PROVIDING TOTAL SOLUTION FOR YOUR FLEET

TECHCROSS

ELECTRO-CLEEN™ SYSTEM

Ballast Water Management System with direct electrolysis

Techcross Electro-Cleen™ System (ECS) is one of the most effective ballast water management systems utilizing electrolysis.

ECS treats all incoming ballast water by in-situ production of hypochlorite with combined effects of electric shock and hydroxyl radical in the Electro Chamber Unit (ECU). This simple disinfection processing is so powerful that it destroys cell membrane of microorganisms and prevents re-growth, needing only one-time treatment. It means ECS contributes to reduction in time and operating cost.

Techcross has upgraded ECS through continuous research and development involving tests and approvals with classification societies for better performance. ECS obtained the world's first IMO Basic Approval in 2006 and many Type Approvals from the flag states and classification societies. In addition, ECS has become the first Korean BWMS that received the USCG Type Approval in 2018.

Techcross has closely cooperated with classification societies to conduct various risk assessments including HAZOP (Hazard & Operability), hydrogen gas safety tests, FMEA (Failure Mode & Effects Analysis) and software verification. The FMEA was carried out in 2013 with the ABS in Houston, and was considered to be the industry's first one with class for BWMS. With all these risk assessments, Techcross has shown a strong commitment for improving safety of products.

IMO Final Approval
2008

Korean Government
2008

KR Type Approval
2008

Liberian Government
2011

ABS Type Approval
2011

Japanese Government
2012

RS Type Approval
2013

BV Type Approval
2013

RINA Type Approval
2013

Cyprus Government
2014

LR Type Approval
2015

Australia Government
2016

DNV&GL Design Assessment
2016

CCS Type Approval
2017

Danish Government
2017

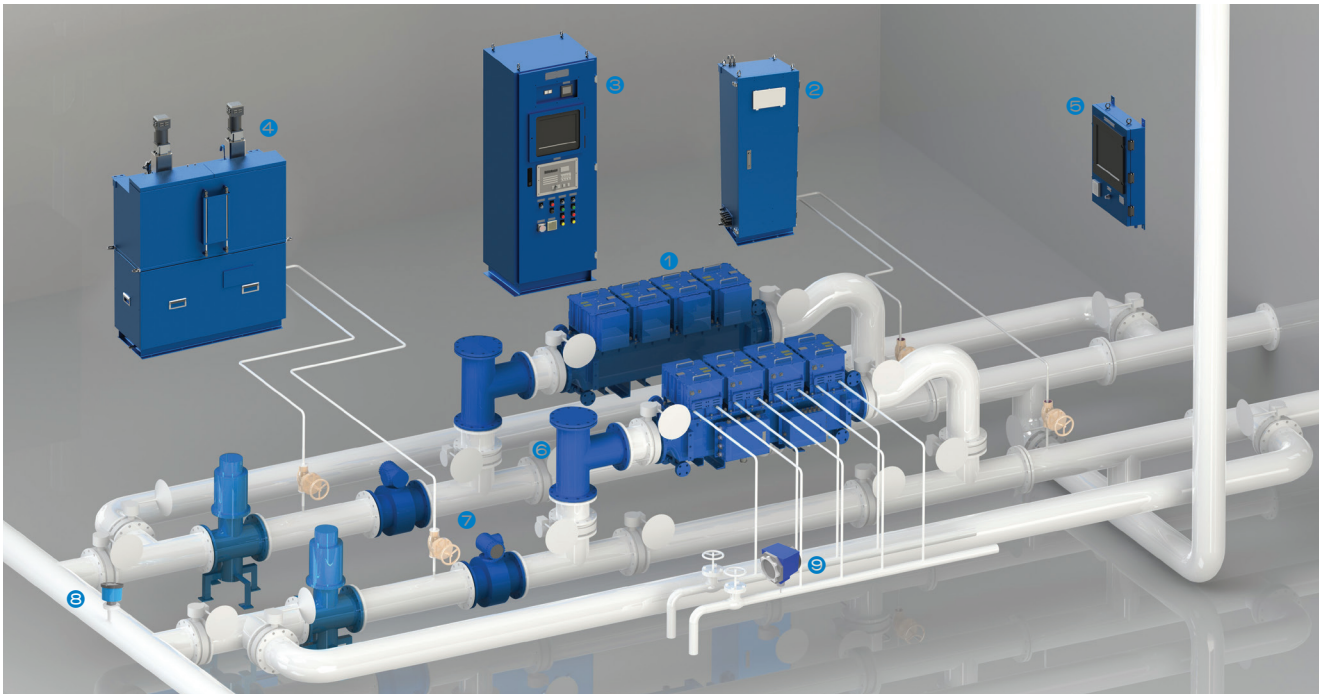
Greek Government
2017

Panamanian Government
2017

USCG Type Approval
2018

Turkey Government
2018

Norway Government
2018



1. ECU (Electro Chamber Unit)
2. TSU (TRO Sensor Unit)
3. PDE (Power Distributor Equipment)
4. ANU (Auto Neutralization Unit)
5. CPC (Control PC)
6. T-strainer
7. FMU (Flow Meter Unit)
8. CSU (Conductivity Sensor Unit)
9. FTS (Freshwater Temperature Sensor)

Ballasting

CSU → FMU → T-strainer → ECU → PDE → TSU → Ballast Tank

All the incoming ballast water passes through T-strainer before it is treated by ECU. ECU can disinfect marine organisms in the ballast water with one time treatment during ballasting.

Deballasting

FMU → ANU → TSU → Overboard

A main process during deballasting operation is neutralization of the treated water by ANU. ANU is designed to automatically neutralize the treated water according to data about flow rate and TRO concentration by FMU & TSU.

Advantages of ECS

- Strong disinfection efficacy
- Low power consumption
- Low operational costs
- Largest reference list
- Convenient installation and maintenance
- Automation of system
- Global network

SPECIFICATION OF ECS

Specific information of Electro-Cleen™ System

ECU (Electro Chamber Unit)

Specification	ECU is the core component killing marine organisms in the ballast water ranging from ECU 150B to ECU 1000B. Each model can be combined in parallel to achieve higher TRCs (Treatment Rated Capacity).	
Size	ECU 150B	W790 X D540 X H862 (mm), 250kg
	ECU 300B	W1,243 X D763 X H862 (mm), 455kg
	ECU 450B	W1,490 X D763 X H862 (mm), 605kg
	ECU 600B	W1,840 X D763 X H862 (mm), 755kg
	ECU 1000B	W2,000 X D1,124 X H914.5 (mm), 1,280kg
Power Supply	AC 440V, 3ph, 60Hz (FROM PDE)	
Component	EM(Electro Module), PRU(Power Rectifier Unit), EPJ(ECU Power Junction box), ESJ(ECU Signal Junction box)	
Ex-Certificate	Ex II 2 G Ex de IIB T4 Gb : LCIE 12 ATEx 3095X / Ex de IIB T4 Gb : IECEx KGS 12.0008X	

< ECU 150B >

< ECU 300B >

< ECU 450B >

< ECU 600B >

< ECU 1000B >

PDE (Power Distributor Equipment)

Specification	PDE supplies AC 440V from the ship to all other components of ECS and controls communications of all other components.	
Size	PDE 12A	W700 X D700 X H1,600 (mm), 200kg
	PDE 24A	W700 X D700 X H1,900 (mm), 310kg
	PDE A4	W700 X D700 X H1,600 (mm), 280kg
Power Supply	AC 440V, 3ph, 60Hz / AC220V, 60Hz	

< PDE 12A >

< PDE 24A >

< PDE A4 >

< ANU 5T >

< ANU 10T >

ANU (Auto Neutralization Unit)

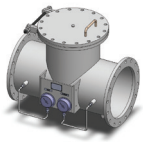
Specification	ANU is designed to automatically neutralize treated ballast water prior to its discharge so that the discharge of Residual Biocides may not exceed 0.1ppm (instantaneous maximum limit) according to TRO level measured by TSU.	
Size	ANU 5T	W800 X D726 X H1,657.5 (mm), 220kg
	ANU 10T	W1,200 X D726 X H1,657.5 (mm), 308kg
Power Supply	AC 220V, 60Hz (FROM PDE)	
Neutralizer	Sodium Thiosulfate	
Mixture Ratio	2 (Fresh water) : 1 (Neutralizing agent)	
Tank Capacity	ANU 5T	100 Liter for each tank (Both : 200 Liter)
	ANU 10T	200 Liter for each tank (Both : 400 Liter)

TSU (TRO Sensor Unit)

Specification	TSU measures concentrations of TRO (Total Residual Oxidant) generated by ECU during ballasting operation. TSU also checks the TRO level in the treated ballast water for proper neutralization of ballast water before its discharge.
Size	W470 X D450 X H1,347 (mm), 100kg
Power Supply	AC 220V, 60Hz (FROM PDE)
Ex-Certificate	II 2 G Ex px IIC T4 Gb / ITS11 ATEx 17384

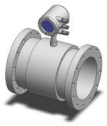
CPC (Control PC & S/W)

Specification	Control PC features an upgraded touchscreen interface which is easy & simple to operate ECS. In addition, the CPC shows all the data saved relating to ECS operation.
Size	W480 X D119 X H660 (mm), 35kg
Type	Wall, Console
Power Supply	AC 220V, 60Hz (FROM PDE)



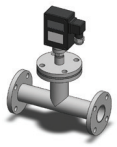
T-strainer

Specification	T-strainer with a 3mm mesh filter is used during ballasting operations to filter out large marine species and foreign materials in the incoming ballast water. It helps protect electrodes inside the ECU to maintain an optimal performance of ECU for a strong disinfection efficacy.	
Size	150A	H258 X L450 X L216 (mm), 50kg
	900A	H934 X L1,450 X L820 (mm), 1,536kg
Type	Straight, Angle	
Pressure Range	-1 ~ 10 Bar	



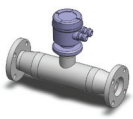
FMU (Flow Meter Unit)

Specification	Measures flow rate of ballast water during ballasting and deballasting operation.
Power Supply	AC 220V



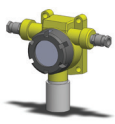
FTS (Freshwater Temperature Sensor)

Specification	Measures temperature of cooling water supplied to a rectifier from vessel.
Power Supply	DC 24V



CSU (Conductivity Sensor Unit)

Specification	Measures electrical conductivity of seawater passing through ECU during ballasting operation.
Power Supply	DC 24V



GDS (Gas Detection Sensor)

Specification	Detects a possible leak of hydrogen gas from ECU.
Power Supply	DC 24V

ECS-HYCHLOR™ SYSTEM

Ballast Water Management System with indirect electrolysis

ECS-HYCHLOR™ SYSTEM

Specification

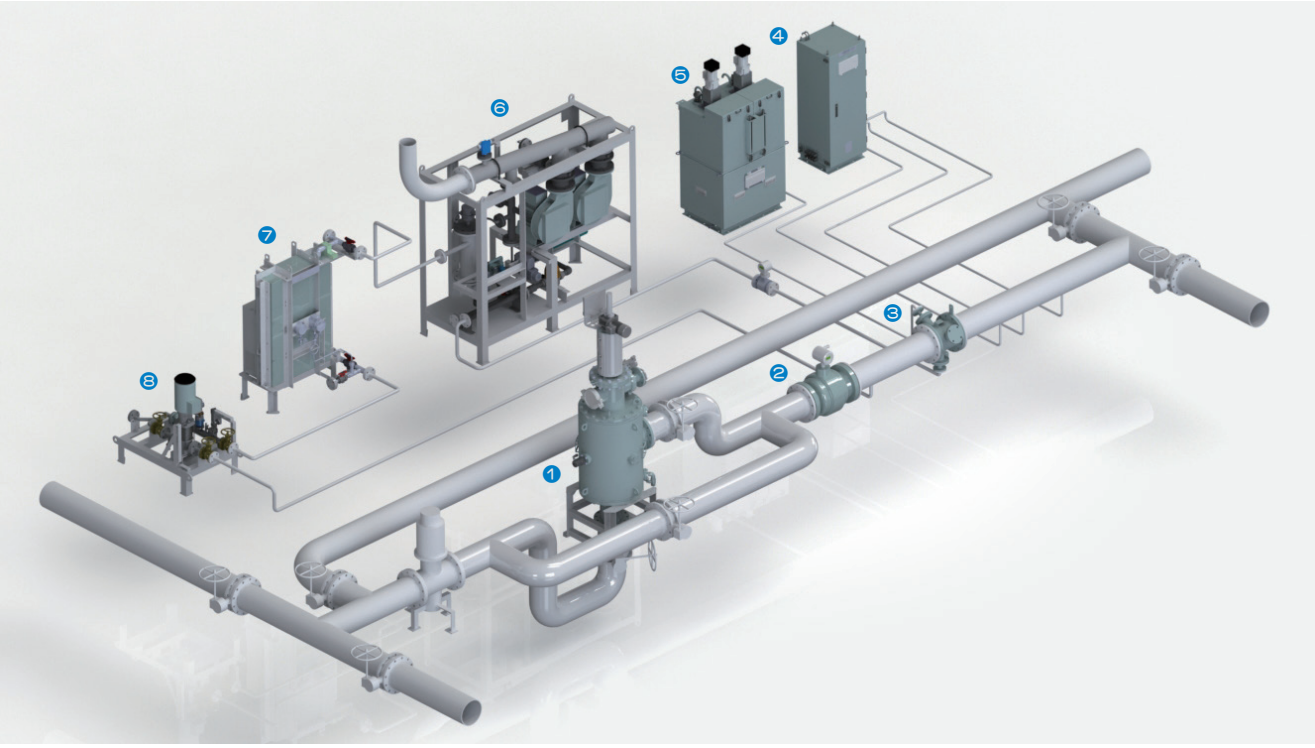
Division	Specification
Filtration	50㎛ auto back flushing
Pressure loss	< 0.1 bar (filter)
Operation	TRO 5mg/L
Neutralization	< TRO 0.1mg/L
HGU power consumption	4 ~ 5.2kW/100㎥
TRC	150 ~ 8,000㎥/hr
Salinity	No limit (If salinity is below 8 PSU, sea water contained in the APT tank of vessel is used for the electrolysis, or highly concentrated electrolyte is injected from STU or mixing solution to maintain 8 PSU for the operation.)
(Amb*) Temperature	0 ~ 55°C
Feed temperature	＞ 2.5°C (min.)

ECS-Hychlor™ System (ECS-Hychlor) adopts a disinfection technology combining filtration with indirect electrolysis. It consists of filtration, electro chlorination unit and neutralization units with some of accessories. The filter unit is mounted directly on the main ballast pipeline to eliminate larger microorganisms and suspended solid than 50㎛ in size. The organisms and solids are filtered out by filtration unit and discharged along with ambient water, using auto back-flushing function. During de-ballasting, ballast water does not pass through the filtration unit.

ECS-Hychlor has been completed all the tests for USCG type approval in March 2019. After collection of relevant applications with IL report in June, it will be expected to obtain the type approval by the end of 2019.

Approval Status

Test / Approval	Progress	Remark
IMO Basic Approval	Obtained in May 2015	2015. 05. 15 MEPC 68
IMO Final Approval	Obtained in April 2016	2016. 04. 18 MEPC 69
USCG Type Approval	Expected by 2019	



1. AFU (Auto Filter Unit)
2. FMU (Flow Meter Unit)
3. SMU (Static Mixer Unit)
4. TSU (TRO Sensor Unit)
5. ANU (Auto Neutralization Unit)
6. DMU (Degas Module Unit)
7. HGU (Hypochlorite Generation Unit)
8. PMU (Pump Module Unit)

Ballasting

AFU → PMU → HGU → DMU → SMU → TSU → Ballast Tank

Deballasting

Ballast Tank → ANU → SMU → TSU → Overboard

Advantages of ECS-Hychlor

- Easy installation
- Interchangeable service (same unit / spare parts / contact point / warehouse)
- Zero holding time
- Automation of system
- Global network

RETROFIT SERVICE

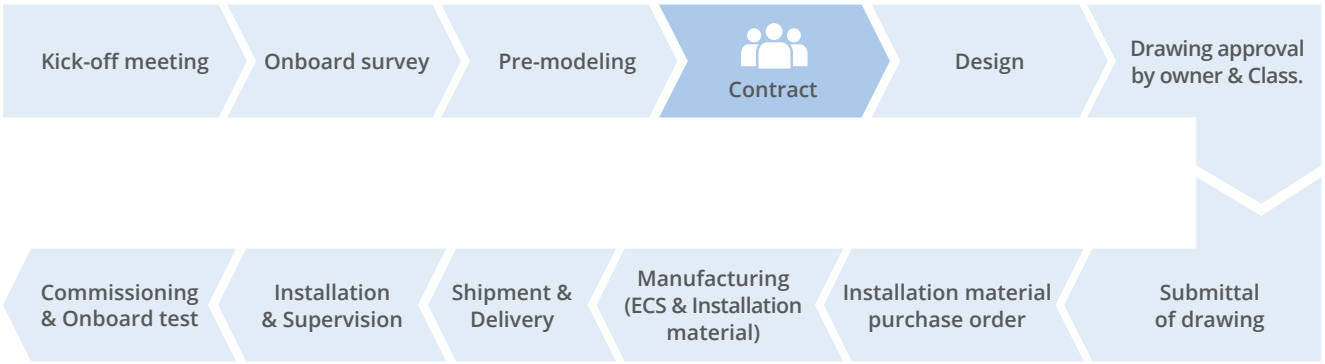
Prompt and accurate service in retrofitting

Techcross provides ship owners who are looking for retrofitting Ballast Water Management System with the total engineering solution.

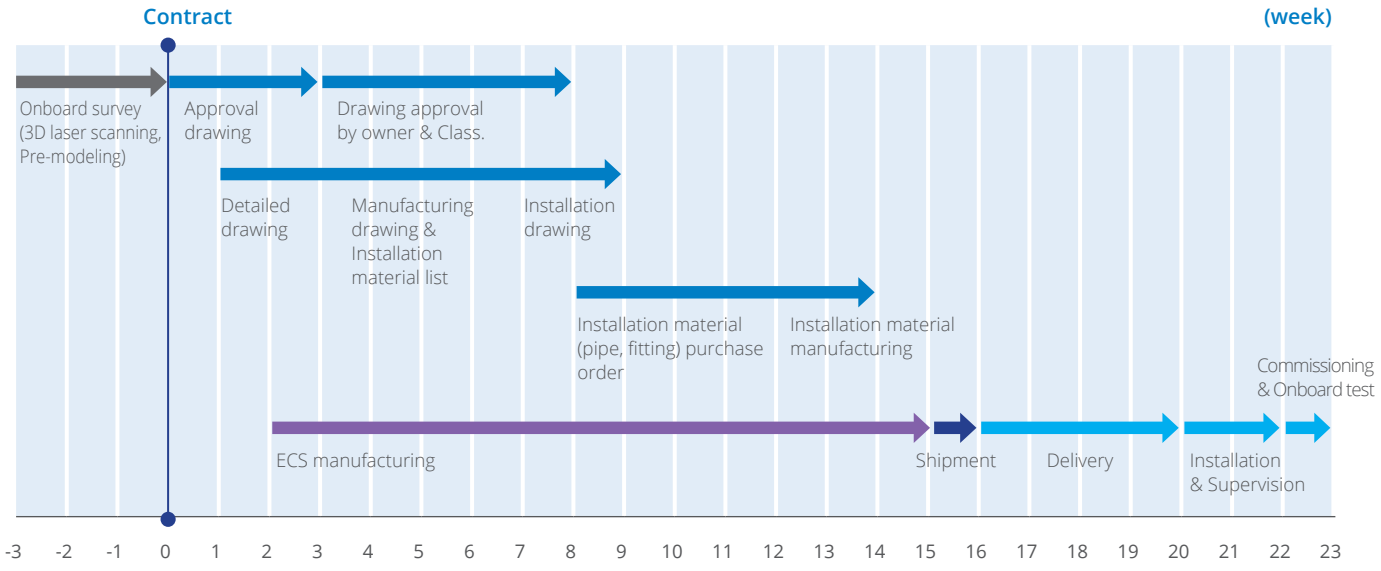
Service Scope

Option 1	ECS supply + Commissioning
Option 2 (Engineering Solution)	Onboard survey + Design + ECS supply + Supervision + Commissioning
Option 3 (Turn key Solution)	Onboard survey + Design + ECS & Installation material supply + Installation & Supervision + Commissioning

Service Process



Service Schedule (Standard time table) : 23 weeks



Case Study

LNG Carrier Project

Ship type	153,000 CBM LNGC	**Installation location**	Engine room
B.P capacity	2,800㎥/h X 3sets (2 working, 1 standby)	**Installation site**	Dry-dock (Singapore)
ECS model	ECS 3,000B X 2sets	**Date**	2018

Installation & Commissioning process

Material check / storage	Pre-inspection	Lifting / Shifting / Installation of equipment	Commissioning
			
5 days	25 days		
30 days			

Before → After

Advantages

Efficient Engineering

- Most extensive organization in BWMS
- Skilled engineering manpower
- Optimized design using 3D laser scanner

Competitive Cost

- Competitive engineering cost through in-house retrofit team
- Minimized design & installation cost through a variety of project experiences and installation alternatives

Superior Partnership

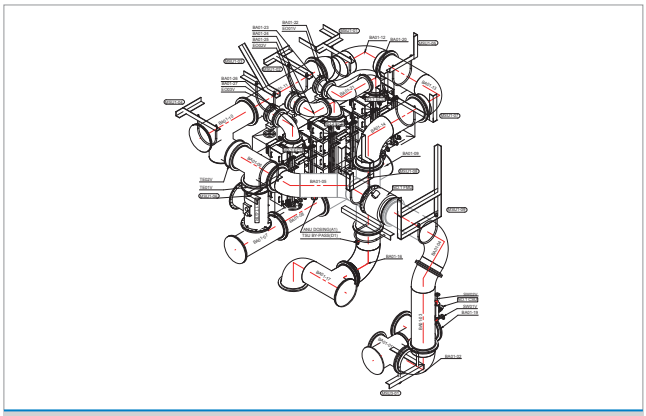
- Global training center
- Close partnership with repair shipyards
- Global service network

REFERENCES

An abundant installation references on new and existing vessels

Retrofit

Before installation



Installation drawing

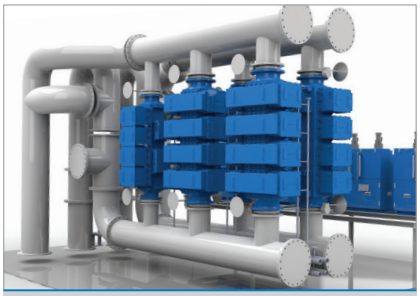
3D scanning & modeling

After installation

Specification

Division	Specification
Ship type	145,700 CBM LPG Carrier
Class	KR / LR
Capacity	3,000㎥/h X 3sets
Model	ECS 3,000B X 2sets
Installation location	Engine room
Installation site	Dry-dock (Singapore)
Date	2018

New building : SKID mount type



Modeling

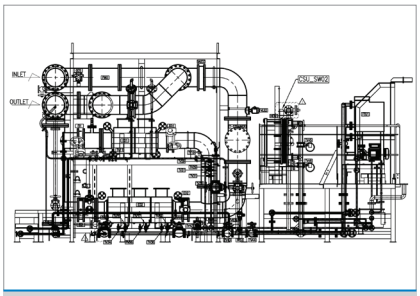
Installation

Installation

Specification

Division	Specification	Division	Specification
Ship type	170K LNG	Model	ECS 2600B X 2sets
Class	DNV	Installation location	Engine room
Capacity	5200㎥/h X 1set	Date	2013

New building : On-deck room



Drawing

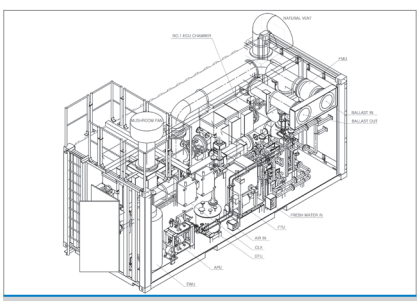
On-deck room (Port side)

Before delivery

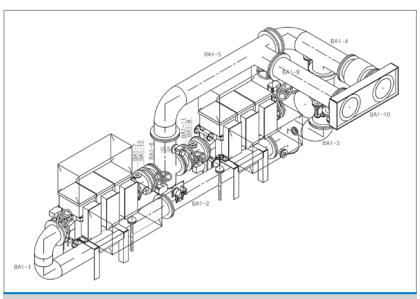
Specification

Division	Specification	Division	Specification
Ship type	37K PC Tanker	Model	Ex-ECS 750B X 2sets
Class	KR	Installation location	On-deck
Capacity	750㎥/h X 2sets	Date	2014

New building & Retrofit : Container SKID



ISO view



Ballast line ISO view

Specification

Division	Specification
Ship type	Tanker
Container size	20ft
Model	Ex-ECS 900B X 1set
Installation location	On-deck

*New installation solution for Tanker

GLOBAL NETWORK

Techcross' service agents all over the world

A/S Service Network

Country		Company	Address
Head Office		TECHCROSS	433 Noksansaneopbuk-ro, Gangseo-gu, Busan, Korea
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		DINTEC	DINTEC Bldg., 309, Jungang-daero, Dong-gu, Busan, Korea
	Singapore	Techcross Singapore	18 Boon Lay Way #07-108 Tradehub 21 Singapore 609966
		DINTEC Singapore	7 Soon Lee Street #02-23, I-SPACE, Singapore
	China	Winkong Marine Engineering Co., Ltd	Floor 17, Zhongxin Building, No.263, Liaoning Road, Qingdao, China
	Japan	Dowa Line Co., Ltd.	2-37-5, Nishishinbashi, Minatoku, Tokyo, 105-0003, Japan
	India	Norinco	301, Orbit Plaza, New Prabhadevi Marg Prabhadevi, Mumbai - 400025, India
Europe	Netherlands	Techcross Europe	Vasteland 78 3011 BN Rotterdam, Netherlands
		Harbour Electronical	Energieweg 54 3133EC Vlaardingen, Netherlands
	Poland	MTS Marine Technical Services Ltd	Lubieszynska 5, 72-006 Mierzyn, Poland
Americas	USA	Techcross USA	Ste. B 13486 FM 529 Rd. Houston TX 77041-2738
		Far-East Marine Service	8833 Knight Road, Houston, Texas 77054 USA
		Kormarine Services, LLC	12802 FM 529 Houston TX USA
	Panama	Hi-Tek Marine S.A.	Panama City, Panama, International Business Park (Howard Base), Building A, Office N 103

Sales Network

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Head Office		TECHCROSS	433 Noksansaneopbuk-ro, Gangseo-gu, Busan, Korea
Asia	China	Winkong Marine Engineering Co., Ltd	Floor 17, Zhongxin Building, No.263, Liaoning Road, Qingdao, China
		Dalian Shipbuilding Industry Zhongyi International Trade Co., Ltd.	No.16 Zhu Qing St. DaLian China PC : 116001
		Hipson Marine Limited. Guangzhou Office	Room 2702, No.699-13 Dongfeng Road East, Guangzhou, 510080, China
		For Win Equipment&Engineering Co., Ltd.	Room205, House Hao Bai C2 Block Building, No.50, Xisanhuanbeilu, Beijing, 100044 China
		HuaHai Equipment&Engineering Co. Ltd.	Room 4B-4C., Yindong B/D, No.58 New Jin Qiao Road, Pudong New District, Shanghai, China
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		MMSL Japan, Ltd	4-2, Ohtemachi 1-chome, Chiyoda-ku, Tokyo 100-8088, Japan
		Chart Shipping Co., Ltd.	6F Shimbashi Daiichi BLDG., 6-9-2, Shimbashi, Minato-ku, Tokyo 105-0004, Japan
	Taiwan	Soonex	10F, No.57, Sect.2, Tun Hwa South Road, Taipei 106, Taiwan, R.O.C
	Malaysia	MOGbiss Sdn. Bhd	No. 6-1 First Floor, Jalan Kemuning Prima E33/E, Seksyen 33, 40400 Shah Alam, Selangor, Malaysia
	Singapore	Techcross Singapore	18 Boon Lay Way #07-108 Tradehub 21 Singapore 609966
	India	Norinco	301, Orbit Plaza, New Prabhadevi Marg Prabhadevi, Mumbai - 400025, India
	UAE	System Dynamics (for UAE, Saudi Arabia, Bahrain, Kuwait & Qatar)	FZE P.O. Bo 51288 HFZA. Sharjah, UAE
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Europe	Greece	Pera Marine Ltd.	5, Akti Miaouli Str. Piraeus 185 35 Greece
		MIE	Kanari 1, GR-185 37, Piraeus, Greece
	UK	Encompass Marine Limited	26 Flour Squre Grimsby NE Lincolnshire DN31 3LP, United Kingdom
	Poland	MTS Marine Technical Services Ltd	Lubieszynska 5, 72-006 Mierzyn, Poland
	Netherlands	Techcross Europe	Vasteland 78 3011 BN Rotterdam, Netherlands
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		DMS Deck & Machinery Ltd.	3 Thalias Street 4011 Limassol
	Turkey	Amat Engineering	Guzelyali Mah. Bagdat Cad No : 54 Kat : 1 34903 Pendik, Istanbul, Turkey
		Is & Th Promise General Trading (for Middle East)	Maslak Meydan SK Beybi Giz Plaza No.1/55 Sariyer Istanbul
	Monaco	Tritech Engineers	19 rue Princess Caroline, MC 98000, Monaco
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	Denmark	European Marine Technology (for Denmark, Sweden, Norway West)	Faaborgvej 66, 5700 Svendborg, Denmark
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