Instructions: Please do not change the order of Rows No. 1 through No. 240. Please do not use special characters. Text highlighted in **red** indicates information needed to conduct quality control of submitted data, please try to fill in as much as possible for the number of variables relevant for the submitted data sets. Note that all rows in **bold** contain a drop-down menu, please follow the instructions provided and choose one of the options.

Number	Metadata element name	Your input	Help reference number
1	Submission Date	29/11/2023	1
2	Accession no. of related data sets on the 14.3.1 data platform or any other data base		2
3	URL of metadata set		3
4	URL of associated data set		4
5	DOI of dataset (if applicable)		5
6	Investigator-1 name	Yoana Voynova	6.1
7	Investigator-1 institution	Helmholtz Zentrum Hereon	6.2
8	Investigator-1 institution ID (OceanExpert)		6.3.
9	Investigator-1 address	Max Planck Str.1, Geesthacht, 21502, Germany	6.4
10	Investigator-1 phone		6.5
11	Investigator-1 email	yoana.voynova@hereon.de	6.6
12	Investigator-1 researcher ID	0000-0002-0714-3210	6.7
13	**Investigator-1 ID type (OceanExpert, ORCID, ResearcherID, etc.)**	**ORCID**	**6.8**
14	Investigator-2 name	Martina Gehrung	6.1
15	Investigator-2 institution	Helmholtz Zentrum Hereon	6.2
16	Investigator-2 institution ID (OceanExpert)		6.3.
17	Investigator-2 address	Max Planck Str.1, Geesthacht, 21502, Germany	6.4
18	Investigator-2 phone		6.5
19	Investigator-2 email	martina.gehrung@hereon.de	6.6
20	Investigator-2 researcher ID		6.7
21	**Investigator-2 ID type (OceanExpert, ORCID, ResearcherID, etc.)**		**6.8**
22	Investigator-3 name	Wilhelm Petersen	6.1
23	Investigator-3 institution	Helmholtz Zentrum Hereon	6.2
24	Investigator-2 institution ID (OceanExpert)		6.3.
25	Investigator-3 address	Max Planck Str.1, Geesthacht, 21502, Germany	6.4
26	Investigator-3 phone		6.5
27	Investigator-3 email	wilhelm.petersen@hereon.de	6.6
28	Investigator-3 researcher ID		6.7
29	**Investigator-3 ID type (OceanExpert, ORCID, ResearcherID, etc.)**		**6.8**
30	Data submitter name	Vlad A. Macovei	7.1
31	Data submitter institution	Helmholtz Zentrum Hereon	7.2
32	Data submitter - institution ID (OceanExpert)		7.3
33	Data submitter address	Max Planck Str.1, Geesthacht, 21502, Germany	7.4
34	Data submitter phone		7.5
35	Data submitter email	vlad.macovei@hereon.de	7.6
36	Data submitter researcher ID	0000-0002-9615-9934	7.7
37	**Data submitter ID type (OceanExpert, ORCID, ResearcherID, etc.)**	**ORCID**	**7.8**
38	Name of sampling site or title of related research project	FerryBox pCO2 measurements in the North Sea	8
39	Short description including purpose of observation	A flow-through membrane pCO2 sensor is integrated with the FerryBox installed on the Lysbris Seaways commercial vessel. The vessel sailed in the North Sea with the main serviced ports being Hamburg/Germany, Cuxhaven/Germany, Skogn/Norway, Sheerness/UK, Belfast/UK, Glasgow/UK, Amsterdam/Netherlands. The most recent calibration of this sensor happened in Septmeber 2021, and the calibration was made for a pCO2 range between 0 and 2300 µatm. Therefore, for this submission, we decided to leave in many of the high values recorded near coastal areas or in the Elbe Estuary, as well as many of the low values in the Norwegian fjords. We believe these measurements are real - they are consistent between multiple journeys, and we only selected arriving journeys so that the initialisation of the measurement system does not influence the results. These are valuable data in seldomly measured regions. The mean difference between the intake temperature sensor and the FerryBox temperature sensor was 0.32 °C.	9
40	Method(s) applied	Membrane-based pCO2 sensor measurement of surface seawater; https://doi.org/10.1002/lom3.10403; https://doi.org/10.1175/JTECH-D-13-00083.1; The FerryBox pCO2 was corrected to SST based on the temperature dependence (Takahashi et al., 1993). pCO2 was converted to fCO2 using a Matlab adaptation of the Seacarb toolbox (Gattuso et al., 2021).	10
41	First day of measurement included in data file (YYYY-MM-DD or YYYY-MM-DDTHH:MM:SS)	2022-11-08	11.1
42	Last day of measurement included in data file (YYYY-MM-DD or YYYY-MM-DDTHH:MM:SS)	2022-12-27	11.2
43	Site specific measurement longitude		12.1
44	Site specific measurement latitude		12.2
45	Transect measurement longitude easternmost	11.1437	12.3
46	Transect measurement longitude westernmost	0.7408	12.4
47	Transect measurement latitude northernmost	63.7292	12.5
48	Transect measurement latitude southernmost	51.4141	12.6
49	Funding agency name		13.1

50	Funding project title		13.2
51	Funding project ID (Grant number)		13.3
52	Platform name	Lysbris Seaways	14.1
53	**Platform category**	**Voluntary Observing Ship**	**14.2**
54	Platform ID	58LY	14.3
55	**Platform ID type**	**ICES**	**14.4**
56	Platform-1 owner	DFDS Seaways	14.5
57	**Platform-1 country**	**Norway**	**14.6**
58	EXPOCODE	58LY20221108	15.1
59	Cruise ID		15.2
60	**Cruise ID type**		**15.3**
61	Author list for citation	Macovei, Vlad; Voynova, Yoana; Gehrung, Martina; Petersen, Wilhelm	16
62	References	Reference for method: https://doi.org/10.1175/JTECH-D-13-00083.1	17
63	Supplemental information	Reference for comparison with GO system: https://doi.org/10.1002/lom3.10403	18
64	Depth: Variable abbreviation in data files	N/A - all samples are surface samples (0)	19.1
65	**Depth: Variable unit**	**m**	**19.2**
SOCAT	xCO2: Variable abbreviation in data files	N/A	SOCAT
SOCAT	**xCO2: Variable unit**		SOCAT
133	pCO2: Variable abbreviation in data files	pCO2 at SST calculated	23.1
135	**pCO2: Variable unit**	**µatm**	**23.3**
167	fCO2: Variable abbreviation in data files	fCO2 at SST calculated	24.1
168	**fCO2/pCO2/xCO2: Observation type**	**underway**	**24.2**
169	**fCO2: Variable unit**	**µatm**	**24.3**
170	**fCO2/pCO2/xCO2: Collection method (e.g. with pump)**	**water collection with pump**	**24.4**
171	fCO2/pCO2/xCO2: Location of seawater intake		24.5
172	fCO2/pCO2/xCO2: Depth of seawater intake		24.6
173	**fCO2/pCO2/xCO2: Analyzing instrument**	**4H-Jena HydroC CO2-FT membrane-based sensor; CO2 analysed with an NDIR**	**24.7**
174	fCO2/pCO2/xCO2: Analyzing information with citation (SOP etc)	https://doi.org/10.1175/JTECH-D-13-00083.1	24.8
175	**fCO2/pCO2/xCO2: Quality control**	**Yes**	**24.9**
176	fCO2/pCO2/xCO2: Abbreviation of data quality flag scheme		24.10
177	**fCO2/pCO2/xCO2: Data quality flag scheme**		**24.11**
178	fCO2/pCO2/xCO2: Uncertainty	1% manufacturer provided uncertainty. During calibration, 2.6 ppm regression error was achieved compared to the standard gases. Expected in field uncertainty <10µatm. Suggested flag: E	24.12
179	fCO2/pCO2/xCO2: Equilbrator type	No equilibrator - membrane based sensor	24.13
180	fCO2/pCO2/xCO2: Equilibrator volume (L)	N/A	24.14
181	**fCO2/pCO2/xCO2: Equilibrator vented or not**		**24.15**
182	fCO2/pCO2/xCO2: Equilibrator water flow rate (L min-1)	N/A, but flow rate past the membrane is usually 4 L/min	24.16
183	fCO2/pCO2/xCO2: Equilibrator headspace gas flow rate (L min-1)		24.17
184	fCO2/pCO2/xCO2: How was temperature inside the equilibrator measured (i.e. which sensor)?	SHT85 Humidity and Temperature Sensor from Sensirion	24.18
SOCAT	fCO2/pCO2/xCO2: Uncertainty of temperature measured inside the equlibrator	±0.1°C manufacturer uncertainity	SOCAT
SOCAT	fCO2/pCO2/xCO2: Calibration method and frequency for temperature sensor inside the equlibrator		SOCAT
185	fCO2/pCO2/xCO2: How was pressure inside the equilibrator measured (i.e. which sensor)?		24.19
SOCAT	fCO2/pCO2/xCO2: How was the total measurement pressure determined?	DS_Standard-HDI_E internal pressure sensor from First-Sensor	SOCAT
SOCAT	fCO2/pCO2/xCO2: Uncertainty of total measurement pressure, and how was this calculated?	1% of total full scale span - manufacturer provided	SOCAT
SOCAT	fCO2/pCO2/xCO2: Calibration method and frequency for pressure sensor(s)		SOCAT
186	fCO2/pCO2/xCO2: Drying method for CO2 gas		24.20
187	fCO2/pCO2/xCO2: Manufacturer of the gas detector		24.21
188	fCO2/pCO2/xCO2: Model of the gas detector		24.22
189	fCO2/pCO2/xCO2: Resolution of the gas detector		24.23
190	fCO2/pCO2/xCO2: Uncertainty of the gas detector		24.24
191	fCO2/pCO2/xCO2: Calibration method		23.25
192	**fCO2/pCO2/xCO2: Frequency of calibration**	Precalibration done on 10.09.2021 by 4H-Jena, the instrument manufacturer, in their calibration tank, with a range of 9 standard gases. We wanted to be able to determine the pCO2 in the estuaries as well (e.g. sometimes the ship travels quite far upstream in the Elbe Estuary). Postcalibration done on 11.12.2023 for span correction.	**23.26**
193	fCO2/pCO2/xCO2: Manufacturer of standard gas		23.27
SOCAT	fCO2/pCO2/xCO2: Traceability of standard gases to WMO standards		SOCAT
194	fCO2/pCO2/xCO2: Concentrations of standard gas	199.93; 449.00; 521.00; 584.05; 839.06; 955.87; 1245.83; 1641.25; 2037.33	23.28
195	fCO2/pCO2/xCO2: Uncertainties of standard gas		23.29
196	fCO2/pCO2/xCO2: Water vapor correction method		23.30
SOCAT	fCO2/pCO2/xCO2: Method to calculate pCO2 from xCO2 (reference)		SOCAT
SOCAT	fCO2/pCO2/xCO2: Method to calculate fCO2 from pCO2 (reference)		SOCAT
197	fCO2/pCO2/xCO2: Temperature correction method (from measurement temperature in the equilibrator to SST)	The FerryBox pCO2 was corrected to SST based on the temperature dependence (Takahashi et al., 1993)	23.31
198	fCO2.pCO2/xCO2: At what temperature was fCO2 reported?		23.32
199	fCO2/pCO2/xCO2: Method reference (citation)		23.33
200	fCO2/pCO2/xCO2: Changes to Method or SOP		23.34
201	Temperature: Variable abbreviation in data files	Tequ	25.1
202	**Temperature: Observation type**	**underway**	**25.2**
203	**Temperature: Variable unit**	**Celsius**	**25.3**

204	**Temperature: Collection method (e.g. bottle sampling)**	**water collection with pump**	**25.4**
205	**Temperature: Analyzing instrument**	**FSI**	**25.5**
206	Temperature: Analyzing information with citation (SOP etc)		25.6
207	**Temperature: Quality control**	**No**	**25.7**
208	Temperature: Abbreviation of data quality flag scheme		25.8
209	**Temperature: Data quality flag scheme**		**25.9**
210	Temperature: Uncertainty	±0.005°C manufacturer uncertainity	25.10
211	**Temperature: Field replicate information**		**25.11**
212	Temperature: Method reference (citation)		25.12
213	Temperature: Changes to Method or SOP		25.13
214	Salinity: Variable abbreviation in data files	Salinity	26.1
215	**Salinity: Observation type**	**underway**	**26.2**
216	**Salinity: Variable unit**	**PSU**	**26.3**
217	**Salinity: Collection method (e.g. bottle sampling)**	**water collection with pump**	**26.4**
218	**Salinity: Analyzing instrument**	**Teledyne**	**26.5**
219	Salinity: Analyzing information with citation (SOP etc)		26.6
220	**Salinity: Quality control**		**26.7**
221	Salinity: Abbreviation of data quality flag scheme		26.8
222	**Salinity: Data quality flag scheme**		**26.9**
223	Salinity: Uncertainty		26.10
224	**Salinity: Field replicate information**		**26.11**
225	Salinity: Method reference (citation)		26.12
226	Salinity: Changes to Method or SOP		26.13
227	Var1: Variable abbreviation in data files	T_Intake	27.1
228	Var1: Full variable name	In-situ sea-surface temperature	27.2
229	**Var1: Observation type**	**underway**	**27.3**
230	Var1: Variable unit	Celsius	27.4
231	**Var1: Collection method (e.g. bottle sampling)**	**water collection with pump**	**27.5**
232	**Var1: Analyzing instrument**	E-H TSM187	**27.6**
233	Var1: Analyzing information with citation (SOP etc)		27.7
234	**Var1: Quality control**		**27.8**
235	Var1: Abbreviation of data quality flag scheme		27.9
236	**Var1: Data quality flag scheme**		**27.10**
237	Var1: Uncertainty	Class A according to IEC 60751 - equates to ±0.15 °C manufacturer uncertainity	27.11
238	**Var1: Field replicate information**		**27.12**
239	Var1: Method reference (citation)		27.13
240	Var1: Changes to Method or SOP		27.14