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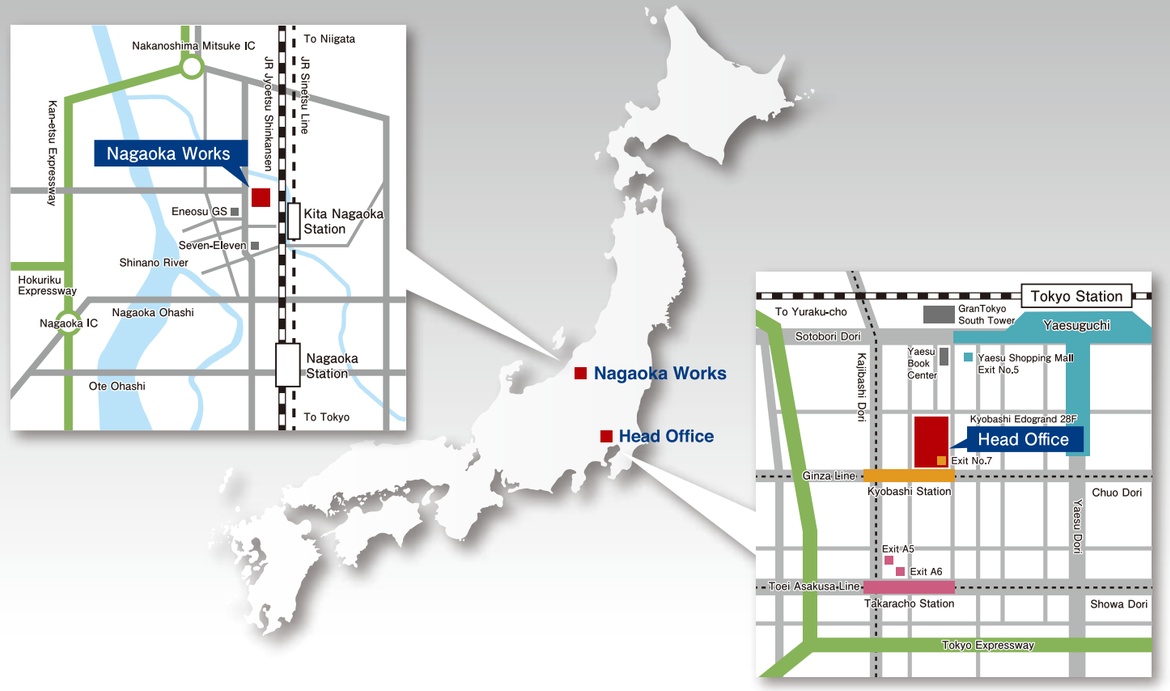

TB Global Technologies Ltd.

Notice : Tokyo Boeki Machinery Ltd. and Tokyo Boeki Engineering Ltd. merged on April 1, 2021 to become TB Global Technologies Ltd.

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https://www.tbgtech.co.jp

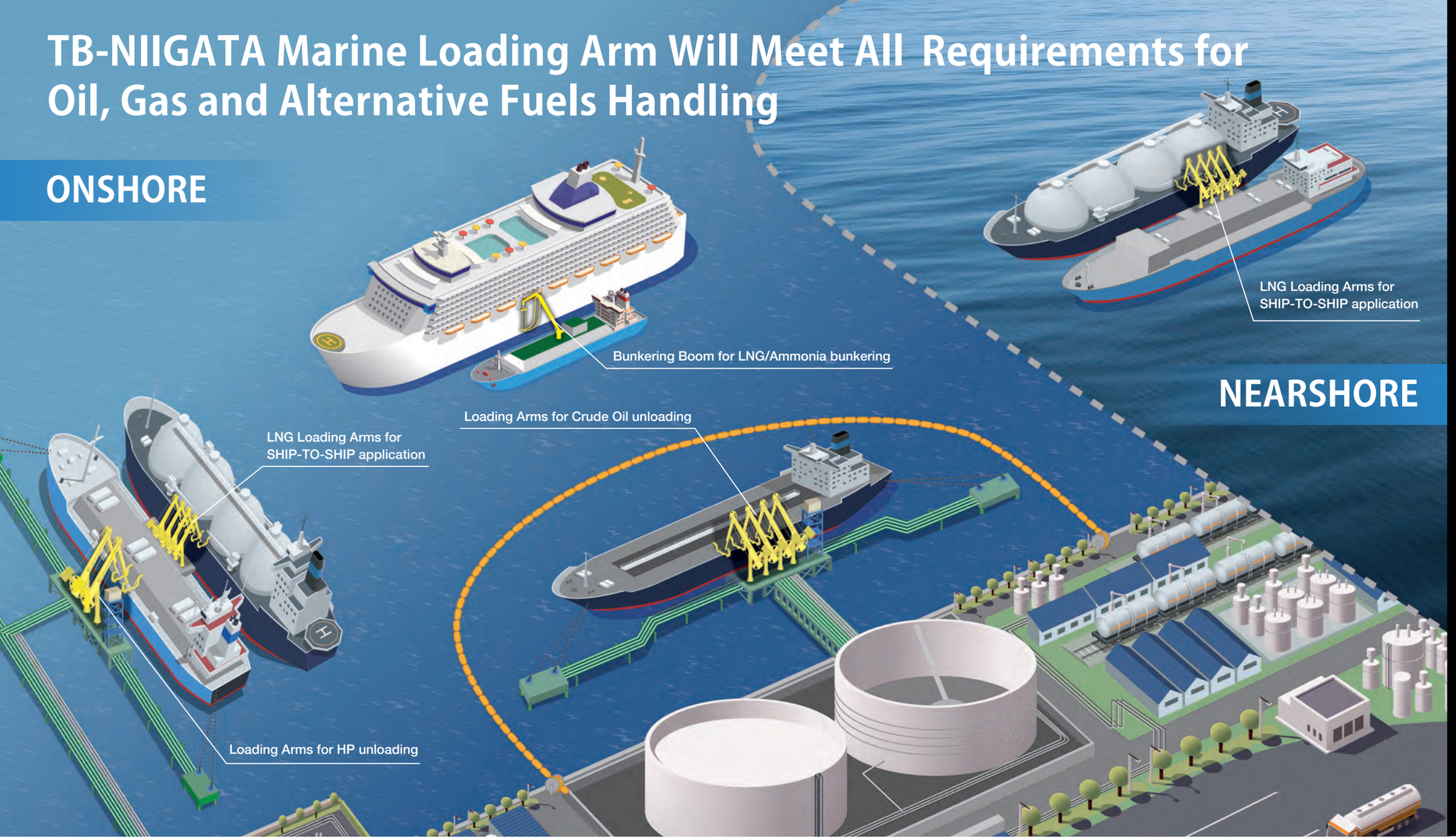
TOMAS TOKYO BOEKI GROUP

202410

TB-NIIGATA

MARINE LOADING ARMS

TB-NIIGATA Marine Loading Arm Will Meet All Requirements for Oil, Gas and Alternative Fuels Handling



TOTAL SOLUTION

Emergency Release System (ERS)

Hydraulic Quick Coupler (H-QCDC)

Mobile Marine Loading Arms

About Us

For more than 60 years, TB Global Technologies Ltd.(TBG) has been manufacturing transfer systems for loading and offloading of liquids and gases at ambient, elevated or cryogenic temperature. Our long experience and high technical know-how assure best practice design, production, installation and after-sales service through our world wide network.

Features

Marine loading arm enable safer, faster and more secure economical loading operations in harsh conditions especially when compared with flexible hose. Marine loading arms are designed for various tanker sizes from barges to the largest crude tankers (100~500,000DWT) and are installed successfully at many terminals around the world. TB-NIIGATA marine loading arms are equipped single/multi-ball race(s) TB-NIIGATA swivel joints and specialized packing which permits safe loading operation avoiding product leakage. TB-NIIGATA marine loading arms with the right combination of swivel joints (style 50-40-80) allow adequate freedom of movement to follow any motion of a vessel within the operation range.

Swivel joints and packing can be tailored to the fluid type to give the best product transfer performance of any kind of fluids or gasses. Fluid types includes but are not limited to crude oil or petroleum products, cryogenic products, refrigerated LPG, ethylene or LNG (-162°C), LH2(-253°C), elevated temperature products such as molten sulfur (120°C) or asphalt (180°C) and many kinds of chemical products.

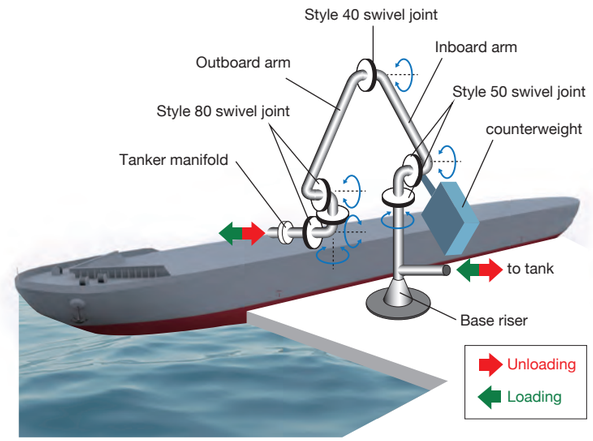
History

1902	Started NOC (NIPPON OIL.,LTD.)'s oil well machine maintenance business as a brunch factory of NIIGATA WORKS in Nagaoka city, Niigata prefecture.
1910	Became NIIGATA ENGINEERING's Nagaoka factory (current TB GLOBAL TECHNOLOGIES Nagaoka factory) due to the establishment of NIIGATA ENGINEERING CO,.LTD.
1955	Tokyo Boeki started to import Loading Arms.
1959	Started a technical tie-up with CHIKSAN CORPORATION (USA).
1961	Started manufacturing Swivel Joints.
1962	Started manufacturing Loading Arms.
1968	Supplied first LNG loading arm to Tokyo Gas
1988	Completed retrofit work on 16" LNG arms with ERS.
1989	Total LNG loading arms supply excessed 100 sets
1993	First automated arm supplied to OSAKA GAS.
1998	Obtained ISO9001.
2003	February 26th : NIIGATA LOADING SYSTEMS, LTD. founded.
2004	Presented 5th generation LNG loading arm's new technologies at SOCIETY of INTERNATIONAL GAS TANKER & TERMINAL OPERATORS LTD.
2005	Supplied LNG loading arms fully manufactured in-house (Loading arm, ERS, H-QCDC) to SAKHALIN LNG.
	Total LNG loading arms supply excessed 200 sets
2008	Developed an ERS with single cylinder for LNG service.
2013	Total LNG loading arms supply excessed 300 sets
2015	NIIGATA LOADING SYSTEMS, LTD. changed its corporate name to TOKYO BOEKI ENGINEERING LTD.
2018	Opened the Singapore branch.
2019	Developed world's first loading arm for ship-to-shore transfer of liquefied hydrogen.
2020	Appointed as the "Companies Taking on the Zero-Emission Challenge" by the Ministry of Economy, Trade, and Industry in Japan
2021	TOKYO BOEKI MACHINERY LTD. and TOKYO BOEKI ENGINEERING LTD. merged to form TB GLOBAL TECHNOLOGIES LTD.

Basic Models of Loading Arm

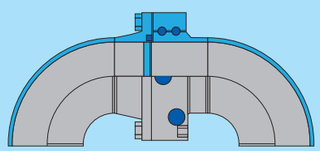
Basic structure of Loading Arm

Marine loading arm consists of 3 different types of swivel joints(6 swivels)-Style 50,40 and 80.
The combination of these 3 types of swivel joints allows the arms to follow the movement of vessel in all directions smoothly and enables safe un/loading operation.
Style 50 swivel joint, located at the top of the riser, permits horizontal slewing and vertical movement of the arm assembly.
Style 40 swivel joint, connects inboard and outboard arms at the apex of the assembly and provides vertical rotation at the point of junction between in/outboard arms.
Style 80 swivel joint, the termination of the arm assembly, provides required flexibility around the 3 axis where the arm connects to the barge or tanker manifolid.



Swivel joint

Swivel joint, the key part of loading arm, with a machined ball-race allows 360-degree rotation and movement in one, while under internal pressure. TB-Niigata swivel joints with special cladding ball race used in joints enable high-resistance of thrust, radial and bending moment load and long endurance. The materials of joint body and packing are appropriately chosen depending on the kinds of fluids handled design pressure and temperature. As the prevention of corrosion, the sealing part is stainless-overlaid.

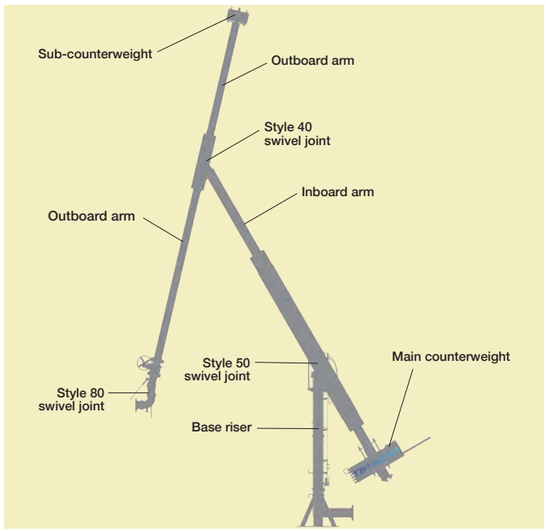


FBMA

(Fully Balanced Marine Arm)

FBMA is the simplest and fully balanced loading arm having main counterweight and sub-counterweight.
It can be operated with only a few operators (manual type), and provide easy maintenance as well as overhaul.
Desigh of the FBMA is available in 3"-12" up to 14.5m long (sum of the length of in/outboard arms) for different kinds of products. Hydraulic operation is also available.

Size (end connection)	**:3"～12"**
Arm length	**:8.5m～14.5m,up to 12.5m for 12"**
Tanker size	**:100～10,000DWT**
Operation	**:Manual,Hydraulic**

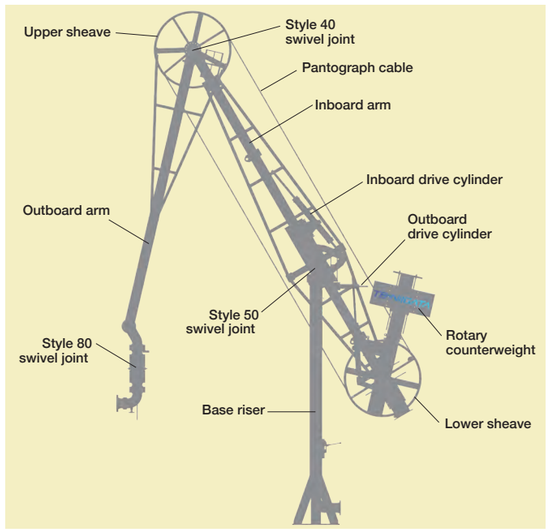


RCMA/RCMA-T/RCMA-S

(Rotary Counterweighted Marine Arm /RCMA-Truss structure/RCMA-Suspended)

RCMA is fully balanced in all positions with the combination of rotary counterweight and pantograph structure which balances both inboard and outboard arms simultaneously.
It is desighed for smooth-operability and is used for larger diameter connection and also has wide working range.
Both manual and hydraulic operation are available.
Connecting size is from 8"-16"(end connection), and the length of arm is set from 12.5m up to 24m.

Size (end connection)	**:8"～16"**
Arm length	**:12.5m～24m**
Tanker size	**:3,000DWT～500,000DWT**
Operation	**:Manual, Hydraulic**

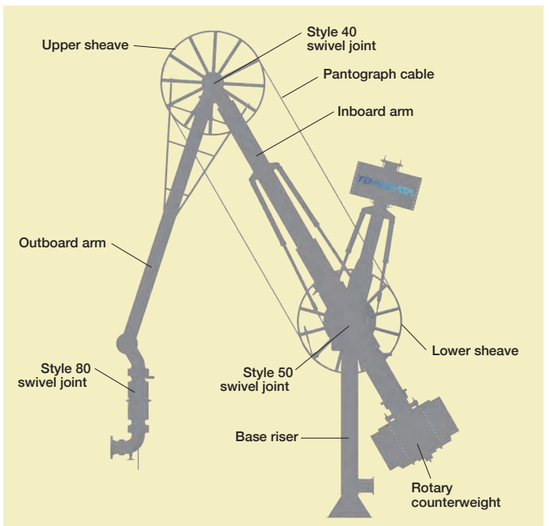


DCMA/DCMA-S

(Double Counterweighted Marine Arm /DCMA-Suspended)

DCMA is fully balanced in all positions with independent counterweights and pantograph structure.
Hydraulic operation is standard design and its end connection size is from 8"-16". The arm length is from 12.5m～28m.

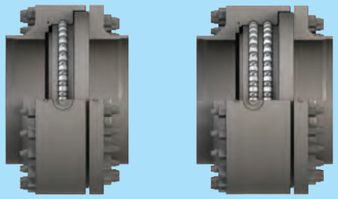
Size (end connection)	**:8"～16"**
Arm length	**:12.5m～28m**
Tanker size	**:3,000DWT～500,000DWT**
Operation	**:Hydraulic**



For LNG

Cryogenic Swivel Joint

Swivel joints for LNG without snap-in race have a ball race section of a single race with an overlay weld of a different metal material from that of the body to increase hardness. Swivel joints for LNG with snap-in races are or double raced or triple-raced as before.

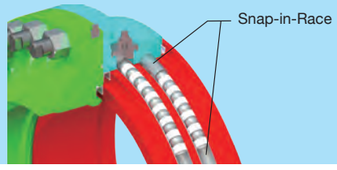


Single Race
(Without Snap–in-Race)

Double Race
(With Snap–in-Race)

Snap-in-Race

Swivel joints used in TB-NIIGATA marine loading arms for cryogenic service can employ Snap-in-Race which is replaceable ball-race.This specially hardened stainless steel ball-races withstand large load and ensure long-term usage. They are used for not only cryogenic swivel joints but for joints at ambient and elevated temperature.



FBMA For Coastal Terminal (size : 6"~8")

RCMA-S/DCMA-S For Export / Import Terminal (size : 16")

MLA for Small Scale LNG

TB-NIIGATA new model for small-scale not only boasts a structure design that minimizes mechanical and temperature difference loads, but also offers a host of advanced features to enhance safety and efficiency. Equipped with an Emergency Release System (ERS) and the state-of-the-art Hydraulic Quick Connect/Disconnect (H-QCDC) mechanism, our loading arm ensures swift response in critical situations, safeguarding both personnel and equipment. Additionally, this versatile solution accommodates piping sizes from 6"to 10", with the option of a vapor piggyback line (4"to 6"), and offers a wide range of adjustable arm lengths to perfectly match our customers' specific needs. Experience unparalleled performance and energy efficiency with our small-scale marine loading arm, setting a new benchmark for industry excellence.

Size (end connection)	**: 6" to 10"**
Arm Length	**: 12m ～ 18m**
Max Flow Rate(10")	**: ≅2,000 m3/hr**
Operation	**: Hydraulic**

For LH2(Liquefied Hydrogen)

MARINE LOADING ARMS

Loading/Unloading operation of 6” LH2 Marine Loading Arm

Development of MLA for LH2

In 2014, we started development of a 6” tubular steel loading arm for liquefied hydrogen in order to realize a carbon-neutral society in the future, and in 2022 we succeeded in the world's first loading of liquefied hydrogen.
In the area of liquefied hydrogen (-253°C), which is much cooler than LNG (-162°C), existing low-temperature technology alone cannot cope.
We have developed a new structure for the entire LA including patented swivel joints, patented ERS (Emergency Release System), and pipes, which are constructed with a vacuum double-wall pipe structure for the entire wetted pipe, and measures against heat input and heat transfer for the swivel joints and ERS.

We are also taking on the challenge of developing larger equipment (16”) for the construction of large-scale supply chains.
We will play a part in the hydrogen society and provide further social contribution.

16” Ship Shore Coupling (SSC) tested by LH2

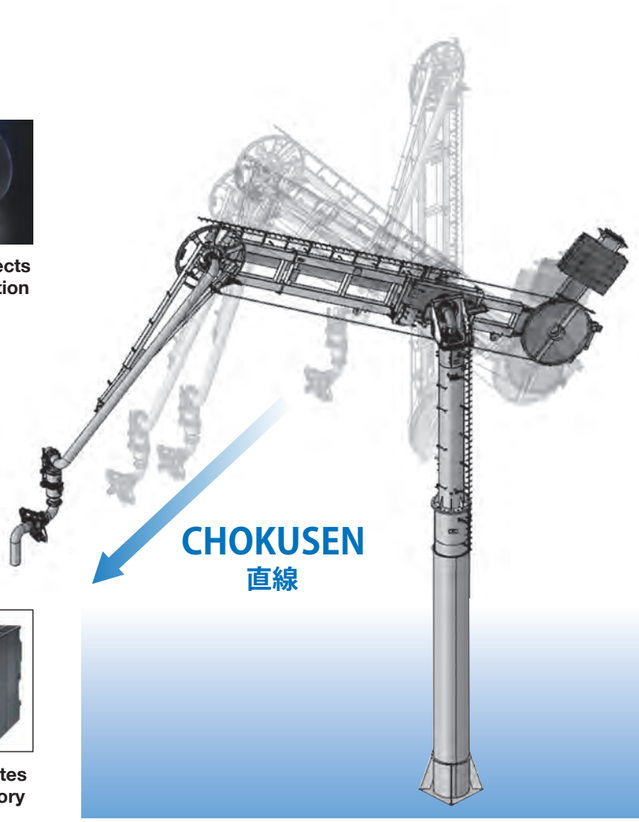
16” RCMA-S LH2 Marine Loading Arm

Technologies for Ship to Ship

Chokusen

Chokusen, which is exclusive and innovative system allows the operator to control the loading arm along a straight trajectory, with the significant benefits of facilitating the ship manifold connection and reducing the operating travelling time of the arm.
The straight movement is done by a specific trajectory calculation and the use of proportional solenoid valves to modulate the speed of the arm along the 3 axis.
Different than the conventional loading arms with rotational design, the straight movement makes the travelling time reduced of about 50% and the final connection remarkably facilitated.

Sensor detects flange position



Cylinders drive the arm motion

PLC calculates best trajectory

Proportional valve controls flow

	Conventional MLA	Chokusen
Operation Details	The command corresponds to the movement of one cylinder ⇒Operator must always ‘correct’ the trajectory ⇒Arm to ship connection is not easy and requires skilled operator	The command corresponds to movement of three cylinders ⇒The control calculates the trajectory ⇒Arm to ship connection is facilitated, thus faster

MLA for HP(CNG) service

TB-NIIGATA high-pressure natural gas (HPNG) loading arm is tailored to meet the growing demand for FSRU-type import terminals. The standard design features a robust 12" pipe size, capable of accommodating pressures up to 100 bar.g. For specialized applications, the design can be extended to an impressive 150 bar.g, catering to your specific requirements. Our loading arm seamlessly connects to a wide range of possible FSRU manifold arrangements, allowing continuous operation over extended periods, providing unmatched flexibility and convenience. By design, this loading arm minimizes maintenance operations, reducing downtime and maximizing productivity.

- Designed based on our safe and reliable RC-S loading arm for cryogenic service.
- Assuring perfect balance with counterweight

Diameter	: 12"
Fluid	: HPNG
Design pressure	: 15MPa
Operating pressure	: 10MPa
Design temperature	: -20°C／80°C

Bunkering Boom for LNG/Ammonia

LNG Bunkering

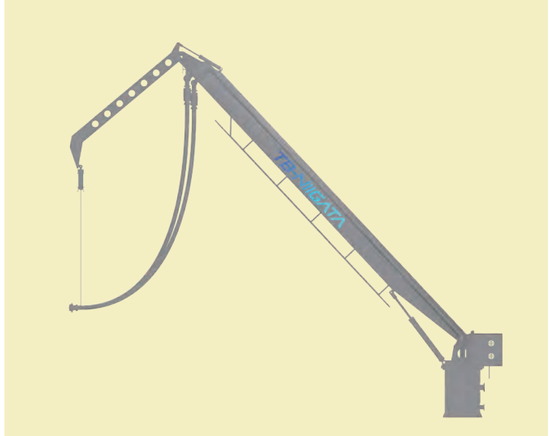
TB-NIIGATA LNG bunkering boom is meticulously engineered to meet rigorous ship class certifications, enabling seamless integration onto LNG Bunkering Ships. This specialized solution is purpose-built for ship-to-ship transfers, ensuring safe and efficient bunker operations for a wide range of LNG-powered vessels. Equipped with a full bore Emergency Release System (ERS) as standard, it guarantees optimal flow rates and enhanced safety during transfers. By replacing the traditional crane and hose combination, our bunkering boom alleviates the burdensome aspects of bunker operations, allowing for a smoother and more efficient process.

Diameter	: 4" to 8"
Fluid	: LNG
Design pressure	: 1.9MPa
Operating pressure	: 0.35MPa
Design temperature	: -165°C / 80°C

Ammonia Bunkering

TB-NIIGATA groundbreaking Ammonia bunkering boom is equipped with our innovative Emergency Release System (ERS) solution ensures to minimize any NH3 spillage, prioritizing safety and environmental protection. By taking proactive measures to develop this advanced Ammonia bunkering boom, we ensure that our customers have access to the latest technology and stay ahead in the evolving field of ammonia bunkering.

Diameter	: 4" to 8"
Fluid	: LNH3
Design pressure	: 1.9MPa
Operating pressure	: 1.0MPa
Design temperature	: -33°C / 80°C



Safety and Mobility ~ Satisfactory Product
Lineup To Meet Every Need

Emergency Release System (ERS)

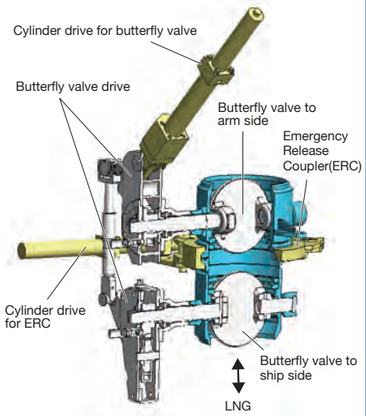
Emergency Release System(ERS) is the system that disconnect the loading arm from the tanker manifold within several seconds with no leakage in any emergency circumstances such as sudden and rapid movement of vessels due due to unexpected events, such as gust, earthquake, etc...
This ERS system consists of the ERS unit installed integrally at style 80 swivel joint and the electrical/hydraulical equipment that control the ERS unit.
TBG has successful ERS delivery records. for different kinds of fluids and gases and since the first installation in 1982, all of the LNG loading arms supplied for LNG export/import in and outside Japan are equipped with this unit.

1 Start separating

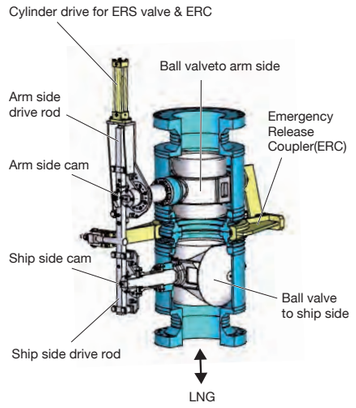
2 Two valves shut completely

3 ERC opens and finishing separation

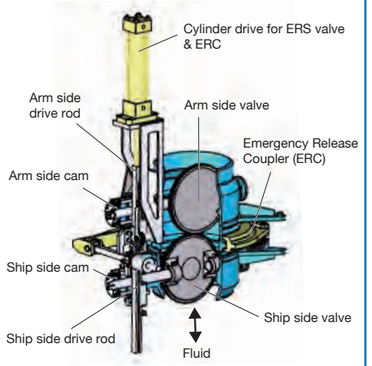
Double butterfly valve ERS unit



1/4 double ball valve ERS unit



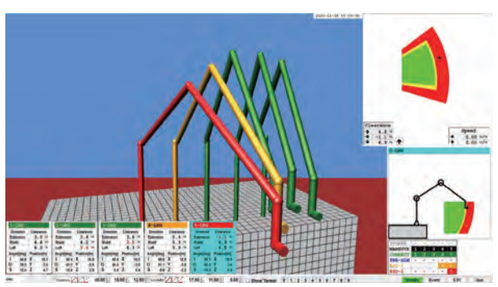
Light Weight DBFV ERS unit
Single actuator type for NH3, LPG and Petrochemical/Refrg., 8"~16", ASME 150Lb



FEATURES
- Weight reduction of 30%~50% (compare to conventional model)
- Reliable mechanism with single actuator
- High-performance valve

Position Monitoring System (PMS)

(1) Position Monitoring System enables you to monitor the mooring location of the tanker connected with loading arms for safe un/loading operation.
(2) By monitoring the mooring position of tanker or the drifting speed constantly, this system allows you to correct the tanker position instantly.



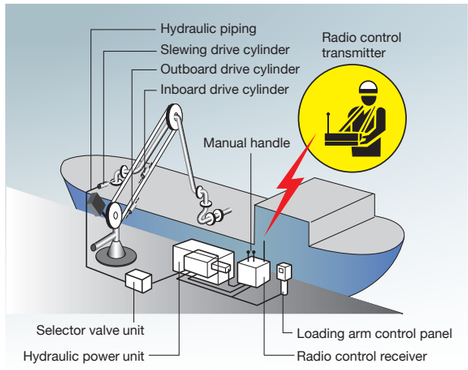
【System outline】
Based on the data from angle sensors installed on the loading arm, PMS main unit calculates the location of the outer flange of the arm, mooring position of the ship, drifting speed, or allowable working range, then in the emergency situation, it alarms for prevention of arm damages.
These data from PMS main unit are sent to the PMS monitor located in the jetty control room or central monitoring room in the safty area, and the arm position and the tanker information (location·speed·distance) are shown on the display.
【Installation advantage】
PMS monitor shows you the position of each loading arm (stored·maneuvering·loading) or arm attitude instantaneously. It also monitors the mooring position of the ship and drifting speed constantly and enables you to figure out the safety angles of each arms quantitatively.
The different kinds of real-time data from the angle sensors and alarming system for emergency allows you to handle any contingencies in appropriate measures instantly.

Radio Control System

Radio control system is developed for safe, assured and easy loading arm maneuvering.

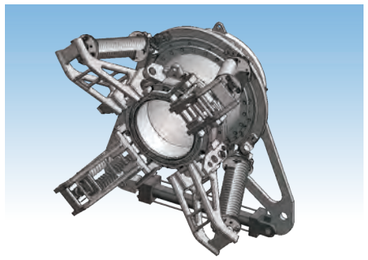
[Features]

(1) This compact and lightweight radio control transmitter allows one person operation.
(2) This cordless control system also permits safe and easy loading arm selection and flanging operation in the tanker manifold area.



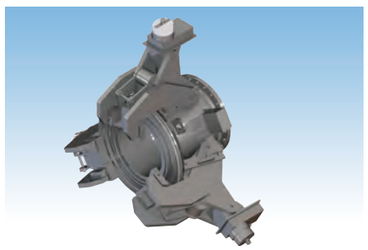
Hydraulic Quick Coupler (H-QCDC) for Cryogenic service (size : 16")

(1) This hydraulic coupler is installed on the end of the loading arm and enables quick, safe and asssured connecting and disconnecting operation.
(2) By combination usage with radio controller, operatable by only one person.
(3) H-QCDC units have installed on loading arms for large tanker to expedite arm dis/connecting operation.
(4) TBG manufactures H-QCDC domestically to high quality standards.
Few loading arm makers have the technical knowledge to manufacturing H-QCDC, TB Global Technologies Ltd. provides all applications of service-design, manufacturing, installation and after sales service for H-QCDC.



Hydraulic Quick Coupler (H-QCDC) for Ambient temperature service (size : 10"~16")

QCDC is installed at the end of the loading arm and allows fast, safe and accurate dis/connecting loading arm to the tanker manifold.
By using this quick coupler, it is not necessary to insert a flange gasket or to bolt the flange to the tanker manifold.
Quick coupler is activated by hydraulic pressure and its flanging time requires only a few seconds to complete a tight connection.
After connecting coupler to the tanker manifold, the clamp is tightened mechanically, to assure the correct tightness required for safe un/loading operation.



Manual Quick Coupler (Size: 6"~12")

Manual Quick Coupler is installed at the end of the loading arm enabling an easy connection by rotating several clamps with the manual handle.
It is unnecessary to insert the gasket or to bolt the flange to the manifold.
The available size is from 6" up to 12" and it can be installed on the existing loading arms.

After-Sales Service

TB Global Technologies Ltd. provides quick and reliable after sales service worldwide in case of any troubles and needs of repair.
For safe and long-term usage of loading arms, our highly experienced personnel offer periodical inspection, maintenance and overhaul with TB-NIIGATA genuine spare parts.
All critical spare parts are stocked at TBG Nagaoka works and ready for timely shipment.