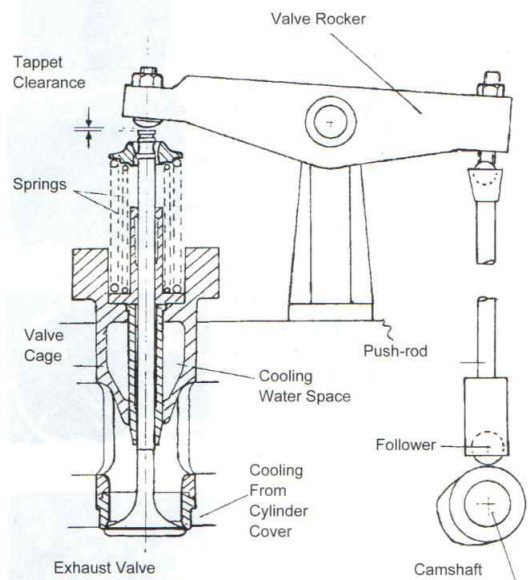


Uniflow Scavenge:

Air passes straight up through the length of the cylinder, forcing the exhaust through ports or valves at the top of the cylinder.



Exhaust Valves and Tappets

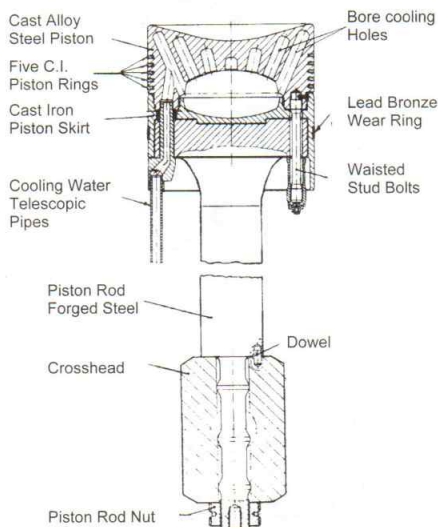


Large Two-stroke Engine Pistons

Cooling of pistons is necessary to remove excess heat from combustion and to limit thermal stressing. It also limits thermal expansion to maintain correct clearances between piston and liner and between ring grooves and rings. Cooling may be carried out by circulating either water or oil.

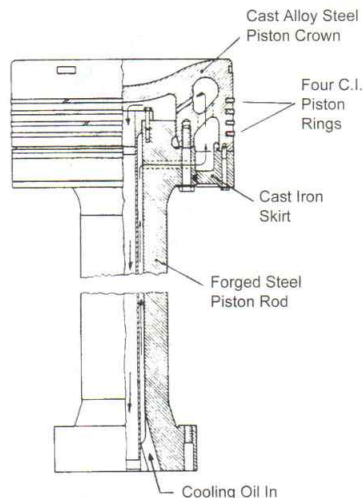
Fresh Water Cooling Piston:

Fresh water cooling has the advantage of greater thermal capacity than oil; it may also sustain higher outlet temperatures (up to 70°C) improving thermal efficiency. Water cooling has the disadvantage that flexible connections and glands to convey it to and from the piston require maintenance and there is the possibility of crankcase contamination from gland leakage.



Oil Cooling Piston:

Oil cooling has lower thermal capacity and a lower temperature limit (56°C) to prevent carbon or lacquer forming on hot surfaces, with consequent loss in heat transfer or choking of passages.



Machinery Part Cleaners

Limpiadores de Piezas de Maquinaria
機械部品洗浄装置 機械零件清洗机

The machinery part cleaner designed for maritime use. It saves man hours because of simple operation and fast cleaning without supervision. The machines are able to accommodate and clean the most common auxiliary engine spare parts, filters, pump parts, tools, cylinder cover, etc.

Internal box is made of stainless steel plates and is well isolated in order to reduce the loss of heat and enable the machine to stay heated all day, ready of use. The energy loss at evaporation is reduced considerable as the machine is fitted with a steam reducer in the top, which opens for steam discharge when the machine is started.

The items are placed on the fixed grating which has a carrying capacity up to 1,350 kgs or for smaller items in a special designed basket, made of stainless steel. The cleaning liquid is heated to the required temperature controlled by the fitted thermostat.



Before



After

			Unit Per Set
CODE	87 11 01	87 11 02	87 11 03
Model	201M	203M	204M
Liquid Demand	40 ltr	63 ltr	125 ltr
Power Source	3x440V-60Hz	3x440V-60Hz	3-x-440V-60Hz
Connection*	3,700 Watt/ 3x380V- 50 Hz*	6,600 Watt/ 3x380V- 50Hz*	11,000 Watt/ 3x380V- 50Hz*
Max Temperature	25 – 85°C		
Inside Dimensions W×D×H mm	650×600×550	900×600×800	1,240×920×800
Outside Dimensions W×D×H mm	880×700 ×1,200	1,125×700 ×1,430	1,500×1,060 ×1,430
Max. Carrying Capacity kg	300	550	1,350
Weight kg	80	132	200
Name of Mfr.	Marine Technic a/s		

Remark: *please advise by order

Anti-splashing Tapes for Ship's Engine Room

Cinta de Anti-Sapicadura para Sala de Máquinas
燃料油用飛散防止テープ 防護帯

For preventing outbreak of a fire caused by a splash of combustible oil, such as fuel oil, lubricating oil, etc. from oil pipes connected to an engine or a generator in a ship's engine room.

Amended SOLAS Reg.4.2.5.3, 4.2.3 and 4.2.4, Chapter II-2 stipulate that oil fuel line shall be screened or otherwise

suitably protected to avoid as far as practicable oil spray or oil leakage onto the source of ignition, hot surfaces, into machinery air intakes, or other sources of ignition.



Piping, valves, pressure gauges, or any other auxiliary parts become loose due to vibration, fatigue, deterioration of material, excess tension, and tend to be damaged with a pinhole or crack.

Covering with this anti-splashing tape to protect the exhaust pipe and other high temperature equipments from being exposed to splashes of combustible oil and preventing possible occurrence of a fire.

The tape consists of aramid woven cloth superimposed with aluminium foil on both sides, and an adhesive agent is applied to one side and covered by a separator film.

The tape can withstand prominent pressure of 1.5 MPa when applied properly.

Specifications

Tensile Strength	318 N per 10 mm width
Ordinary Joint Strength	7 N per 10 mm width
Shear Joint Strength	196 N per 20 mm x 20 mm
Pressure Resistance	Maximum : 3.0 MPa Approved : 1.5 MPa
Heat Resistance	Maximum : 150°C
Oil Resistance	Inactive with respect to heavy oil, light oil, etc.
Weather Resistance	When tested with a weather meter, normal after 72 hours
Approved	Class NK, ABS, BV, CCS, DNV, KR, LR, RINA, UL
Name of Mfr.	Tokyo Nisshin Jabara Co., Ltd.

* Data on the above table is actual test data, not quarantined data.

Unit Per Rls.		Unit Per Sht.	
Tape		Sheet	
CODE	Width x Length	CODE	Width x Length
87 18 01	35 mm x 10 mtr	87 18 07	250 mm x 10 mtr
02	50 mm x 10 mtr	05	500 mm x 10 mtr
08	75 mm x 10 mtr	06	1,000 mm x 10 mtr
04	100 mm x 10 mtr		
03	140 mm x 10 mtr		

M/E Scavenging Drain Analysis (SDA) Onboard Test Kits "Fe-asy Checker 26"

Equipo de pruebas a bordo M/E para análisis de desagüe de eliminación (SDA)
船上簡易全鉄分析キット 船用簡易全鉄含量测试分析套件

A highly accurate analysis test kit on board for total iron content in the scavenging drain of diesel-powered main engines.



The colorimetric method enables crew members to take extremely accurate analysis of total iron content by specific wavelength filter for a photoelectric colorimeter and a special mix of two kinds of Reagents (A & B). The result is displayed in parts per million (PPM) value.

Optimizing scavenging drain oil requires careful monitoring of conditions inside the diesel main engine and recently, many instances of low-temperature sulfuric acid corrosion have been reported due to an increase of design pressure

inside the cylinders. This analysis kit can measure not only conventional magnetic iron particles, but also the total iron content including iron ions, which lead to earlier detection of abnormalities inside the cylinder.

87 12 01	M/E Scavenging Drain Analysis (SDA) Onboard Test Kit "Fe-asy Checker 26"	Set
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Accessories

CODE	Product	Product No	Unit
87 12 02	ReAgent A	101	Btl.
87 12 03	ReAgent B	102	Btl.
87 12 04	Lure Lock Syringe, 200's/Pkt	201	Pkt.
87 12 05	Syringe Cap, 200's/Pkt	202	Pkt.
87 12 06	Syringe Filter, 200's/Pkt	203	Pkt.
87 12 07	Disposable Cell, 200's/Pkt	204	Pkt.
87 12 08	Pipet	301	Pc.
87 12 16	Pipet Tip	302	Pc.
87 12 09	Capillary Micro Pipet	401	Set
87 12 10	Universal Top Plate	502	Pc.
87 12 11	Syringe Holder	503	Pc.
87 12 12	Cuvette Rack	701	Set
87 12 13	Vortex Mixer	501	Pc.
87 12 14	Replacement Capillary Tube, 100's/Pkt	402	Pkt.
81 12 15	Absorption Spectrophotometer	601	Set

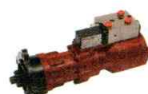
Engine Starter Motors

Aparatos de arranque para motores

エンジンスターターモーター 发动机用启动马达

Reliable and powerful starter motors for diesel engines and generators. Their independent, dead-ship or black-start capability is ideal as your primary or secondary method of starting fire pumps, emergency generators and compressors. Starters are available from stock from locations around the world. There are three types: Hydraulic, Air (pneumatic), and Spring (mechanical) type.

The starter motor must be specified to match the engine type and configuration so, when ordering, please specify the maker and model of engine and, if available, the original part number of the old starter motor.



Hydraulic Type



Air (Pneumatic) Type



Spring (Mechanical) Type

How to order: CODE

Engine Starter Motor, Hydraulic or Air or Spring Type, Engine Capacity (litres), Engine maker, model and original part number of old starter etc.

		Unit Per Set
CODE	Description	
87 12 51	Engine Starter Motor, Hydraulic Type	
87 12 52	Engine Starter Motor, Air Type	
87 12 53	Engine Starter Motor, Spring Type	

Ultra High Pressure Products for Main Engine

Productos de ultra alta presión para el motor principal

メインエンジン用超高压製品 用于主机的超高压产品

General Safety and Warnings for High Pressure Products

These products are mainly used for opening the Cylinder Head for main engine maintenance, loosening very tight bolt & nut. During the maintenance work, hose assemblies may fail abruptly and unexpectedly due to a variety of reasons. Hydraulic oil shooting out at high pressure and/or at high speed can cause serious personal injury and severe damage to objects as well as pollution of the environment.

Example of potential hazards

1. Bursting hose components.
2. Whipping hose ends.
3. Oil spray leakage.
4. Coupling blow off.

Make sure for your safety that:

1. The design and operation of tools and machines complies with the existing safety regulations.
2. Inspect hose assemblies for damage and wear at regular intervals. The inspection of hose kit should be done under zero pressure.
3. Defective or damage hose assemblies must be replaced immediately.
4. A coupling and a nipple should be connected properly and do not connect with other brand even it is interchangeable.
5. When the leakage is confirmed from the high pressure components, stop using and replace immediately.

When ordering these products, please specify the manufacturer & model of Main Engine, as the original couplings are required for Main Engine.

Hydraulic Couplings

Acoplamiento hidráulicos 油压カップリング
液压联轴器

Compact design, non-drip, quick connect coupling and nipple that stand up to 250MPa for bolt tensioner and jack application. All exposed components are made of zinc chrome plated steel.

Nominal flow diameter: 2.5 mm (3/32")
Temperature range: -20°C - +80°C (0F - + 175 F)

Unit Per Pc.

CODE	Description	Max. Working Pressure	Connection
87 13 01	Coupling	150 MPa	G1/4" Female with valve
87 13 02	Nipple		G1/4" Female with valve
87 13 03	Nipple		G1/4" Male without valve
87 13 04	Coupling	200 MPa	G1/4" Female with valve
87 13 05	Nipple		G1/4" Female with valve
87 13 06	Nipple		G1/4" Male without valve
87 13 07	Coupling	250 MPa	G1/4" Female with valve
87 13 08	Nipple		G1/4" Female with valve
87 13 09	Coupling		G1/4" Female 90° Connection with valve



Adapters

Adaptadores

超高压油压アダプター 适配器

Made of steel, black zinc plating with durable design adapters, suitable for most couplings and hoses.



Unit Per Pc.

CODE	Description	Max. Working Pressure	Connection
87 13 11	Adapter	150 MPa	G1/4" w/60° internal cone x NPT 3/8"
87 13 12	Adapter		G1/4" w/60° internal cone x R3/8"
87 13 13	Adapter		G1/4" w/120° external cone x R1/4"
87 13 14	Adapter	200 MPa	G1/4" w/120° external cone x G1/4" w/120° external cone
87 13 15	Adapter		G1/4" w/60° internal cone x G1/4" w/120° external cone
87 13 16	Adapter		G1/4" w/120° external cone x 3/4-16 UNF w/60° external cone
87 13 17	Elbow Adapter		G1/4" w/120° internal cone female swivel x G1/4" w/120° external cone fixed male thread

Porting Blocks

Portar bloques

超高压ポーティング・ブロック 舷侧块

Made of steel, black zinc plating or stainless steel with durable design porting blocks. Make it possible to utilize/connect several hydraulic lines from a single pump to numerous tools as well as the possibility of connecting a pressure gauge.



Unit Per Pc.

CODE	Description	Max. Working Pressure	Connection
87 13 21	4 way block steel	300 MPa	G1/4" w/120° internal sealing cone female thread
87 13 22	3 way block steel		G1/4" w/120° internal sealing cone female thread
87 13 23	3 way block stainless steel		G1/4" w/120° internal sealing cone female thread
87 13 24	5 way block steel		G1/4" w/120° internal sealing cone female thread

Ultra High Pressure Hoses

Mangueras de ultra alta presión

超高压ホース 超高压软管

Ultra-high pressure thermoplastic hoses reinforced with high tensile steel wire that gives you extremely high working pressure up to 2,500 bar with maintained flexibility through entire service life. Its low volumetric expansion gives fast response time in hydraulic systems while the smooth inner bores provide a minimized pressure drop. Various kinds of fittings are available upon request.

Unit Per Mtr.

CODE	87 13 26	87 13 27
Working Pressure	1,800 Bar	2,500 Bar
Inner Core	Polyoxymethylene (POM)	
Outer Cover	Polyimide (PA)	
Construction	4 spiral layers of high tensile steel wire	6 spiral layers of high tensile steel wire
Min. burst pressure	4,500 Bar	6,250 Bar
Min. bend radius	130 mm	175 mm



Pressure Gauges for High Pressure Filled with Glycerine

Stainless steel cover with glycerine filled gauges with accuracy of $\pm 1.6\%$ in 63mm gauges and 0-1% in 100mm to 150mm gauges. Both bottom and panel mounted type is available, range of pressure is up to 5,000 bar.



Unit Per Pc.

CODE	Measuring Range (bar)	Dial Size	Connection
65 33 51	0 – 1,000	63	bottom connection G1/4" male
65 33 52		63	panel mounting G1/4" male
65 33 53		100	bottom connection G1/2" male
65 33 54		100	panel mounting G1/2" male
65 33 55	0 – 1,600	150	bottom connection G1/2" male
65 33 56		100	bottom connection G1/2" male
65 33 57		100	panel mounting G1/2" male
65 33 58	0 – 2,000	150	bottom connection G1/2" male
65 33 59		100	bottom connection G1/2" male
65 33 60	0 – 3,000	150	bottom connection G1/2" male
65 33 61		100	bottom connection 9/16"-18UNF Female
65 33 62	0 – 4,000	150	bottom connection 9/16"-18UNF Female
65 33 63		100	bottom connection 9/16"-18UNF Female
65 33 64		150	bottom connection 9/16"-18UNF Female
65 33 65	0 – 5,000	100	bottom connection 9/16"-18UNF Female
65 33 66		150	bottom connection 9/16"-18UNF Female

Ultra High Pressure Pumps

Bombas de ultra alta presión 超高压ポンプ 超高压泵

Air Driven Hydraulic Pumps up to 3,500 Bar

These pumps are air driven explosion-proof type hydraulic pumps that can generate hydraulic pressures up to 3,500 bar. Light weight compact air hydraulic pumps provide easy handling, safe and efficient services with built-in automatic pressure stop function to prevent unexpected accidents. These are suitable for engine maintenance when used with bolt tensioners.



Unit Per Set

CODE	Max. working pressure (Auto stop)	Tank capacity	Displacement per cycle	Weight
87 13 31	1,540Bar (1,060Bar)	3.5 liters	0.43 cc	20 kg
87 13 32	1,540Bar (1,060Bar)	6.5 liters	0.76 cc	24 kg
87 13 33	2,400Bar (1,750Bar)	6.5 liters	4.2 cc	30 kg
87 13 34	3,500Bar (2,500Bar)	8.0 liters	4.2 cc	40 kg

Hand Pumps up to 2,500 Bar

Light weight aluminium body and compact design with two stage hydraulic hand pumps provide easy handling and efficient engine maintenance service. Two stage hydraulic pumps can generate hydraulic pressure up to 2,500 bar.



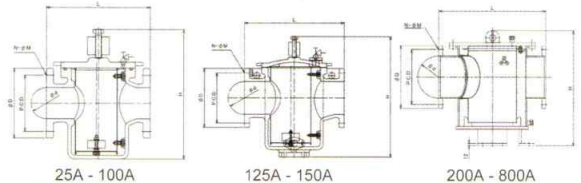
Unit Per Set

CODE	Max. working pressure	Tank capacity	Pump flow capacity	Weight
87 13 36	1,800 Bar	2.2 liters	L 20cc H 0.8cc	8.1 kg (dry)
87 13 37	2,500 Bar	2.2 liters	L 20cc H 0.8cc	8.1 kg (dry)

Marine Can Water Filters

Filtros Marinos de agua 簡型水こし 船用簡型水過濾器

Made of casting steel and used for water pipelines in ship. Complete with inner strainer. Connecting flange size are conform to JIS 5K standard.



Unit Per Set

CODE	Nominal Diam. mm	Flange				Total Height mm	Weight kg
		Face to Face mm	Diam. mm	P.C.D. mm	Bolt No. Diam. mm		
87 20 01	25	170	95	75	4 M10	178	5.80
02	40	190	115	90	4 M12	211	8.2
03	40	190	120	95	4 M12	211	8.4
04	50	200	130	105	4 M12	258	11.4
05	65	250	155	130	4 M12	314	18.5
87 20 06	80	270	180	145	4 M16	335	25.4
07	100	320	200	165	8 M16	391	35.7
08	131	400	235	200	8 M16	480	52.4
09	156	460	265	230	8 M16	573	71.6
10	200	550	320	280	8 M20	600	95
87 20 11	250	680	385	345	12 M20	725	150
12	300	760	430	390	12 M20	820	185
13	350	820	480	435	12 M22	920	245
14	400	880	540	495	16 M22	1,010	290
15	450	1,040	605	555	16 M22	1,230	440
87 20 16	500	1,130	655	605	20 M22	1,320	530
17	550	1,220	720	665	20 M24	1,380	720
18	600	1,310	770	715	20 M24	1,455	830
19	650	1,410	825	770	24 M24	1,514	1,150
20	700	1,500	875	820	24 M24	1,574	1,200
87 20 35	750	1,600	945	880	24 M30	1,630	1,390
36	800	1,700	995	930	24 M30	1,900	1,690

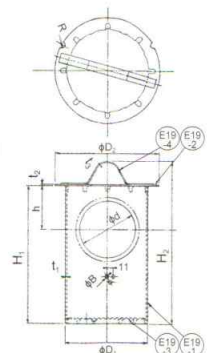
Filter Elements for Marine Can Water Filter

Repuestos para Filtros Marino

簡型水こし用エレメント 过滤器构成元件

Suitable for use with marine can water filter based on JIS F-7121 specification.

Made of stainless steel with light weight and tough structure.



Unit Per Pc.

CODE	Model	Size mm				Weight kg
		d	D1	D2	H1	
87 20 21	SWSII-FC-S-C-25	33	50	68	109.1	0.17
22	SWSII-FC-S-C-32	47	65	84	137	0.24
23	SWSII-FC-S-C-40	47	65	84	137	0.28
24	SWSII-FC-S-C-50	62	75	94	172	0.28
25	SWSII-FC-S-C-65	78	100	125	218	0.42
87 20 26	SWSII-FC-S-C-80	91	110	140	226	0.69
27	SWSII-FC-S-C-100	116	130	160	282	1.56
28	SWSII-FC-S-C-125	141	162	195	319	1.77
29	SWSII-FC-S-C-150	167	200	235	371	2.19
30	SWSII-SS-S-C-200	217	250	347	350	2
87 20 31	SWSII-SS-S-C-250	269	330	390	505	4
32	SWSII-SS-S-C-300	320	380	440	581	6
33	SWSII-SS-S-C-350	359	420	485	709	8
34	SWSII-SS-S-C-400	410	471	535	755	9.5
37	SWSII-SS-S-C-450	461	562	637	861	14
87 20 38	SWSII-SS-S-C-500	514	625	700	927	18
39	SWSII-SS-S-C-550	566	689	780	980	21
40	SWSII-SS-S-C-600	617	753	845	1,033	25
41	SWSII-SS-S-C-650	667	816	910	1,074	31
42	SWSII-SS-S-C-700	719	882	980	1,134	40
87 20 43	SWSII-SS-S-C-750	770	941	1,040	1,170	47
44	SWSII-SS-S-C-800	820	1,008	1,110	1,482	67

Name of Mfr. : Niikura Kogyo Co., Ltd.

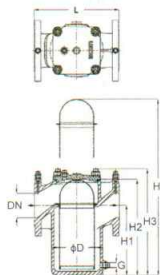
Strainers (DIN)

Single Basket, DIN Flanges PN10/16
Ductile Cast Iron

Cedazo Senclo de Hierro Fundido (según DIN)

DIN 型筒型水こし

DIN 型铸铁联接管



Simplex Basket Strainer for general use. Fitted with a fluid drain plug and suitable for use in horizontal pipe lines only. Ductile Cast Iron body with epoxy coating treatment on the surface (internal and external). Maximum differential pressure at 20°C is 1 bar.

Material specification

Component	Material	EN and/or (DIN)
Body and cover	Ductile cast iron	GJS-500-7(GGG-50)
Cover seal	NBR	
Drain plug	Stainless steel	
Material bleed screw	Stainless steel	

How to order: CODE

Strainer (DIN), single basket, Ductile cast iron, DIN flanges PN 10/16, SIZE DN

Unit Per Pc.

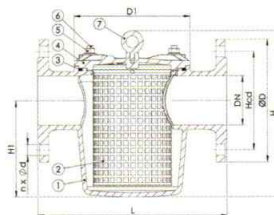
CODE	DN	L	D	H1	H2	H3	H4	G	Weight Kg
87 20 52	20	171	81	156	178	220	330		6
53	25	171	81	156	178	220	330		6
54	32	189	102	164	214	250	420	3/8"	15
55	40	189	102	164	214	250	420		15
56	50	189	102	164	214	250	420		15
87 20 57	65	230	127	214	282	315	530		25
58	80	279	168	235	313	350	610		28
59	100	317	176	324	427	465	810	3/8"	42
60	125	379	222	324	452	510	900		55
61	150	461	262	389	540	580	1,090		75
87 20 62	200	605	322	489	694	745	1,340		140
63	250	604	402	605	815	880	1,550	3/8"	195
64	300	719	472	730	974	1,035	1,860		300

Cast Iron Mud Boxes (DIN)

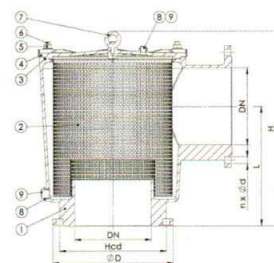
Basket Type, Raised face flanged according to DIN PN 10

Depósitos de Lodos (según DIN) Tipo Cesta

DIN 型マッドボックス DIN 型铸铁联接网箱



Straight



Angle

Mud boxes are installed in suction pipes aboard vessels to protect pumps against large solids. Straight type, Cast Iron body and bonnet mud box with Stainless Steel strainer. Fitted with bonnet lifting eyebolt. Raised face flanges.

Material Specification

Component	Material	EN and/or DIN
Body	Cast Iron	GG-25
Disk	Stainless Steel	1.4432
O-ring	Rubber	NBR
Bonnet	Cast Iron	GG25

Applications

Fuel oil, Lubricating oil, Flammable hydraulic oil, Sea water, Water.

How to order: CODE

Mud box (DIN), basket type, cast iron, flat flanged according to DIN PN 10, STRAIGHT or ANGLE, SIZE DN

Unit Per Pc.

CODE	DN	Size mm						Weight Kg
		Hcd	D	L	H	D ₁	H ₁	
87 20 65	40	110	150	200	191	111	95	6.9
66	50	125	165	230	208	136	106	10
67	65	145	185	290	239	172	134	14
68	80	160	200	310	270	190	156	17
69	100	180	220	350	309	350	185	24
87 20 70	125	210	250	400	385	400	229	36
71	150	240	285	480	436	480	268	47
73	200	295	340	600	538	387	335	84
74	250	350	395	600	589	479	355	116
84	300	400	478	600	640	479	380	135

MESON Model No.: 100.1.9.9.1

Angle

CODE	DN	Size mm						Unit Per Pc.
		Hcd	D	L	H	D ₁	H ₂	Weight Kg
87 20 75	40	110	150	125	228	136	179	8.9
76	50	125	165	135	241	172	198	12
77	65	145	185	150	265	190	231	15
78	80	160	200	175	297	229	263	21
79	100	180	220	195	347	270	318	27
87 20 80	125	210	250	220	381	302	365	38
81	150	240	285	270	455	387	424	56
83	200	295	340	300	523	479	528	92
85	250	350	395	390	635	479	655	113
86	300	400	478	450	729	639	769	172
87 20 87	350	460	505	400	735	665	862	250

MESON Model No.: 101.1.9.9.1

Level Gauges for Oil (DIN)

Reflex Type with Push-Button, Spring to Close
According to SOLAS Requirements

Indicador de Nivel de Aceite (según DIN) Tipo Reflex con Pulsador

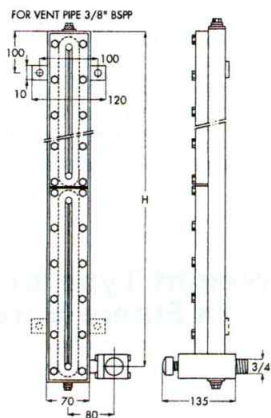
DIN 型油水位計

DIN 型油位計

Especially for oil storage tanks and similar applications. The level gauges are also often used on board of ships.

They meet the requirements of the international classification societies, such as Lloyd, BV, ABS, and DNV.

Available length is between 245 mm and 6,000 mm. Please specify required length when ordering.



Also following types are available if required.

* with the same connection on top including push-button or lever and weight.

* all of stainless steel.

* anti-clockwise to close.

Pressure/Temperature rating : 2 bar – 95°C.

Materials

Part	Material according to DIN	
Body	Steel	St.35
Cover Plate	Stainless Steel	X5CrNi18 10

How to order: 87 - 20 - 91

Level gauge for oil (DIN), reflex type, according to SOLAS requirements, with push-button, spring to close, LENGTH H in mm, TYPE of CLASSIFICATION SOCIETY

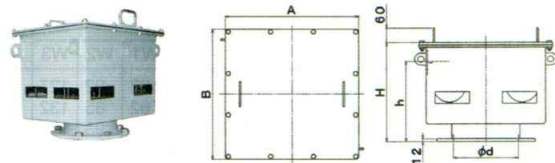
Air Vent Heads

Ventilaciones 空氣管頭 通气管头

Auto-closing appliances of ball float. Model No. 53B(W), 53C(W), 53P(W) application of IACS unified requirements P3 are approved by NK, ABS, LRS, DNV and BV. Model No. 53P(W) is approved by NK, and DNV.

Model: 53B (Without screen for ballast water tank)

53B (300 450 mm) Size: 300 to 45



CODE	Model	Dimensions mm					Unit Per Pc.
		Φd	A	B	H	h	Wgt Kg
87 23 23	53B-300	300	613	633	458	365	120
24	53B-350	350	669	699	492	383	146
25	53B-400	400	719	745	524	410	165
26	53B-450	450	853	903	634	481	248

Name of Mfr.: Niikura Kogyo Co., Ltd.

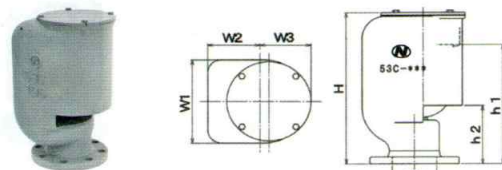
Model: 53BW (with screen for fuel oil tank, water ballast tank next to cargo oil tank)

CODE	Model	Dimensions mm					Unit Per Pc.
		Φd	A	B	H	h	Wgt Kg
87 23 29	53BW-300	300	613	633	466	340	130
30	53BW-350	350	669	699	499	358	158
31	53BW-400	400	719	745	531	385	180
32	53BW-450	450	853	903	635	453	255

Name of Mfr.: Niikura Kogyo Co., Ltd.

Model: 53C

53C (100~250 mm) Size: 50 to 250



CODE	Model	Dimensions mm							Unit Per Pc.
		Φd	H	h1	h2	W1	W2	W3	Wgt Kg
87 23 35	53C-100	100	364	284	140	16	202	118	20
36	53C-125	125	433	342	180	16	260	192	35
37	53C-150	150	502	390	195	18	302	200	51
61	53C-200	200	641	487	264	20	350	253	102
62	53C-250	250	771	593	335	22	453	313	145

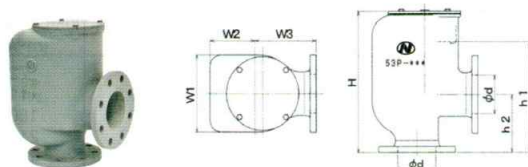
Name of Mfr.: Niikura Kogyo Co., Ltd.

Model: 53CW (with screen for fuel oil tank, water ballast tank next to cargo oil tank)

CODE	Model	Dimensions mm								Unit Per Pc.
		Φd	H	h1	h2	W1	W2	W3	W4	Wgt Kg
87 23 38	53CW-50	50	261	219	113	162	92	88	-	12
39	53CW-65	65	261	219	113	162	85	96	-	12
40	53CW-80	80	298	246	123	190	98	109	-	17
41	53CW-100	100	364	284	140	202	118	116	-	20
42	53CW-125	125	433	342	180	260	192	192	151	35
87 23 43	53CW-150	150	502	390	195	302	200	224	163	51
63	53CW-200	200	641	487	264	350	253	233	249	102
64	53CW-250	250	771	593	335	453	298	280	310	145

Name of Mfr.: Niikura Kogyo Co., Ltd.

Model : 53P (without screen for ballast water tank)



CODE	Model	Dimensions mm							Unit Per Pc. Wgt Kg
		Φd	H	h1	h2	t	W1	W2	
87 23 45	53P-50	50	264	221	112	14	162	92	127 14
46	53P-65	65	264	221	122	14	162	85	132 15
47	53P-80	80	300	248	132	14	190	98	152 20
48	53P-100	100	366	286	152	16	202	118	162 25
49	53P-125	125	435	344	197	16	260	192	202 41
87 23 50	53P-150	150	502	392	222	18	302	200	242 60
51	53P-200	200	640	487	282	20	350	253	272 108
52	53P-250	250	767	589	342	22	450	310	332 182

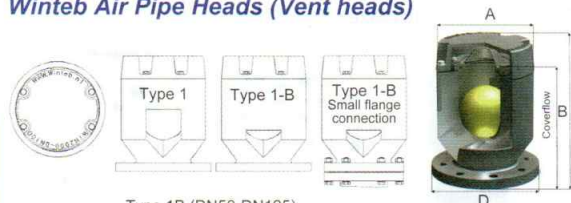
Name of Mfr.: Niikura Kogyo Co., Ltd.

Model: 53PW (with Screen for Fuel oil tank)

CODE	Model	Dimensions mm							Unit Per Pc. Wgt Kg
		Φd	H	h1	h2	W1	W2	W3	
87 23 53	53PW-50	50	264	221	112	162	92	127	- 14
54	53PW-65	65	264	221	122	162	85	132	- 15
55	53PW-80	80	300	248	132	190	98	152	- 20
56	53PW-100	100	366	286	152	202	118	162	- 25
57	53PW-125	125	435	344	197	260	192	202	151 41
87 23 58	53PW-150	150	502	392	222	302	200	242	163 60
59	53PW-200	200	640	487	282	350	253	272	249 108
60	53PW-250	250	767	589	342	450	310	332	310 182

Name of Mfr.: Niikura Kogyo Co., Ltd.

DIN PN10 type Winteb Air Pipe Heads (Vent heads)



Type 1B (DN50-DN125)
Anti Splash water type
Recommended for fuel tanks

WIN2000 Type 1 Air Vent Head, including Screen (mesh 18) with DIN PN10 flange connection.

- Made of seawater resistant Aluminium DIN1725.
- Non corroding (If fitted according to fitting instructions).
- Maintenance free, smallest design available.
- Cost saving.
- High volume metric flow.
- Light weight = less fuel = less CO2 emission.

Available three types:

- Type 1 - Standard
- Type 1B - Smaller air inlet opening
- Type 1B - Small flange connection

Approved by all major classification societies - ABS, BV, DNV, Lloyd's, RINA, RMRS, CCS, and NK.

Please specify the type of air vent heads, flange size to be connected with the type of pipe head when ordering.

Model: WIN2000 Type 1 (with Screen)

Flow Rate & Air Speed

Model	Flow Rate at 0.25 bar (m³/h)*	Flow Rate at 0.25 bar (m³/h)**	Max. Inlet Air Speed (m/s)	Inlet air flow rate at max. inlet air speed (m³/h)
W2T1-PN10-50	23	19	11	72
W2T1-PN10-65	34	33	9.5	11.5
W2T1-PN10-80	57	52	10	180
W2T1-PN10-100	102	78	8	216
W2T1-PN10-125	128	116	9.5	432

(to be continued)

W2T1-PN10-150	204	188	10	665
W2T1-PN10-175	210	195	8.5	720
W2T1-PN10-200	340	273	10	1,080
W2T1-PN10-250	450	405	9.5	1,700
W2T1-PN10-300	775	705	15	3,780
W2T1-PN10-350	940	896	19	6,500
W2T1-PN10-400	1,250	1,095	20.5	8,100
W2T1-PN10-450	1,800	-	15.5	9,000

* values correspond with the WIN2000 type 1 without screen, flowrate is with water being pumped through the air pipe head.

** values correspond with the WIN2000 type 1 with screen mesh 18, flowrate is with water being pumped through the air pipe head.

CODE	Model	Dimensions mm					Flange size			Unit Per Pc. Wgt Kg
		Φd	A	B	C	Ball Dia	O.D.	Pitch	Bolt Hole	
87 23 74	W2T1-PN10- 50	50	108	161	136	60	165	125	4×18	2.0
75	W2T1-PN10- 65	65	130	200	168	75	185	145	8×18	2.75
76	W2T1-PN10- 80	80	160	226	190	90	200	160	8×18	3.75
77	W2T1-PN10-100	100	195	226	226	105	220	180	8×18	6.0
65	W2T1-PN10-125	125	235	320	262	130	250	210	8×18	8.5
87 23 66	W2T1-PN10-150	150	275	372	312	155	285	240	8×22	12
67	W2T1-PN10-175	175	275	372	312	155	315	270	8×22	13
68	W2T1-PN10-200	200	340	470	385	200	340	295	8×22	19.5
69	W2T1-PN10-250	250	415	593	478	250	395	350	12×22	31
70	W2T1-PN10-300	300	560	741	595	325	445	400	12×22	63
87 23 71	W2T1-PN10-350	350	642	842	675	360	505	460	16×22	88
72	W2T1-PN10-400	400	725	950	760	400	565	515	12×26	114
73	W2T1-PN10-450	450	740	1,110	925	480	615	565	20×26	34

Name of Mfr.: World Wide Metric

Weight Type Breather Valves with Flame Screen

Válvulas de alivio de presión con pantalla antideflagrante

ウエイト式ブリザーバルブ 帯火焰滤网的配重式透气阀

Designed for Cargo Tanks in oil tankers to relieve the effect of overpressure or vacuum caused by thermal variations or during cargo loading and unloading. Fitting of vent main pipe, connecting flange is JIS 5K. Approved by NK, and LRS.

Setting pressure is 5 kPa to 20 kPa & -3.5 kPa to -7 kPa.



BVW-13C MODEL

BVW-41C-80 (FC) &
BVW-41C-II-B-80 (SCS)

BVW-13C

CODE	Model	Unit Per Pc.			
		d1	L	H	Weight kg
87 23 81	BVW-13C-FC-80	80	508	270	57
82	BVW-13C-FC-100	100	538	305	80

Name of Mfr.: Niikura Kogyo Co., Ltd.

BVW-41C-FC-080 / BVW-41C-II-B-080

CODE	Model	Unit Per Pc.			
		d1	L	H	Weight kg
87 23 83	BVW-41C-FC-80	80	280	400	36
84	BVW-41C-II-B-80	80	280	400	36

Name of Mfr.: Niikura Kogyo Co., Ltd.

Emergency Shut-off Valves & Air Reservoirs

Válvulas de cierre de emergencia y depósito de aire
非常遮断弁とエアリザーバー 緊急遮断閥和儲気罐

Every Pipe to suck in oil from Tank located up in the double bottom such as Fuel-oil Tank, Lubricating-oil Tank and Heat-agent-oil Tank must be equipped with Stop Valve or Cock in the way that it is located direct to Tank wall.

This Stop Valve or Cock has to be of function and structure so that it can shut off oil-flow direct at the installed position and also can be remote-controlled for shut-off from a safe place out of the area. This is a Device fit for such purpose.

Shut-off Operation

Air operating type:

Only open the compressed air supply valve connected from air reservoir. Air reservoir should be kept certain pressure between 0.39 MPa and 0.89 MPa.

* If there is insufficient pressure in the tank, there is a risk of inadequate air supply causing malfunction.

Wire operating:

Only pull the lever connected with wire. For manual shut, these valves can close with handle wheel by rotating in clockwise direction.

Reset after Shut-off

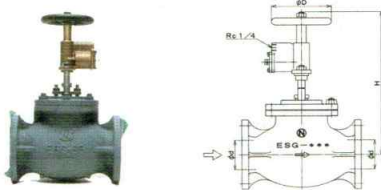
1. Rotate clockwise until a head of piston is set in the grooving on spindle, and then rotate counterclockwise the handle to set valve in full open condition.
2. In an emergency, the valves can be manually reset by lifting the handle upward.

* Regarding Air operating type, 1 or 2 should be applied after air supply valve is closed.

JIS Flanged End Globe Type

JIS 5K

*Shut-off Operation: Air operating type



CODE	Type	Size mm				Weight kg
		d	L	H	D	
87 45 01	ESG-005-025	25	120	265	100	7
02	ESG-005-040	40	160	270	100	11
03	ESG-005-050	50	210	270	100	15
04	ESG-005-065	65	250	320	125	20
05	ESG-005-080	80	280	325	125	25
87 45 06	ESG-005-100	100	340	410	160	35
07	ESG-005-125	125	410	430	160	45
08	ESG-005-150	150	480	460	160	65
09	ESG-005-200	200	570	615	315	100
10	ESG-005-250	250	740	655	315	135

Name of Mfr.: Niikura Kogyo Co., Ltd.

Shut-off Operation : Wire operating type

CODE	Type	Size mm				Weight kg
		d	L	H	D	
87 45 11	ESG-005-025-W	25	120	265	100	7
12	ESG-005-040-W	40	160	270	100	11
13	ESG-005-050-W	50	210	270	100	15
14	ESG-005-065-W	65	250	320	125	20
15	ESG-005-080-W	80	280	325	125	25

Name of Mfr.: Niikura Kogyo Co., Ltd.

JIS 10K

*Shut-off Operation: Air operating type

CODE	Type	Size mm				Weight kg
		d	L	H	D	
87 45 41	ESG-010-025	25	130	265	100	9
42	ESG-010-040	40	170	270	100	12
43	ESG-010-050	50	220	270	100	16.5
44	ESG-010-065	65	270	320	125	22
45	ESG-010-080	80	300	325	125	27
87 45 46	ESG-010-100	100	350	410	160	41
47	ESG-010-125	125	420	430	160	58
48	ESG-010-150	150	490	460	160	68
49	ESG-010-200	200	570	615	315	110
50	ESG-010-250	250	740	655	315	150

Name of Mfr.: Niikura Kogyo Co., Ltd.

*Shut-off Operation: Wire operating type

CODE	Type	Size mm				Weight kg
		d	L	H	D	
87 45 51	ESG-010-025-W	25	130	265	100	8
52	ESG-010-040-W	40	170	270	100	12
53	ESG-010-050-W	50	220	270	100	16.5
54	ESG-010-065-W	65	270	320	125	22
55	ESG-010-080-W	80	300	325	125	27

Name of Mfr.: Niikura Kogyo Co., Ltd.

JIS 16K

*Shut-off Operation: Air operating type

CODE	Type	Size mm				Weight kg
		d	L	H	D	
87 45 71	ESG-016-025	25	130	265	100	8
72	ESG-016-040	40	170	270	100	12
73	ESG-016-050	50	220	270	100	16.5
74	ESG-016-065	65	270	320	125	22
75	ESG-016-080	80	300	325	125	27

Name of Mfr.: Niikura Kogyo Co., Ltd.

*Shut-off Operation: Wire operating type

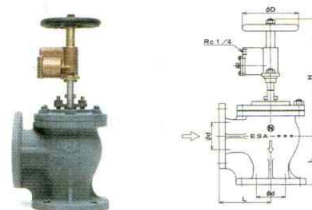
CODE	Type	Size mm				Weight kg
		d	L	H	D	
87 45 76	ESG-016-025-W	25	130	265	100	8
77	ESG-016-040-W	40	170	270	100	12
78	ESG-016-050-W	50	220	270	100	16.5
79	ESG-016-065-W	65	270	320	125	22
80	ESG-016-080-W	80	300	325	125	27

Name of Mfr.: Niikura Kogyo Co., Ltd.

JIS Flanged End Angle Type

JIS 5K

*Shut-off Operation: Air operating type



CODE	Type	Size mm				Weight kg
		d	L	H	D	
87 45 21	ESA-005-025	25	120	265	100	7
22	ESA-005-040	40	160	270	100	10
23	ESA-005-050	50	210	270	100	14
24	ESA-005-065	65	250	320	125	18
25	ESA-005-080	80	280	325	125	22
87 45 26	ESA-005-100	100	340	410	160	30
27	ESA-005-125	125	410	430	160	42
28	ESA-005-150	150	480	460	160	50
29	ESA-005-200	200	570	615	315	85
30	ESA-005-250	250	740	655	315	115

Name of Mfr.: Niikura Kogyo Co., Ltd.

Shut-off Operation : Wire operating type

CODE	Type	Size mm				Unit Per Pc.
		d	L	H	D	Weight kg
87 45 31	ESA-005-025-W	25	65	245	100	7
32	ESA-005-040-W	40	80	240	100	9
33	ESA-005-050-W	50	100	240	100	13
34	ESA-005-065-W	65	115	280	125	17
35	ESA-005-080-W	80	130	280	125	21

Name of Mfr.: Niikura Kogyo Co., Ltd.

JIS 10K

*Shut-off Operation: Air operating type

CODE	Type	Size mm				Unit Per Pc.
		d	L	H	D	Weight kg
87 45 56	ESA-010-025	25	85	245	100	9
57	ESA-010-040	40	100	240	100	10
58	ESA-010-050	50	120	240	100	13
59	ESA-010-065	65	130	280	125	19
60	ESA-010-080	80	140	280	125	23.5
87 45 61	ESA-010-100	100	160	355	160	32.5
62	ESA-010-125	125	180	370	160	49
68	ESA-010-150	150	205	385	160	66
69	ESA-010-200	200	230	535	315	95
70	ESA-010-250	250	290	560	315	135

Name of Mfr.: Niikura Kogyo Co., Ltd.

*Shut-off Operation: Wire operating type

CODE	Type	Size mm				Unit Per Pc.
		d	L	H	D	Weight kg
87 45 63	ESA-010-025-W	25	85	245	100	9
64	ESA-010-040-W	40	100	240	100	10
65	ESA-010-050-W	50	120	240	100	13
66	ESA-010-065-W	65	130	280	125	19
67	ESA-010-080-W	80	140	280	125	23.5

Name of Mfr.: Niikura Kogyo Co., Ltd.

JIS 16K

*Shut-off Operation: Air operating type

CODE	Type	Size mm				Unit Per Pc.
		d	L	H	D	Weight kg
87 45 81	ESA-016-025	25	85	245	100	9
82	ESA-016-040	40	100	240	100	10
83	ESA-016-050	50	120	240	100	13
84	ESA-016-060	65	130	280	125	19
85	ESA-016-080	80	140	280	125	23.5
87 45 86	ESA-016-100	100	160	355	160	32.5
87	ESA-016-125	125	180	370	160	49
88	ESA-016-150	150	205	385	160	66
89	ESA-016-200	200	230	535	315	95
90	ESA-016-250	250	290	560	315	135

Name of Mfr.: Niikura Kogyo Co., Ltd.

*Shut-off Operation: Wire operating type

CODE	Type	Size mm				Unit Per Pc.
		d	L	H	D	Weight kg
87 45 91	ESA-016-025-W	25	85	245	100	9
92	ESA-016-040-W	40	100	240	100	10
93	ESA-016-050-W	50	120	240	100	13
94	ESA-016-065-W	65	130	280	125	19
95	ESA-016-080-W	80	140	280	125	23.5

Name of Mfr.: Niikura Kogyo Co., Ltd.

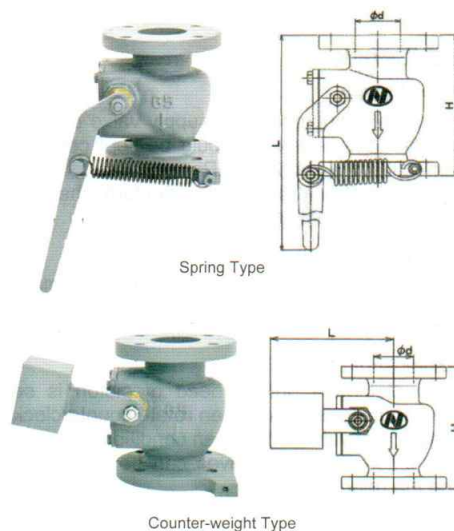
Self-Closing Valves

Válvulas de cierre automático

自動閉鎖弁 自閉閥

Required in the middle of the drainpipe and need to be installed in a handle-operated position when directing the drain water that accumulates at the top of the deep tank to the bilge reservoir.

Regulations also require that a quick-acting self-closing valve be installed in the drainpipe that collects at the top of the deep-water tank. Available in spring type and counter-weight type. Connecting Flange is JIS 5K.



39A-050~100 / 39A-W-050~100

CODE	Type	Model	Size mm			Unit Per Pc.
			d	H	L	Weight Kg
87 46 61	Spring type	39A-50	50	165	375	7
62		39A-65	65	180	375	10
63		39A-80	80	240	470	16
64		39A-100	100	280	465	23
87 46 65	Counter-weight type	39A-A-50	50	165	155	8
66		39A-A-65	65	180	192	12
67		39A-A-80	80	240	228	20
68		39A-A-100	100	280	168	32

Name of Mfr.: Niikura Kogyo Co., Ltd.

Quick-Closing Valves (DIN)

Ductile Cast Iron for Marine Service
Pressure Rating PN 16/10

Válvulas de cierre rápido (DIN), Fundición dúctil para servicio marino

Presión nominal PN 16/10

非常遮断弁 (DIN) 压力定格 PN 16/10

船用球墨铸铁 快关阀 (DIN) 压力等级 PN 16/10

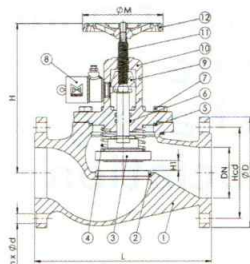
Angle and straight types metal seated quick closing valve made with Nodular Cast Iron. It equipped with universal release cylinder for mechanical, hydraulic or pneumatic closing. Also has an integrated safety feature for fire release and raised face flanges.

Applications:

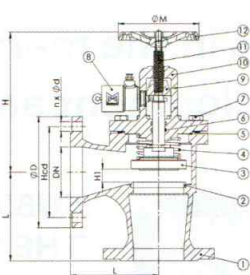
Fuel oil, Lubricating oil, Flammable hydraulic oil, Cargo oil, Non-flammable hydraulic fluid, Boiler feedwater, Condensate, Sea water, Water.



Straight



Angle



Pressure and Temperature Range

Size	Max. Press. At 180°C	Flange Rate
DN 15 - 150	10	PN16
DN 200-250	6	PN10

Material Specification

Component	Material	EN and/or DIN
Body	Ductile Cast Iron	EN-GJS400-18-LT
Bonnet	Ductile Cast Iron	EN-GJS400-18-LT
Disc	Stainless Steel	1.4301
Seat	Stainless Steel	1.4301
Stem	Stainless Steel	1.4301
Gasket	Rubber	NBR
O-ring	Rubber	FKM
Screw	Stainless Steel	1.4401
Release Cylinder	Copper Alloy	CW614N
Setting nut	Copper Alloy	CW617N
Handwheel	Cast Iron	GG25

How to order: CODE

Quick-closing valve (DN), ductile cast iron, pressure rating PN 10, TYPE of OPERATION, STRAIGHT or ANGLE, SIZE DN

Straight Type

CODE	DN	Size mm					Weight Kg
		Hcd	D	L	H	M	
87 46 01	15	65	95	130	176	120	5.2
02	20	75	105	150	178	120	5.9
03	25	85	115	160	188	120	6.8
04	32	100	140	180	192	120	8.4
05	40	110	150	200	202	140	10.0
87 46 06	50	125	165	230	224	140	14.0
07	65	145	185	290	253	140	19.0
08	80	160	200	310	253	160	26.0
09	100	180	220	350	298	160	46.0
10	125	210	250	400	338	200	54.0
87 46 53	150	240	285	480	410	200	72.0
54	200	295	340	600	575	400	150.0
55	250	350	405	730	615	400	183.0

MESON Model No. : 450.2.4.4.1

Angle Type

							Unit Per Pc.
CODE	DN	Size mm					Weight Kg
		Hcd	D	L	H	M	
87 46 11	15	65	95	90	169	120	5
12	20	75	105	95	170	120	5.6
13	25	85	115	100	179	120	6.4
14	32	100	140	105	186	120	8.3
15	40	110	150	115	205	140	9.9
87 46 16	50	125	165	125	204	140	14
17	65	145	185	145	233	140	19
18	80	160	200	155	252	160	26
19	100	180	220	175	278	160	41
20	125	210	250	200	295	200	47
87 46 56	150	240	285	225	335	200	63

MESON Model No. : 451.2.4.4.1

Conversion Table (kgf - N)

kgf → N		N → kgf		kgf → N		N → kgf	
1	9.8066	1	0.1020	51	500.1	51	5.2006
2	19.613	2	0.2039	52	510.0	52	5.3025
3	29.420	3	0.3059	53	519.8	53	5.4045
4	39.227	4	0.4079	54	529.6	54	5.5065
5	49.033	5	0.5099	55	539.4	55	5.6084
6	58.840	6	0.6118	56	549.2	56	5.7104
7	68.647	7	0.7138	57	559.0	57	5.8124
8	78.453	8	0.8158	58	568.8	58	5.9144
9	88.260	9	0.9177	59	578.6	59	6.0163
10	98.066	10	1.0197	60	588.4	60	6.1183
11	107.87	11	1.1217	61	598.2	61	6.2203
12	117.68	12	1.2237	62	608.0	62	6.3222
13	127.49	13	1.3256	63	617.8	63	6.4242
14	137.29	14	1.4276	64	627.6	64	6.5262
15	147.10	15	1.5296	65	637.4	65	6.6282
16	156.91	16	1.6315	66	647.2	66	6.7301
17	166.71	17	1.7335	67	657.1	67	6.8321
18	176.52	18	1.8355	68	666.9	68	6.9341
19	186.33	19	1.9375	69	676.7	69	7.0360
20	196.13	20	2.0394	70	686.5	70	7.1380
21	205.94	21	2.1414	71	696.3	71	7.2400
22	215.75	22	2.2434	72	706.1	72	7.3420
23	225.55	23	2.3453	73	715.9	73	7.4439
24	235.36	24	2.4473	74	725.7	74	7.5459
25	245.17	25	2.5493	75	735.5	75	7.6479
26	254.97	26	2.6513	76	745.3	76	7.7498
27	264.78	27	2.7532	77	755.1	77	7.8518
28	274.59	28	2.8552	78	764.9	78	7.9538
29	284.39	29	2.9572	79	774.7	79	8.0558
30	294.20	30	3.0591	80	784.5	80	8.1577
31	304.01	31	3.1611	81	794.3	81	8.2597
32	313.81	32	3.2631	82	804.2	82	8.3617
33	323.62	33	3.3651	83	814.0	83	8.4636
34	333.43	34	3.4670	84	823.8	84	8.5656
35	343.23	35	3.5690	85	833.6	85	8.6676
36	353.04	36	3.6710	86	843.4	86	8.7696
37	362.85	37	3.7729	87	853.2	87	8.8715
38	372.65	38	3.8749	88	863.0	88	8.9735
39	382.46	39	3.9769	89	872.8	89	9.0755
40	392.27	40	4.0789	90	882.6	90	9.1774
41	402.07	41	4.1808	91	892.4	91	9.2794
42	411.88	42	4.2828	92	902.2	92	9.3814
43	421.69	43	4.3848	93	912.0	93	9.4834
44	431.49	44	4.4868	94	921.8	94	9.5853
45	441.30	45	4.5887	95	931.6	95	9.6873
46	451.11	46	4.6907	96	941.4	96	9.7893
47	460.91	47	4.7927	97	951.3	97	9.8912
48	470.72	48	4.8946	98	961.1	98	9.9932
49	480.53	49	4.9966	99	970.9	99	10.095
50	490.33	50	5.0986	100	980.7	100	10.197