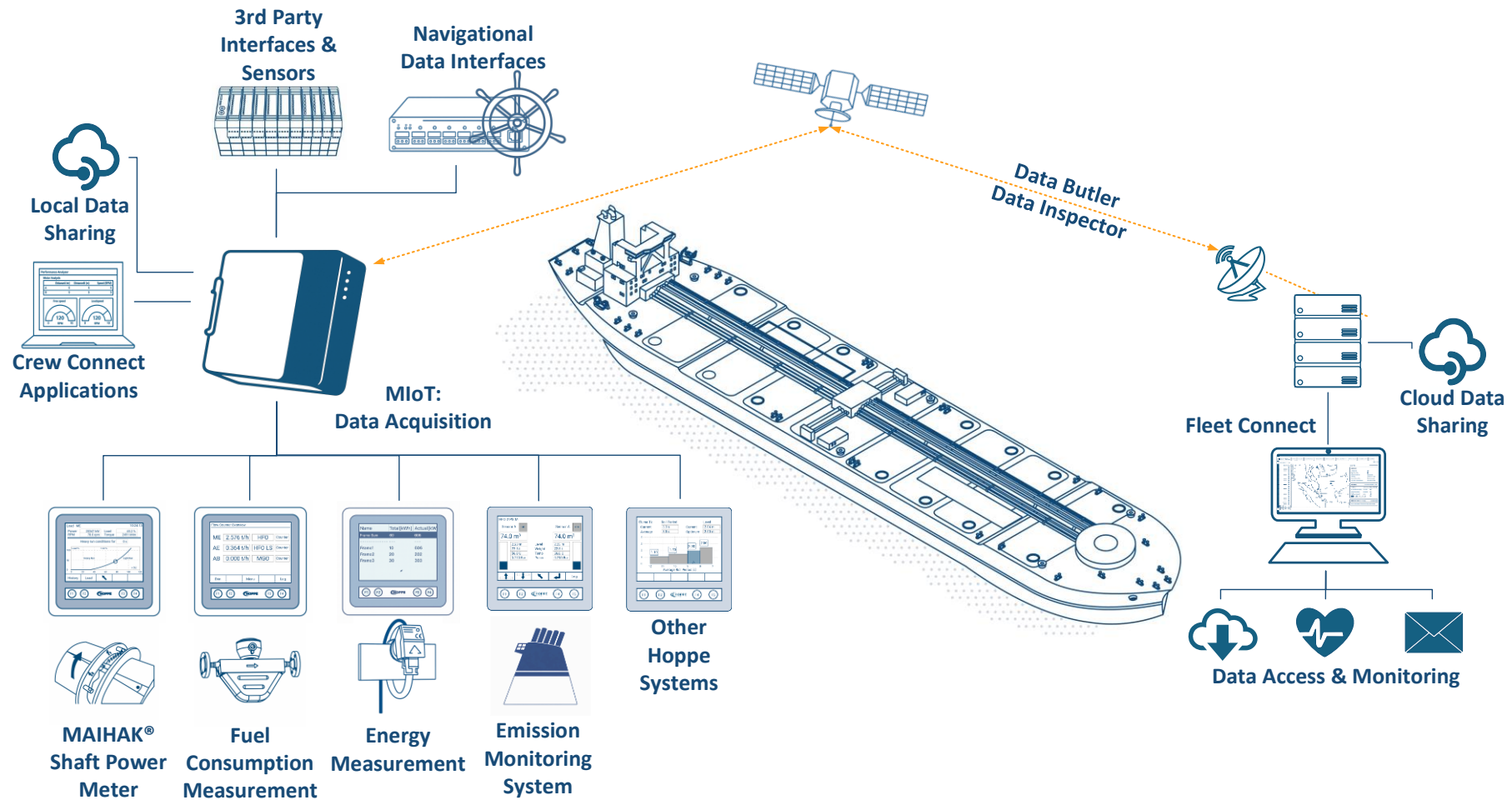
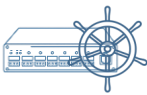
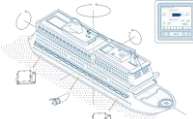


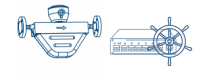
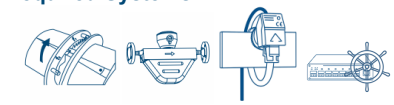
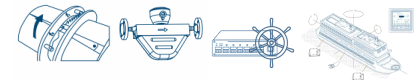
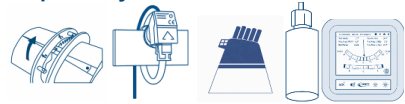
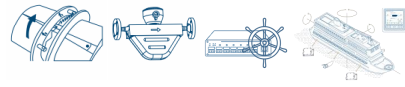
MIOT Data Acquisition, Measuring System and Data Sources, Used Cases, Partner

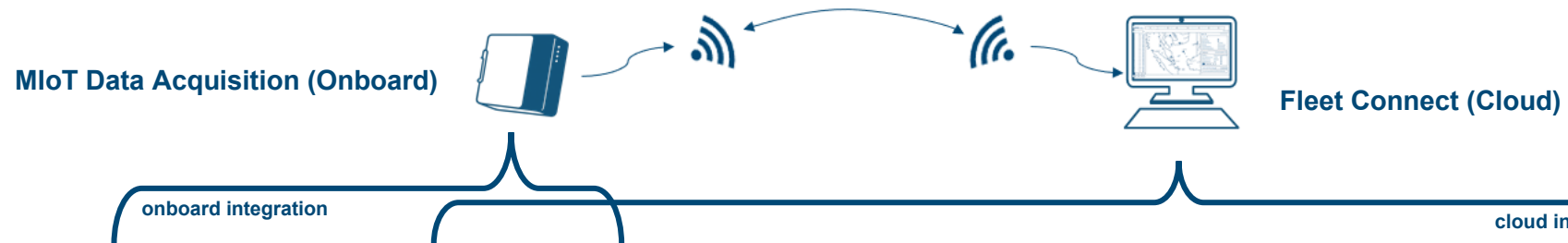


Hoppe Measurement Systems, Data Sources and Signals

 MAIHAK® Shaft Power Meter Shaft Power - Torque - Speed – Revolution -Energy Counter	 Fuel Consumption Measurement Fuel Consumption per Consumer - Fuel Counter per Consumer
 Energy Measurement Electric Power per Consumer and Group - Electric Energy Counter per Consumer and Group	 Energy Measurement Electric Power per Consumer and Group - Electric Energy Counter per Consumer and Group
 Navigational Data Interfaces Speed – Position – Wind - Rudder	 3rd Party Interfaces & Sensors AMS - PMS – Flowmeter - Analogue Inputs - Digital Inputs
 Energy Measurement Tank Level - Tank Volume - Tank Mass	 Electronic Inclinator Heel Angle - Roll Period
 Draught & Dynamic Draught and Floating Draft at Draft Marks - Static Trim - Dynamic Trim	

Systems, Sensors and Use Cases

Hull Performance (ISO 19/030) Speed loss Fouling detection Required Systems 	Basic Emission Reporting (MRV / DCS) Voyage-level fuel & CO₂ reporting Required Systems 
Advanced Emission Reporting (CII) Carbon Intensity Indicator IMO rating Required Systems 	Commercial Reporting & Analysis Charter performance Speed/consumption Required Systems 
Technical Reporting & Analysis Engine condition · Diagnostics Required Systems 	Trim Optimisation Optimal trim setting per loading condition Required Systems 
Electronic Logbooks Auto-filled deck & engine logs Required Systems 	Operational Safety Heel · Roll · Stability monitoring Required Systems 



	NAPA	RINA Sertica	Kongsberg Vessel Ins.	Kaleris/ Navis	RaaLabs	StormGeo	NAVTOR	Wärtsilä	ZeroNorth	Acceleron	Swiss Climate	VPS	Syroco	Propulsion Analytics	Ankeri	And More
Hull Performance (ISO 19030)	●					●		●	●			✓		●	●	●
Basic Emission Reporting (MRV/DCS)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		
Advanced Emission Reporting (CII)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		
Commercial Reporting & Analysis	✓	●	●	✓	●	✓	●	✓	✓		●		✓	✓	✓	
Technical Reporting & Analysis	✓	✓	✓	✓	✓	✓	●	✓	✓	✓		✓	●	✓		
Trim Optimisation	●		●			✓	●	✓						●		
Electronic Logbooks	✓	✓	●			●	✓	✓								
Operational Safety	✓	✓	✓	✓	✓	✓	✓	✓	●				✓			
And More																

Disclaimer: This overview is based on publicly available information and our own industry experience, and we do not guarantee the completeness or accuracy of the listed capabilities.

Systems, Data Sources and Signals in Detail

Our MIoT Data Acquisition System seamlessly collects operational signals from a wide range of onboard interfaces. It is compatible with both Hoppe-provided solutions and existing third-party systems, ensuring maximum flexibility and data coverage. The signal list and summary below provide examples of signals and typical use cases from recent projects. Signals that are not listed but are required for a project can, of course, be collected after consultation with our Hoppe experts.

1.1 Navigational Data (NMEA-Interfaces)

The signals listed below can typically be collected from nautical equipment via an NMEA 0183 interface. The data can be provided through a single-source interface, e.g., from an ECDIS, Voyage Data Recorder, or another multiplexer. Alternatively, signals can be provided via individual lines, or Hoppe can handle the interfacing with existing signal lines using an NMEA expander.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
1	Distance made good	v.dog.cnt_tot.nm		X	X	X			X	
2	Position Latitude & Longitude	v.gpslat.act.deg, v.gpslon.act.deg		X	X				X	
3	Rudder Angle	v.rua.act.deg					X		X	
4	Speed Over Ground	v.sog.act.kn	X			X				
5	Speed Through Water	v.stw.act.kn	X			X		X		
6	Water Depth	v.wd.act.m	X				X		X	
7	Water temperature	wea.swt.act.degc	X						X	
8	Relative Wind Speed & Direction	wea.wsr.act.mps, wea.wdr.act.deg				X		X	X	
9	Actual Wind Speed & Direction	wea.wst.act.mps, wea.w dtv.act.deg				X		X	X	

1.2 External Systems and Interfaces

The list below provides examples of signals that can be integrated from external systems. Typical third-party connections include Alarm and Monitoring Systems (AMS) as well as equipment such as scrubbers, Wind Assisted Propulsion Systems (WAPS), and Power Management Systems. Of course, any signal or system not listed here can also be integrated after consultation with Hoppe.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
10	Auxiliary Engine Cylinder Exhaust Gas Temperatures	ae.egtcyl[n].act.dgc					X			X
11	Main Engine Charge Air/ Scavenge Air Temperatures	me.satcyl[n].act.dgc, me.atiscac.act.dgc, me.atosac.act.dgc, me.wtisac.act.dgc, me.wtisac.act.dgc					X		X	
12	Main Engine Charge Air/ Scavenge Air Pressures	me.sap.act.bar					X		X	
13	Main Engine Cooling Water Temperatures and Pressures	csw.msac.act.dgc, csw. mswp.act.bar, ...					X		X	X
14	Main Engine Cylinder Bearing Temperatures	me.cyl[n].brg.act.dgc					X			X
15	Main Engine Cylinder Exhaust Gas Temperatures	me.egtcyl[n].act.dgc					X		X	X
16	Main Engine Cylinder Oil Consumption	me.coms.act.kgph					X		X	
17	Main Engine Fuel Rack Position	me.frp.act.prc					X			

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
18	Main Engine Turbo Charger Speed, Temperatures and Pressures	me.egtitc[n].act.dgc, me. egtotc[n].act.dgc, me.spdtc[n].act.rpm, me.egpitc[n].act.bar, me .egpotc[n].act.bar					X		X	
19	Scrubber Consumption e.g. Magnesium Hydroxide, Urea, ...	egc.mhc.act.tph, egc.urc .act.tph					X		X	
20	Fuel Viscosity	[x].fvs.act.cSt					X			X

1.3 Shaft Power Meter

A shaft power meter can measure the power, torque, and rpm of the propulsion shaft. Either our Hoppe MAIHAK Shaft Power Meter can be installed, or an existing unit can be interfaced with.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
21	Main Engine Power	me.pow.act.kw			X		X	X	X	X
22	Main Engine Mechanical Energy Counter	me.eng.cnt_tot.gwh			X		X		X	
23	Shaft Power	sa.pow.act.kw			X		X	X	X	X
24	Shaft Mechanical Energy Counter	sa.eng.cnt_tot.gwh			X		X		X	
25	Main Engine Speed	me.spd.act.rpm	X				X	X	X	X
26	Shaft Speed	sa.spd.act.rpm	X				X	X	X	X
27	Main Engine Torque	me.tqu.act.knm					X	X	X	X
28	Shaft Torque	sa.tqu.act.knm					X	X	X	X

1.4 Fuel Consumption Measurement

A fuel consumption measurement system can be installed to measure and calculate the fuel consumption for each consumer. A whole Hoppe Fuel Consumption Measurement System can be installed, or any existing Flowmeter and System can be interfaced.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
29	Auxiliary Boiler Fuel Consumption	ab.fms.act.tph		X	X	X			X	
30	Auxiliary Boiler Fuel Counter	ab.fms.cnt_tot.t		X	X	X			X	
31	Additional Fuel Consumer Consumption e.g. IGG, GCU, Diesel Power Packs, Incinerators, ...	[x].fms.act.tph [x].fms.cnt_tot.t		X	X	X			X	
32	Additional Fuel Consumer Fuel Counter e.g. IGG, GCU, Diesel Power Packs, Incinerators, ...	[x].fms.cnt_tot.t		X	X	X			X	
33	Auxiliary Engine Fuel Consumption	ae.fms.act.tph		X	X	X			X	
34	Auxiliary Engine Fuel Counter	ae.fms.cnt_tot.t		X	X	X			X	
35	Flowmeter Fuel Density	fm.den.act.tpm3					X		X	X
36	Flowmeter Fuel Temperature	fm.temp.act.dgc					X		X	X

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
37	Flowmeter Fuel Mass Flow	fm.rate.act.tph					X		X	
38	Flowmeter Counter	fm.rate.cnt_tot.t					X		X	
39	Main Engine Fuel Consumption	me.fms.act.tph		X	X	X	X		X	
40	Main Engine Fuel Counter	me.fms.cnt_tot.t		X	X	X	X		X	

1.5 Energy Measurement

Energy measurement systems can be installed to monitor electric power production and consumption onboard. Hoppe can provide and install the required equipment or integrate with existing devices and systems.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
41	Additional Electric Consumer Power e.g. Cooling Water Pumps, Cargo Equipment, ...	[x].pow.act.kw							X	
42	Additional Electric Consumer Energy Counter	[x].eng.cnt_tot.mwh							X	
43	Auxiliary Engine Electric Power	ae.pow.act.kw			X				X	X
44	Auxiliary Engine Electric Energy Counter	ae.eng.cnt_tot.gwh			X				X	
45	Air Compressor Hours	airc.hrsm.act.kw					X			
46	Air Compressor Power	airc.powm.act.kw					X			
47	CII Cargo Cooling Plant Electric Power & Energy Counter	ccp.pow.act.kw, cpp.eng.cnt_tot.mwh			X				X	
48	CII Cargo Pumps Electric Power & Energy Counter	cp.pow.act.kW, cp.eng.cnt_tot.mwh			X				X	

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
49	CII Hydraulic Power Packs (FRAMO) Electric Power & Energy Counter	hppcp.pow.act.kw, hppcp.eng.cnt_tot.mwh			X				X	
50	CII Reefer Electric Power & Energy Counter	rj.pow.act.kw, rj.eng.cnt_tot.mwh			X				X	
51	CII Reliquification Plant Electric Power & Energy Counter	crp.pow.act.kw, crp.eng.cnt_tot.mwh			X				X	
52	Shore Power	sp.pow.act.kw			X				X	
53	Shore Power Energy Counter	sp.eng.cnt_tot.mwh			X				X	
54	Shaft Generator Electric Power	sg.pow.act.kW			X				X	X
55	Shaft Generator Electric Energy Counter	sg.eng.cnt_tot.mwh			X				X	

1.6 Draught Measurement

The below listed signals are typically gathered from a Draught Measurement System. Either a Hoppe Draught Measurement System can be installed or any other system interfaced.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
56	Draughts Fore & Aft	ddm.aftcl.act.m, ddm.fw dcl.act.m	X			X		X	X	X
57	Trim	ho.tdyn.act.m						X		X

1.7 Dynamic Draught and Floating Monitoring

This Hoppe system provides highly accurate real-time trim data, enabling optimal performance and fuel efficiency at sea based on live measurements.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
58	Dynamic Trim	ho.tdyn.act.m						X		

1.8 Tank Content Measurement

Typically Tank content and all its related figures are being measured by our Hoppe Tank content Measurement system. Alternatively any other Tank Content System or single sensors can be interfaced.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
59	Tank Content Mass	t[n].tm.act.t					X		X	
60	Tank Content Volume	t[n].tv.act.m3					X			
61	Tank Level	t[n].tl.act.m					X			

1.9 Electronic Inclinator & HOSIM

Our HOSIM and Electronic Inclinator can measure the motion of the vessel and all its key information.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
62	Trim by Inclinator	ho.t.act.m						X		
63	Roll Angle	ho.rol.act.deg					X			X
64	Roll Period	ho.rol.avg.s					X			X
65	Actual Heel Angle	rol.aftcl.avg.deg					X			X

2 Appendix:

The table below summarizes the signals described above.

No.	Signal Name	Example Machine Code	Hull Performance ISO 19030	Basic Emission Reporting (MRV, DCS),	Advanced Emission Reporting (CII)	Commercial Reporting & Analysis	Technical Reporting & Analysis	Trim Optimization	Electronic Logbooks	Operational Safety
1	Distance made good	v.dog.cnt_tot.nm		X	X	X			X	
2	Position Latitude & Longitude	v.gpslat.act.deg, v.gpslon.act.deg		X	X				X	
3	Rudder Angle	v.rua.act.deg					X		X	
4	Speed Over Ground	v.sog.act.kn	X			X				
5	Speed Through Water	v.stw.act.kn	X			X		X		
6	Water Depth	v.wd.act.m	X				X		X	
7	Water temperature	wea.swt.act.degc	X						X	
8	Relative Wind Speed & Direction	wea.wsr.act.mps, wea.wdr.act.deg				X		X	X	
9	Actual Wind Speed & Direction	wea.wst.act.mps, wea.wdtv.act.deg				X		X	X	
10	Auxiliary Engine Cylinder Exhaust Gas Temperatures	ae.egtcyl[n].act.dgc					X			X
11	Main Engine Charge Air/ Scavenge Air Temperatures	me.satcyl[n].act.dgc, me.atisac.act.dgc, me.atosac.act.dgc, me.wtisac.act.dgc, me.wtisac.act.dgc					X		X	
12	Main Engine Charge Air/ Scavenge Air Pressures	me.sap.act.bar					X		X	

13	Main Engine Cooling Water Temperatures and Pressures	csw.mswt.act.dgc, csw.mswp.act.bar, ...					X		X	X
14	Main Engine Cylinder Bearing Temperatures	me.cyl[n].brg.act.dgc					X			X
15	Main Engine Cylinder Exhaust Gas Temperatures	me.egtcyl[n].act.dgc					X		X	X
16	Main Engine Cylinder Oil Consumption	me.coms.act.kgph					X		X	
17	Main Engine Fuel Rack Position	me.frp.act.prc					X			
18	Main Engine Turbo Charger Speed, Temperatures and Pressures	me.egtict[n].act.dgc, me.egtotc[n].act.dgc, me.spdtc[n].act.rpm, me.egpirc[n].act.bar, me.egpotc[n].act.bar					X		X	
19	Scrubber Consumption e.g. Magnesium Hydroxide, Urea, ...	egc.mhc.act.tph, egc.urc.act.tph					X		X	
20	Fuel Viscosity	[x].fvs.act.cSt					X			X
21	Main Engine Power	me.pow.act.kw			X		X	X	X	X
22	Main Engine Mechanical Energy Counter	me.eng.cnt_tot.gwh			X		X		X	
23	Shaft Power	sa.pow.act.kw			X		X	X	X	X
24	Shaft Mechanical Energy Counter	sa.eng.cnt_tot.gwh			X		X		X	
25	Main Engine Speed	me.spd.act.rpm	X				X	X	X	X
26	Shaft Speed	sa.spd.act.rpm	X				X	X	X	X
27	Main Engine Torque	me.tqu.act.knm					X	X	X	X
28	Shaft Torque	sa.tqu.act.knm					X	X	X	X
29	Auxiliary Boiler Fuel Consumption	ab.fms.act.tph		X	X	X			X	

30	Auxiliary Boiler Fuel Counter	ab.fms.cnt_tot.t		X	X	X			X	
31	Additional Fuel Consumer Consumption e.g. IGG, GCU, Diesel Power Packs, Incinerators, ...	[x].fms.act.tph [x].fms.cnt_tot.t		X	X	X			X	
32	Additional Fuel Consumer Fuel Counter e.g. IGG, GCU, Diesel Power Packs, Incinerators, ...	[x].fms.cnt_tot.t		X	X	X			X	
33	Auxiliary Engine Fuel Consumption	ae.fms.act.tph		X	X	X			X	
34	Auxiliary Engine Fuel Counter	ae.fms.cnt_tot.t		X	X	X			X	
35	Flowmeter Fuel Density	fm.den.act.tpm3					X		X	X
36	Flowmeter Fuel Temperature	fm.temp.act.dgc					X		X	X
37	Auxiliary Boiler Fuel Consumption	ab.fms.act.tph					X		X	
38	Auxiliary Boiler Fuel Counter	ab.fms.cnt_tot.t					X		X	
39	Additional Fuel Consumer Consumption e.g. IGG, GCU, Diesel Power Packs, Incinerators, ...	[x].fms.act.tph [x].fms.cnt_tot.t		X	X	X	X		X	
40	Main Engine Fuel Counter	me.fms.cnt_tot.t		X	X	X	X		X	

41	Additional Electric Consumer Power e.g. Cooling Water Pumps, Cargo Equipment, ...	[x].pow.act.kw							X	
42	Additional Electric Consumer Energy Counter	[x].eng.cnt_tot.mwh							X	
43	Auxiliary Engine Electric Power	ae.pow.act.kw			X				X	X
44	Auxiliary Engine Electric Energy Counter	ae.eng.cnt_tot.gwh			X				X	
45	Air Compressor Hours	airc.hrsm.act.kw					X			
46	Air Compressor Power	airc.powm.act.kw					X			
47	CII Cargo Cooling Plant Electric Power & Energy Counter	ccp.pow.act.kw, cpp.eng.cnt_tot.mwh			X				X	
48	CII Cargo Pumps Electric Power & Energy Counter	cp.pow.act.kW, cp.eng.cnt_tot.mwh			X				X	
49	CII Hydraulic Power Packs (FRAMO) Electric Power & Energy Counter	hppcp.pow.act.kw, hppcp.eng.cnt_tot.mwh			X				X	
50	CII Reefer Electric Power & Energy Counter	rj.pow.act.kw, rj.eng.cnt_tot.mwh			X				X	
51	CII Reliquification Plant Electric	crp.pow.act.kw, crp.eng.cnt_tot.mwh			X				X	

	Power & Energy Counter									
52	Shore Power	sp.pow.act.kw			X				X	
53	Shore Power Energy Counter	sp.eng.cnt_tot.mwh			X				X	
54	Shaft Generator Electric Power	sg.pow.act.kW			X				X	X
55	Shaft Generator Electric Energy Counter	sg.eng.cnt_tot.mwh			X				X	
56	Draughts Fore & Aft	ddm.aftcl.act.m, ddm.fw dcl.act.m	X			X		X	X	X
57	Trim	ho.tdyn.act.m						X		X
58	Dynamic Trim	ho.tdyn.act.m						X		
59	Tank Content Mass	t[n].tm.act.t					X		X	
60	Tank Content Volume	t[n].tv.act.m3					X			
61	Tank Level	t[n].tl.act.m					X			
62	Trim by Inclinator	ho.t.act.m						X		
63	Roll Angle	ho.roa.act.deg					X			X
64	Roll Period	ho.rop.avg.s					X			X
65	Actual Heel Angle	roa.aftcl.avg.deg					X			X