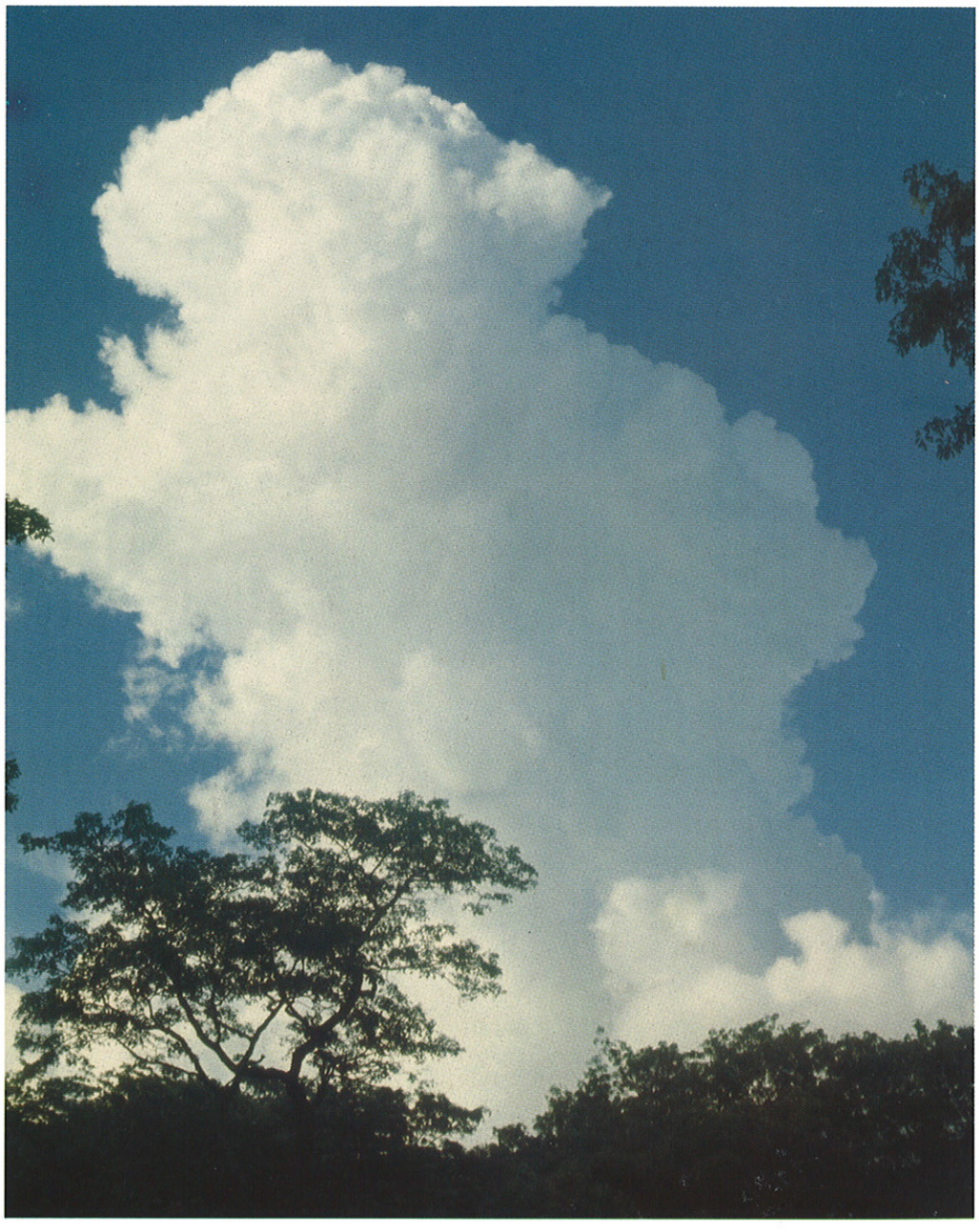
DNMI
Det norske meteorologiske institutt

RECOMMENDED FORMAT (NORSOK) FOR THE DELIVERY OF METOCEAN DATA

REPORT NO. 18/97

Knut A. Iden

KLIMA



DNMI - REPORT

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Recommended format (NORSOK) for the delivery of metocean data

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PROJECT CONTRACTOR

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SUMMARY

DNMI participated in a working group established by NORSOK to establish a standard regarding the collection of Metocean data. The document "Norsok Standard, Collection of Metocean Data N-002 Rev.1,September 1997" was delivered by the group. The document refers to different formats for distribution of the information collected. MIROS a/s has delivered the majority of EMS systems on the Norwegian Continental shelf. MIROS a/s has developed a format suitable to deliver Metocean data both in real time and in delayed time (quality controlled data). This format (DF022) was recommended for the delivery of Metocean data. The format description (DF022 Version 3) is given here.
The format has been developed afterwards to include new data blocks. The description of two new data blocks introduced in October 2000 are given as an Appendix.

SIGNATURE

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Abstract:
This document contains a description of a data format used in a Miros Environmental, Metrological and Vessel Performance (EMP) Monitoring System.The format is used for:

- transmission of data as ASCCI charachters on serial lines
- storing of data on ASCII files
- transmission of data as ASCII files (e.g. FTP)
- storing of data in database tables

The format consists of a series of data-packages or a complete database.

- Each data-package consists of a number of data-blocks.
- A database consits of tables with the same content as the data-blocks.

The number of blocks (tables) and the length of each individual block (table) is configureable. Each data-block (table) is related to a specific sensor or group of sensors. A block (table) content is fixed, i.e a defined parameter has its unique position. A parameter definition of each block (table) is the scope of this document.

REVISIONS RECORD	
Rev	Description
1	Released for construction.
2	Updated to cover - multiple sensor possibilities - additional data blocks: AL, AT, CU, CW, HM, VD, VE, VH, VM, VN, WD, WO, WP, WQ, WT - variable block length possibilities - expanded data block:: CL, CV, WI, WL, WR the document is restructured.
3	Added new data blocks : SS, QA, WU.WV, MS, MT, WN Expanded data blocks: WI,VN,WQ,WL
4	
5	
6	
7	
8	
9	
10	

TABLE OF CONTENTS

1 INTRODUCTION

1.1 General

The purpose of the Miros Adaptive EMP Data Format is to serve as a standard protocol
- for storing of EMP data
- and distribution of EMP data to various users

It may in addition be used to identify parameters in a database.

The format is based on printable ASCII characters.

1.2 Format structure

The Data Format type DF-022 consists of a number of data-packages or a number of database tables. The packages are stored and/or transmitted at predefined intervals. Each package (or database) contains a number of data-blocks (or tables). On serial lines or on files the package starts with a Message Header Block, followed by a number of data-blocks and ends with a Message Tail Block. The number of data-blocks is configurable.

Each data-block containing a predefined number of parameters, which varies from block to block. All the data blocks except one (the system dependant block) have fixed contents, which are defined in detail in the following chapter. Each data block starts with a block identifier. Each parameter is ended with "Carriage Return" and "Line Feed" (<CR><LF>).

One data block is in addition system dependant and will, if used, be defined in the configuration document for the system.

1.3 Format / system configuration

A specific system will use DF-022 in different ways depending of the requirements for the system. 3 different basic configurations may be used.

Database

A database will consist of a number of database tables each containing the content of one data block. See document DD/003/96/SM/1000/D for further description of table structure and the system configuration document for detailed description of a specific system.

ASCII files

An ASCII file containing DF-022 will normally contain

* only the last DF-022 data package generated or
* a series of data packages for a period of time (typically a day file)

These files may contain only a subset of the information found in the database. See the system configuration document for detailed description of a specific system.

Serial lines

A serial line used for transfer of DF-022 will normally contain a defined subset of the information found in the database or otherwise produced by the system. See the system configuration document for detailed description of specific lines.

The data format DF-022 is normally transmitted as data-packages with predefined intervals. The intervals, baud rate, start-stop-bits, parity etc are defined in the system configuration document as well.

1.4 Data Package Head and Tail

Data packages (on files or serial lines) does always contain a Header Block and a Tail. These blocks are described in detail in chapter 2. The corresponding DF-022 configuration document for a specific site/project will provide accurate content of the header block.

1.5 Block identification

Each individual data-block within a data-package is identified with two characters identifying the block type and one alphanumeric character identifying the sensor producing that particular block. This means that the block identifier "WIC" identifies wind sensor C as the source for data in that particular "WI" data block and "WQ3" identifies wave sensor 3 as source for that particular WQ data block.

Furthermore. The block identifier is followed by three digits, which identifies the length of that particular block (i.e "WIC-009" means that the first nine parameters of the block is included in the package).

1.6 Parameter numbering

Each individual parameter within a block is identified with a block-ID followed by parameter number: i.e parameter WR1/003 is parameter no 003 in block WR1 (= significant wave height). The parameter-number is not transmitted, but shall be used to identify a parameter in the format.

Some of the parameters are given parameter codes, which is intended to give an abbreviated description of the parameter.

1.7 Data Block Overview

An overview of all defined data blocks is found in the table of contents.

2 MESSAGE HEAD AND TAIL

2.1 Message Head

The message head will always be found on the start of a each individual data-package on serial lines and on files.

Param No.	Parameter Name	Format	No. of characters.
1	Start of message (block identifier)	!!!! <CR> <LF>	6
2	Data format identifier	DF-022xxx <CR> <LF>	11
3	Site identifier	XXXXXXXXXXXXXXX XXXXX <CR> <LF>	22
4	Date	XX-XX-XXXX <CR><LF>	12
5	Time	XX:XX <CR> <LF>	7
	Total No of characters in block		58

Parameters in the Message Header does not have a leading space.

Description of Parameters.

'Format identifier' is always set to :DF-022/01 or DF-022/02

'Site identifier' is set by MIROS AS to identify the system (please refer to document DF/xxxx for exact definition (see comments on front page).

'Date', is given as follows : DD-MM-YYYY.
(DD = Day , MM = Month , YYYY = Year).

'Time', is given in as follows : HH:MM (HH = Hour , MM = Minute).
The time is given up to 23:59 hours in UTC, unless otherwise stated in project documentation. The time and date parameters correspond to the transmission time of the data package.

2.2 Message Tail

The message tail will allways be found on the end of a each individual datapackage on serial lines and on files.

Param No.	Parameter Name	Format	No. of characters.
1	End of message (block identifier)	<FF>$$$$$$$<CR><LF>	10
	Total No of characters in block		10

Parameters in the Message Tail does not have a leading space.

3 DATA BLOCK DETAILS

GENERAL

All parameters in the data-blocks, except the block identifiers, have at least one leading space, unless otherwise stated in the description of individual data blocks. Parameters in the Message Header and -Tail does not have a leading space.

The block identifiers starts with a <Form Feed> followed by

- 2 alphabetic characters identifying the block
- 1 alphanumerical character identifying the sensor
- a "-" and 3 numerical characters or 4 numerical characters without the dash. (identifying the number of parameters in the block, including the block identifier itself.). Eg WR1-031.

All parameters in the data blocks (except block identifiers) have a value in the range -999.99 to 9999.99 unless otherwise stated under description of the individual data blocks.

All unused parameters have the value " -999.99".

All undefined parameters (measurement not accepted by quality control routines) have the value " -999.88".

Not all blocks may necessarily be transmitted in a specific data-package.

The data content of a specific data block may be reduced. Eg a block identified as CL1-005 contains data up to and including parameter no 005 within that block whilst a block identified as CL1-012 will contain data up to and including parameter 012.

3.1 AL: Anchor Length

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Averaging window length (configure able 1 to 10 min)	min
003		Anchor 1 length min	m
004		Anchor 1 length aver	m
005		Anchor 1 length max	m
006		Anchor 2 length min	m
007		Anchor 2 length aver	m
008		Anchor 2 length max	m
009		Anchor 3 length min	m
010		Anchor 3 length aver	m
011		Anchor 3 length max	m
012		Anchor 4 length min	m
013		Anchor 4 length aver	m
014		Anchor 4 length max	m
015		Anchor 5 length min	m
016		Anchor 5 length aver	m
017		Anchor 5 length max	m
030		Anchor 10 length min	m
031		Anchor 10 length aver	m
032		Anchor 10 length max	m
033		For future use	
xxx		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

3.2 AT: Anchor Tension

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Averaging window length (configure able 1 to 10 min)	min
003		Anchor 1 tension min	tons
004		Anchor 1 tension aver	tons
005		Anchor 1 tension max	tons
006		Anchor 2 tension min	tons
007		Anchor 2 tension aver	tons
008		Anchor 2 tension max	tons
009		Anchor 3 tension min	tons
010		Anchor 3 tension aver	tons
011		Anchor 3 tension max	tons
012		Anchor 4 tension min	tons
013		Anchor 4 tension aver	tons
014		Anchor 4 tension max	tons
015		Anchor 5 tension min	tons
016		Anchor 5 tension aver	tons
017		Anchor 5 tension max	tons
030		Anchor 10 tension min	tons
031		Anchor 10 tension aver	tons
032		Anchor 10 tension max	tons
033		For future use	
xxx		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

3.3 CL: Cloud Level Data

Par No.	Param Code	Parameter Name		Unit
001		BLOCK IDENTIFIER		
002	Hc1	Cloud Level 1 (lowest cloud)	2 min	m
003	Hc2	Cloud Level 2	2 min	m
004	Hc3	Cloud Level 3	2 min	m
005	Hv1	Vertical Visibility	2 min	m
006	Hc1b	Cloud Level 1 (lowest cloud)	10 min	m
007	Hc2b	Cloud Level 2	10 min	m
008	Hc3b	Cloud Level 3	10 min	m
009	Hv1b	Vertical Visibility	10 min	m
011		Laser performance		
012		Receiver sensitivity		
xxx		For future use		

Description of Parameters.

Contact Miros to obtain relevant information.

Note: Lowest measured value last 2 or 10 minutes is given for each individual parameter.

3.4 CU: Surface Current Data

Data is derived from a sensor measuring current close to the surface (typically a Doppler Log)

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Averaging time-window 1)	min
003		True Current Speed (horizontal - relative sea bed)	m/s
004		True Current Direction, rel north (1-360 °) 2)	deg
005		Water Speed, rel vessel speed	m/s
006		Water Flow Direction, rel vessel heading (-179 to 180 °) 3)	deg

Notes

1) Averaging window in minutes (typically 10 to 90 minutes).

2) Current is flowing **towards** the direction given (360° is true north).

3) Current is coming **from** the the direction given

-90° the current is coming from port side

0° is a head current

180° is an aft current, ie the current is flowing in the same direction as the vessel is heading

On an offshore platform port side is defined as platform west, aft is platform south.

If parameter 005 an 006 is zero; it means that the water is flowing in the same direction and with the same speed as the vessel is moving.

Parameter 004 will be calculated if vessel heading information is known.
Parameter 003 will be calculated if vessel speed rel. sea bed is known.

3.5 CV: Current Speed Vectors

This data block is used for surface current vectors form a Miros Wave and Surface Current Radar

Par No.	Param Code	Parameter Name	Unit	Remarks
001		BLOCK IDENTIFIER		<FF>CV*-xxx <CR><LF>
002		Current Speed, Direction 1	m/s	
003		Current Speed, Direction 2	m/s	
004		Current Speed, Direction 3	m/s	
005		Current Speed, Direction 4	m/s	
006		Current Speed, Direction 5	m/s	
007		Current Speed, Direction 6	m/s	
008		Geographical orientation of vector 1	deg	
009		For future use		

Description of Parameters.

Each vector is 2 min. mean (sampled in sequence). Data for all vectors is stored at the end of a sampling sequence.

NEGATIVE parameter value: surface current is approaching from the direction indicated.

UNSIGNED parameter value: surface current is flowing in the direction indicated.

Parameter 008 may not be used. Direction of vector 1 is in this case equal to direction given in parameter WS*-002 (direction of sector1).

3.6 CW: Current Speed Vectors

Note preliminary definition (Do not use before approved)

This data block is used for current vectors from a 2D or 3 D current sensor.

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Sensor depth	
003		Geographical orientation of x-axis	m/s
004		Vertical offset of z-axis	m/s
005		x-axis speed vector	m/s
006		y-axis speed vector	m/s
007		z-axis speed vector	m/s
008		For future use	

Note the vectors given will be dependant of the sensor type. 2D sensors will only provide X and Y component. 3Dsensors will include vertical axis (Z).

Description of Parameters.

Contact Miros to obtain relevant information.

3.7 HM: Heli-deck Motion

This data block is obsolete and should be replaced by VM and VN.

Par No.	Param Code	Parameter Name		Unit
001		BLOCK IDENTIFIER		
002		List	last 2 min.	deg
003		Max Roll (peak to peak)	last 2 min.	deg
004		Trim	last 2 min.	deg
005		Max Pitch (peak to peak)	last 2 min.	deg
006		Max Vertical Motion (peak to peak)	last 2 min.	m
007		Max Vertical Speed	last 2 min.	m/s
008		List	last 10 min.	deg
009		Max Roll (peak to peak)	last 10 min.	deg
010		Trim	last 10 min.	deg
011		Max Pitch (peak to peak)	last 10 min.	deg
012		Max Vertical Motion (peak to peak)	last 10 min.	m/
013		Max Vertical Speed	last 10 min.	m/s
014		Max Vertical Acceleration	last 2 min.	m/s2
015		Max Vertical Acceleration	last 10 min.	m/s2
016		For future use		

Description of Parameters.

Contact Miros to obtain relevant information.

3.8 MR: Special Wind Data for MET Reports

This data block is obsolete and should be replaced with MS and MT.

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER (note 1)	
002	Mwpp	Max Gust last fixed period reduced ti 10 m ASL	m/s
003	Uwpp	UTC time for parameter. 002	hh:mm
004	Mwap	Max Average Wind-speed last fixed per. reduced to 10 m ASL	m/s
005	Uwap	UTC time for parameter. 004	hh:mm
006		For future use	

Notes

1) MR1 indicates that data is extracted from last fixed 3 hour period starting at either 0000, 0300, 0600, 0900, 1200, 1500, 1800 or 2100 hours UTC.

MR2 indicates that data is extracted from the last fixed 6 hour period starting at either 0000, 0600, 1200, or 1800 hours UTC.

Description of Parameters.

Contact Miros to obtain relevant information.

3.9 MS: Special 3 Hour Wind Data for MET Reports

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Mwpp	Max Gust last fixed period reduced to 10 m ASL	m/s
003	Uwpp	UTC time for parameter. 2	hh:mm
004	Mwap	Max Average Wind-speed last fixed per. reduced to 10 m ASL	m/s
005	Uwap	UTC time for parameter. 4	hh:mm
006		For future use	

Notes

MSx corresponds with the same sensor ID as found in WIx . This means that data marked with WS2 and WI2 is generated by the same sensor.

A new record for each sensor is entered every 3 hours at either 0000, 0300, 0600, 0900, 1200, 1500, 1800 or 2100 hours UTC.

Description of Parameters.

Contact Miros to obtain relevant information.

3.10 MT: Special 6 Hour Wind Data for MET Reports

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Mwpp	Max Gust last fixed period reduced ti 10 m ASL	m/s
003	Uwpp	UTC time for parameter. 2	hh:mm
004	Mwap	Max Average Wind-speed last fixed per. reduced to 10 m ASL	m/s
005	Uwap	UTC time for parameter. 4	hh:mm
006		For future use	

Notes

MTx corresponds with the same sensor ID as found in WIx . This means that data marked with WT2 and WI2 is generated by the same sensor.

A new record for each sensor is entered every 6 hours at either 0000, 0600, 1200 or 1800 hours UTC.

Description of Parameters.

Contact Miros to obtain relevant information.

3.11 PT: Precipitation Data

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Hr1	Precipitation last fixed 3 hours	mm
003		For future use	

Description of Parameters.

Precipitation data is accumulated for fixed 3 hour periods (starting on 00:00 UTC). Data is updated every 3 hours (i.e data presented between 06:00 and 08:59 UTC is accumulated precipitation between 03:00 and 05:59.

3.12 QA: Miros Wave Radar Hardware Status

This data block is "linked" to data block WR (it identifies the hardware status of the sensor producing block WR).

Para. No	Parameter Name	Unit
01 02 up to 16	BLOCK IDENTIFIER	

Description of Parameters.

See document DF/005/WR which describes the data format from the Miros Wave Radar. Parameter no. 41 to 65 in this format is entered into this block.

3.13 SS: Sub Sea Data

Data in this block is normally produced by a sub sea sensor which is anchored on one specific depth or it may be positioned on various depths by a winch.

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Cm	Current Speed (horizontal)	m/s
003	Cd	Current Direction (rel mag. north) (going to)	Deg.
004	Tew	Seawater Temperature	°C
005		Conductivity	S/m
006		Salinity	PSU
007		Turbidity	NTU
008		Pressure	MPa
009		Water depth (of measurement) 1)	m
010		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

Notes

1) Calculated directly from pressure

3.14 ST: Sea Temperature Data

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Tew	Seawater Temperature 1 min mean	°C
003		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

3.15 SY: System Dependant Data

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		For optional use	
xxx		For optional use	

Description of these parameters (if used) will be found in a system dependant data format description (ref. comments on front sheet).

3.16 TH: Air THP Data

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Tea	Air Temperature 1 min. mean	°C
003	Ted	Air Dewpoint Temperature 1 min. mean	°C
004	Hua	Air Humidity 1 min. mean	%RH
005	Pa1	Air Pressure at sensor level 1 min. mean	hPa
006	Pa2	Air Pressure QFE 1 min. mean	hPa
007	Pa3	Air Pressure QNH 1 min. mean	hPa
008	Pa4	Air Pressure QFF 1 min. mean	hPa
009	Pa5	Air Pressure 3 Hour Trend	hPa
010		For future use	
xxx		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

Parameter 009 is not always used.

QFE Calculated air pressure at runway (heli-deck) level (based on parameter 005), using normalized e atmosphere.

QNH Calculated air pressure at sea level (based on QFE), using standard ICAO atmosphere.

QFF Calculated air pressure at sea level (based on QFE), using normalized atmosphere.

The calculation of a normalised atmosphere utilizes actual air temperature.

3.17 VD: Vessel Draft

This data block is used for Vessel Draft data.

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Vessel Draft (instant value at recording time)	m
003		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

3.18 VE: Water Depth

This data block is used for Water Depth data.

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Water depth (instant value at recording time)	m
003		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

3.19 VH: Vessel Heading

This data block is used for Vessel Heading data.

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Vessel Heading 1 min mean	deg
003		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

3.20 VI: Visibility Data

Param No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Lv1	Horizontal visibility	m
003		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

3.21 VM: Vessel Motion (general data)

This data block is intended to provide general motion data for a vessel based on the input from a vessel motion sensor.

VM1, VM2, VM3 etc will be used for various averaging periods. Please refer to project specific document (e.g system description or system spec) for details regarding configuration of your system.

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Observation/ Averaging period	min
003		List (rel. horizon) **(Note 1)**	deg
004		Max Roll Starboard **(Note 1)**	deg
005		Max Roll Port **(Note 1)**	deg
006		Trim (rel. horizon) **(Note 1)**	deg
007		Max Pitch Up **(Note 1)**	deg
008		Max Pitch Down **(Note 1)**	deg
009		Average Heading **(Note 2)**	deg
010		Max Yaw Starboard **(Note 3)**	deg
011		Max Yaw Port **(Note 3)**	deg
012		For future use	

Description of Parameters.

Note 1: Positive angle values for port side up or bow up - relative horizon.

Note 2: Magnetic, Average Heading will only be provided if the motion sensor itself is producing heading data. In all other cases this parameter will be set to 0000.00. (Vessel Heading information from a separate compass may be found in data-block VH.)

Note 3: Max Yaw angle Starboard is always positive. Max Yaw angle Port is always negative.

On a platform : Port= platform east, Bow= platform north.

3.22 VN: Vessel Motion (location dependant data)

This data block is intended to provide motion data for specific locations onboard a vessel based on the input from a vessel motion sensor.

VN1, VN2, VN3 etc will be used for various locations and averaging periods. Please refer to project specific document (e.g system description or system spec) for details regarding configuration of your system.

Only a subset of the below defined parameter may be available on some locations.

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Location x-coordinate **(Note 1)**	m
003		Location y coordinate **(Note 1)**	m
004		Location z coordinate **(Note 1)**	m
005		Observation period in minutes	min
006		Max Heave (peak to peak) **(Note 2)**	m
007		Max Surge (peak to peak) **(Note 2)**	m
008		Max Sway (peak to peak) **(Note 2)**	m
009		Max Heave Speed **(Note 3)**	m/s
010		Max Surge Speed **(Note 3)**	m/s
011		Max Sway Speed **(Note 3)**	m/s
012		Max Heave Acceleration **(Note 4)**	m/s2
013		Max Surge Acceleration **(Note 4)**	m/s2
014		Max Sway Acceleration **(Note 4)**	m/s2
015		Max Heave- Single Period (peak to peak) **(Note 5)**	m
016		For future use	

Description of Parameters.

(Note 1) The coordinate system is vessel-bound. Coordinate system zero-point will vary from vessel to vessel

(Note 2) The distance between the maximum an minimum extreme values in the observation period

(Note 3) The highest speed detected in the observation period

(Note 4) The highest acceleration detected in the observation period

(Note 5) The heave amplitude (distance) is calculated for each heave half period (i.e. between two zero crossings). The highest sum of two consecutive amplitudes in the total observation periods represents the maximum heave for a single heave periods within the observation periods.

3.23 WD: Wind Data

This data - block is used for real time wind data.

Para No.	Param Code	Parameter Name		Unit
001		BLOCK IDENTIFIER		
002	Mv	Wind Speed	3 sec average	m/s
003	Dwn	Wind Direction relative north	3 sec average	deg
004	Dwv	Wind direction relative vessel heading	3 sec average	deg
005		For future use		

Description of Parameters.

Parameter WD*/004 will provide wind dircetion between +180° and -180° (possitive value starboard side, 0°=head wind).

Contact Miros to obtain other relevant information if required.

3.24 WI: Processed Wind Data

One or two sensors may be used as basis for production of data in this block. If two sensors are used, a system will automatically select data from the sensor indicating the highest speed and present the data from that one in this block and simultaneously calculated data for param. 002 and 003. If a stand alone sensor is producing this data-block, parameter 002 and 003 will not be calculated.

Para No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	DifWs	Speed Difference	m/s
003	DifWd	Direction Difference	deg
004	Mwm1	Min. Gust Last 2 min **true wind speed at sensor Level**	m/s
005	Mwa1	Aver. Speed Last 2 min **true wind speed at sensor Level**	m/s
006	Mwp1	Max. Gust Last 2 min **true wind speed at sensor Level**	m/s
007	Dwm1	Min. Direction Last 2 min **rel. true north**	deg
008	Dwa1	Aver. Direction Last 2 min **rel. true north**	deg
009	Dwp1	Max. Direction Last 2 min **rel. true north**	deg
010	Mwm2	Min. Gust Last 10 min **true wind speed red. to 10 m aMSL*)**	m/s
011	Mwa2	Aver. Speed Last 10 min **true wind speed red. to 10 m aMSL*)**	m/s
012	Mwp2	Max. Gust Last 10 min **true wind speed red. to 10 m aMSL*)**	m/s
013	Dwm2	Min. Direction Last 10 min **rel. true north**	deg
014	Dwa2	Aver. Direction Last 10 min **rel. true north**	deg
015	Dwp2	Max Direction Last 10 min **rel. true north**	deg
016	Mwm3	Min. Gust Last 10 min **true wind speed at sensor Level**	m/s
017	Mwa3	Aver. Speed Last 10 min **true wind speed at sensor Level**	m/s
018	Mwp3	Max. Gust Last 10 min **true wind speed at sensor Level**	m/s
019	Dwm1	Min. Direction Last 2 min **rel. vessel heading**	deg
020	Dwa1	Aver. Direction Last 2 min **rel. vessel heading**	deg
021	Dwp1	Max. Direction Last 2 min **rel. vessel heading**	deg
022	Dwm2	Min. Direction Last 10 min **rel. vessel heading**	deg
023	Dwa2	Aver. Direction Last 10 min **rel. vessel heading**	deg
024	Dwp2	Max Direction Last 10 min **rel. vessel heading**	deg
025		For future use	

Description of Parameters.

*) wind speed measured at sensor level is reduced to calculated wind speed at a level 10 metres above mean sea level (aMSL)

Parameter WI*/019 to WI*/024 will provide wind direction between +180° and -180° (positive value starboard side, 0°=head wind).

Contact Miros to obtain other relevant information

3.25 WL: Water Level Data

Par. No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Hw1	Mean Air Gap (10 min aver.)	m
003	Hlat1	Mean Water level referred to LAT (10 min mean)	m
004	Hw2	Minimum Air Gap (last10 min)	m
005	Hw3	Maximum Air Gap (last 10 min)	m
006	Hlat2	Minimum Air Gap referred to LAT (last10 min)	m
007	Hlat3	Maximum Air Gap referred to LAT (last10 min)	m
008		For future use	

Description of Parameters.

002 Hw1 Air Gap is sampled with at least 2 Hz. 10 minutes mean is calculated and updated every minute. The air gap distance is relative sensor location.

003 Hlat1 Sampled and updated as above. Water level given relativ lower astronomical tide (LAT).

004 Hw2 Air gap sampled and uptdated as for parameter 002. Minimum airgap last 10 minutes given

005 Hw3 Air gap sampled and updated as for parameter 002. Minimum airgap last 10 minutes given.

006 Hlat2 See Hlat1, based on parameter 004

007 Hlat2 See Hlat1, based on parameter 005

Other reference points than Hlat may be used. Check your system documentation.

3.26 WN: Wave Data (Short)

Par. No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Hm0	Significant Wave Height	m
003	Hmax	Maximum Wave Height	m
004	Tpeak	Peak wave period	s
005	TM02	Zero crossing period	s
006	Dpeak	Peak wave direction	deg
007		For future use	
xxx		For future use	

Description of Parameters.

Contact Miros for further description.

3.27 WO: Wave Data (Hec)

Par. No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Hlat Sensor No	
003	Hec1	Hec from wave-height sensor WQ1	m
004	Hec2	Hec from wave-height sensor WQ2	m
005	Hec 3	Hec from wave-height sensor WQ3	m
006		For future use	
xxx		For future use	

Description of Parameters.

002 Hlat Sensor No identifies the sensor in the WL group used for calculation of the Hec parameters (2 means that sensor WL2 is used)

003-005 Hec is calculated by use of the sensors in group WQ. The following formula is used:

$$Hec = -0{,}0197*(Hm0)^2 + 1.115*Hm0 + Hlat/1.5$$

3.28 WP: Wave Data (based on time-series)

Preliminary definition (Not released for use).

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Ns	Total Number of Samples in wave analysis	n
003	Fmet	Filter Method used on time series before analysis	
004	Hlim	Zero level height hysteresis	
005	Tlim	Zero level period hysteresis	
006	Cconv	Crossing Convention used (up-crossing or down-crossing)	
007	Nwc	Number of Wave Cycles	n
008	QAC	Number of Marked Cycles	n
009	QASA	Number of Saturation Samples	n
010	QASP	Number of Spike Samples	n
011	H1/3	Significant Wave Height (average of 1/3 highest waves)	m
012	Ts	Significant Wave Period (average of 1/3 highest waves)	s
013	H4RMS	Significant Wave Height (H*4RMS)	m
014	Tz	Average Wave Period	s
015	Hmax	Maximum Wave Height	m
016	Thmax	Period of Wave with Max Height	s
017	Htmax	Height of Wave with Max Period	m
018	Tmax	Max Wave Period	s
019	Crx	Max Crest Height	m
020	Hcrx	Height of Wave with Max Crest	s
021	Thcrx	Period of the Wave with Max Crest	s
022	Cr3	Average Height of 3 Highest Crests	m
023	CR1/3	Average Height of the 1/3 Highest Crests	m
024	Trx	Lowest Trough	m
025	Ss	Significant Wave Steepness (ref H1/3)	
026	Sf3	Average Steepness of 3 Highest Crests (ref Cr3)	
027		For future use	

Description of Parameters.

Contact Miros to obtain relevant information.

3.29 WQ: Wave Data (based on spectra)

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	Hm0	Significant Wave Height	m
003	Hmax	Maximum Wave Height	m
004	Tm02	Mean Zero Up-crossing Period	s
005	Tp1	Primary Wave Peak Period	s
006	Tmax	Maximum Wave Period	s
007	THmax	Period of Max. Wave (Hmax)	s
008	Tp2	Secondary Wave Peak Period	s
009	Dmt	Mean Wave Direction	deg
010	Dm1	Primary Wave Mean Direction	deg
011	Dm2	Secondary Wave Mean Direction	deg

Description of Parameters.

Contact Miros to obtain relevant information.

3.30 WR: Wave and Current Data (Miros Wave Radar)

Par No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002	VARn	Surface Elevation Variance	m*m
003	Hmo	Significant Wave height	m
004	Tp1	Primary Wave Peak Period	s
005	SDp1	Primary Wave Spectral Density	m*m/Hz
006	Dp1	Primary Wave Peak Direction	deg
007	Dm1	Primary Wave Mean Direction	deg
008	SPR1	Primary Wave Direction Spread	deg
009	H2	Secondary Peak Wave height	m
010	Tp2	Secondary Wave Peak Period	s
011	SDp2	Secondary Wave Spectral Density	m*m/Hz
012	Dp2	Secondary Wave Peak Direction	deg
013	Dm2	Secondary Wave Mean Direction	deg
014	SPR2	Secondary Wave Direction Spread	deg
015	Dpt	Total Energy Peak Direction	deg
016	Dmt	Total Energy Mean Direction	deg
017	SPRt	Total Energy Directional Spread	deg
018	Tz	Mean Zero Up crossing Period	s
019	Tav	Mean Period	s
020	CM	Surface Current Magnitude	m/s
021	CD	Surface Current Direction	m/s
022	CE	Surface Current Magnitude East Comp	m/s
023	CN	Surface Current Magnitude. North Comp	m/s
024	SPRc	Surface Current Magnitude. Spread	m/s
025	Hmax	Maximum Wave height	m
026	Ts	Significant Wave Period	s
027	Tmax	Maximum Wave Period	s
028	HTmax	Wave height of Maximum Wave Period	m
029	THmax	Wave Period of Maximum Wave height	s
030-035		For future use	
036-060		Hardware status	
061-090		Configuration data	

Description of Parameters.

Contact Miros to obtain relevant information. Full parameter description is found in document DF/005/WR (Note: parameter numbers in this document has a different sequence number i.e add 5 to the number found above to find corresponding parameter in ref.doc.).

3.31 WS: Wave Freq. / Dir. Spectrum type 1

This wave spectrum block provides data for 6 directions covering 180°. The energy level for approaching waves are unsigned and the energy level for receding waves are marked with a negative sign. (Consequently the spectrum covers 12 directions i.e. 360°). Each direction has 41 spectral points.

Par. No.	Param Code	Parameter Name	Unit
001		BLOCK IDENTIFIER	
002		Observation direction spectrum 1	deg
003		Configuration parameter	
004		Spectral Density(point 1,direct.1)0.00Hz	m*m/Hz
005		Spectral Density(point 2,direct.1)	m*m/Hz
044		Spectral Density(point 41,direct.1)	m*m/Hz
045		Spectral Density(point 1,direct.2)0.00 Hz	m*m/Hz
085		Spectral Density(point 41,direct.2)	m*m/Hz
086		Spectral Density(point 1,direct.2)0.00 Hz	m*m/Hz
126		Spectral Density(point 41,direct.3)	m*m/Hz
127		Spectral Density(point 1,direct.4)0.00 Hz	m*m/Hz
167		Spectral Density(point 41,direct.4)	m*m/Hz
168		Spectral Density(point 1,direct.5)0.00 Hz	m*m/Hz
208		Spectral Density(point 41,direct.5)	m*m/Hz
209		Spectral Density(point 1,direct.6) | 0.00 Hz	m*m/Hz
249		Spectral Density(point 41,direct.6)	m*m/Hz
250		For future use	

Description of Parameters.

002 Observation Direction of Spectrum 1. The directions of the succeeding spectra are incremented by 30°. i.e the direction of spectrum 6 is 150° (clockwise rotated) added to the direction of spectrum 1.

003 Spectral Density:
- 6= Mk1 radar- Spectrum covers 0.0000 Hz to 0.4464 Hz in 0.0112 Hz increments.
- 2= Mk2 radar - Spectrum covers 0.0000 Hz to 0.3125 Hz in 0.0078125 Hz increments.

4-249 6 individual Wave Spectra, each consisting of 41 points. Increments defined by parameter WS1-1. Spectral-point 1 is 0.0000 Hz.

NEGATIVE parameter value: waves are approaching from the direction indicated.

UNSIGNED parameter value: waves are receding in the direction indicated.

3.32 WT: Wave Freq. / Dir. Spectrum type 2

This directional wave spectrum data block provides data for any number of directions covering 360°. Each direction has a configure able number of spectral points. The frequency resolution and the starting frequency of the spectrum are configure able as well.

ASCII file or serial line format.

The WT block is divided in different "pages" each separated by a "form feed" <FF>

The parameters shall not contain any leading spaces. The number of decimals will vary. All parameters are ended with <CR><LF>

This block will form a variable number of pages when printed.

Page WT will contain Block Identifier and general information
Page 00 will contain the non-directional spectrum.
Page 01 the Directional Spectrum #1
Page 02 the Directional Spectrum #2
etc

Database table structure for storing of spectrum

The WT block will consists of a variable number of records.

Record with block identifier WTx will contain general information about the spectre.
Record with block identifier 00x will contain the non-directional spectrum.
Record with block identifier 01x the Directional Spectrum #1
Record with block identifier 02x the Directional Spectrum #2
etc

A table for a wave frequency spectrum in a database will always start with record WT then 00 followed by record 01,02,etc.

Data-block table:

The table provided below describes a directional spectra consisting of 36 sectors (each covering 10°). Each spectrum is furthermore divided in 50 frequency points as an example.

Any other combination of sectors, frequency points and frequency resolution is possible.

Group number corresponds to page in the 'ASCII file or serial line format', and record in the 'Database table structure for storing of spectrum'.

Gr. No.	Para. No	Parameter Name	Unit
WT	01	BLOCK IDENTIFIER **<FF>WT*-xxx**	
	02	Mean observation direction spectrum 1	deg
	03	Number of directional spectra in the block	
	04	Direction convention	
	05	Number of spectral points in each spectrum	
	06	Frequency resolution of spectrum	Hz
	07	Start frequency of spectrum	Hz
	08	for future use	
	09	for future use	
	10	for future use	
00	01	**Spectrum Identifier <FF>00*-xxx**	
	02	for future use	
	03	for future use	
	04	Spectral Density (point 1, integrated)	m*m/Hz
	05	Spectral Density (point 2, integrated)	m*m/Hz
	53	Spectral Density (point 50, integrated)	m*m/Hz
01	01	**Start of spectrum 1 <FF>01*-xxx**	
	02	for future use	
	03	for future use	
	04	Spectral Density (point 1, direct.1)	m*m/Hz
	05	Spectral Density (point 2, direct.1)	m*m/Hz
	53	Spectral Density (point 50, direct.1)	m*m/Hz

36	01	**Start of spectrum 36 <FF>36*-xxx**	
	02	for future use	
	03	for future use	
	04	Spectral Density (point 1,direct.36)	m*m/Hz
	05	Spectral Density (point 2,direct.36)	m*m/Hz
	53	Spectral Density (point 50,direct.36)	m*m/Hz

Description of Parameters.

Page	Parameter	
WT	01	Block identifier is normally transmitted as WT*-007 Note: The "*" is substituted with sensor number in a specific system.
	02	Mean observation direction of Spectrum 1. The mean observation direction of the succeeding spectra are clockwise rotated. Increments are found by dividing 360° by the number found in parameter 03. Mean observation direction is set to 0° for a non directional spectrum. Starting direction shall preferably be number of degrees east of north matching directional resolution (i e 10° if the data block contains 36 directional spectra or 30° if the data block covers 12 directions).
	03	Total number of directional spectra in the block (normally between 1-36).
	04	Direction convention used. 1 = energy coming from the direction given (approaching waves) 2 = energy going to the direction given (receding waves)
	05	Number of frequency components (spectral points) in each directional spectrum.
	06	Frequency resolution of spectrum (0.01Hz is preferred).
	07	Starting point of each spectrum (0Hz, i.e. DC component is preferred)
00	01	Start of spectrum identifier <FF>00*-xxx 00 = spectrum number * = sensor number -xxx = total number of parameters (053 used in this example).
	02	for future use
	03	for future use
	04 to 53	Integrated Wave Spectrum. The spectrum described here consists of 50 points.
01	01	Start of spectrum identifier <FF>01*-xxx 01 = spectrum number * = sensor number -xxx = total number of parameters (053 used in this example).
	02	for future use
	03	for future use
	04 to 53	Wave Spectrum direction one. The spectrum described here consists of 50 points.
02	01 to 53	As above covering sector 2
36	01 to 53	As above covering spectrum 36.

3.33 WU: Wave Freq. / Dir. Spectrum type 3 - DATA

This directional wave spectrum data block provides data for any number of directions covering 360°. Each direction has a configure able number of spectral points. The frequency resolution and the starting frequency of the spectrum are configure able as well.

.

ASCII file or serial line format.

The WU block is divided in one or several different "pages" (or actually sequence of blocks) each separated by a "form feed" <FF>

The parameters shall not contain any leading spaces. The number of decimals will vary. All parameters (spectral values) are ended with <CR><LF>

A complete WU block will form a variable number of pages when printed.

Page 0 will contain non-directional spectrum
Page 1 the Directional Spectrum #1
Page 2 the Directional Spectrum #2
etc

General information regarding configuration is found in block WV.

Database table structure

To be defined later

Data-block table:

The table provided below describes a directional spectra consisting of 36 sectors (each covering 10°). Each spectrum is furthermore divided in 50 frequency points as an example. (Parameter

Any other combination of sectors, frequency points and frequency resolution is possible.

Gr. No.	Para. No	Parameter Name	Unit
00	01	**SENSOR Identifier (WU*-xxx)**	
	02	**Spectrum Identifier (000)**	
	03	Spectral Density (point 1, non-directional spectrum)	m*m/Hz
	04	Spectral Density (point 2, non-directional spectrum)	m*m/Hz
	53	Spectral Density (point 50, non-directional spectrum)	m*m/Hz

Gr. No.	Para. No	Parameter Name	Unit
01	01	**SENSOR Identifier (WU*-xxx)**	
	02	**Spectrum Identifier (001)**	
	03	Spectral Density (point 1,direct.1)	m*m/Hz
	04	Spectral Density (point 2,direct.1)	m*m/Hz
	52	Spectral Density (point 50,direct.1)	m*m/Hz
02	01	**SENSOR Identifier (WU*-xxx)**	
	02	**Spectrum Identifier (002)**	
	03	Spectral Density (point 1,direct.2)	m*m/Hz
	04	Spectral Density (point 2,direct.2)	m*m/Hz
	52	Spectral Density (point 50,direct.2)	m*m/Hz
36	01	**SENSOR Identifier (WU*-xxx)**	
	02	**Spectrum Identifier (036)**	
	03	Spectral Density (point 1,direct.36)	m*m/Hz
	04	Spectral Density (point 2,direct.36)	m*m/Hz
	52	Spectral Density (point 50,direct.36)	m*m/Hz

Description of Parameters.

Page	Parameter	
00		
01	01	Start of spectrum identifier <FF>01*-xxx 01 = spectrum number * = sensor number -xxx = total number of parameters (053 used in this example).
	02	for future use
	03	for future use
	04 to 53	Wave Spectrum direction one. The spectrum described here consists of 50 points.
02	01 to 53	As above covering sector 2
36	01 to 53	As above covering spectrum 36.

3.34 WV: Wave Freq. / Dir. Spectrum type 3 - CONFIGURATION

This data-block is "linked" to data block WU (it identifies the configuration of block WU).

Para. No	Parameter Name	Unit
01	BLOCK IDENTIFIER	
02	Mean observation direction spectrum 1	deg
03	Number of directional spectra in the block	
04	Direction convention	
05	Number of spectral points in each spectrum	
06	Frequency resolution of spectrum	Hz
07	Start frequency of spectrum	Hz
08	for future use	
09	for future use	
10	for future use	

Description of Parameters.

Parameter

01 Block identifier is normally transmitted as WU*-007 Note: The "*" is substituted with sensor number in a specific system, **and shall correspond to the sensor number in table WU.**

02 Mean observation direction of Spectrum 1. The mean observation direction of the succeeding spectra are clockwise rotated. Increments are found by dividing 360° by the number found in parameter 03. Mean observation direction is set to 0° for a non directional spectrum.

Starting direction shall preferably be number of degrees east of north matching directional resolution (i e 10° if the data block contains 36 directional spectra or 30° if the data block covers 12 directions).

03 Total number of directional spectra in the block (normally between 1-36).

04 Direction convention used.

1 = energy coming from the direction given (approaching waves)
2 = energy going to the direction given (receding waves)

05 Number of frequency components (spectral points) in each directional spectrum.

06 Frequency resolution of spectrum (0.01Hz is preferred).

07 Starting point of each spectrum (0Hz, i.e. DC component is preferred)

MIROS	Doc.Type **PARAMETER DEFINITION** **MIROS DATA BLOCKS**			Page 1 of 1
Doc. No.: **DF/WM/UK**	Rev. 3	Check: CNE	Appr: SM	Date: 03.10.2000
Doc.Title: **Data Block WM - Wave Parameters from Wave Spectrum**				

This data block is used for wave parameters calculated from a directional or non-directional wave spectrum. A description of algorithms is found in Miros Doc.No. 1100/TN/001.

Param. No.	Param. Code	Parameter Name	Unit	Remarks
001		Reserved		
002	S_{Dp1}	Primary Wave Spectral Density	m^2/Hz	
003	H_{m0}	Significant Wave Height	m	
004	H_{max}	Estimate of Maximum Wave Height	m	
005	H_{Tmax}	Estimate of Wave Height of Max. Wave Period	m	
006	T_{p1}	Primary Wave Peak Period	s	
007	T_{p2}	Secondary Wave Peak Period	s	
008	T_{pc}	Calculated Peak Period	s	
009	T_s	Estimate of Significant Wave Period	s	
010	T_{m0-1}	Energy period (Estimate of Sign.Wave Period, T_s)	s	
011	T_{m0-2}	Integral period (Estimate of Sign.Wave Period, T_s)	s	
012	T_{m02}	Estimate of Mean Zero Up-crossing Period, T_z	s	
013	T_{m01}	Estimate of Mean Period, T_{av}	s	
014	T_{max}	Estimate of Maximum Wave Period	s	
015	T_{Hmax}	Estimate of Wave Period of Max. Wave Height	s	
016	T_{m24}	Estimate of Average Crest Period, T_c	s	
017	D_{p1}	Primary Wave Peak Direction	deg	1,2
018	D_{m1}	Primary Wave Mean Direction	deg	1,2
019	S_{PR1}	Primary Wave Direction Spread	deg	1
020	D_{pt}	Total Energy Peak Direction	deg	1,2
021	D_{mt}	Total Energy Mean Direction	deg	1,2
022	S_{PRt}	Total Energy Directional Spread	deg	1
023	?	Spectral Band Width		
024	Sk	Skewness		
025	S_{m02}	Estimate of Wave Steepness based on H_{m0} and T_z		
026	m_0	0'th order Moment	m^2	
027	m_1	1'st order Moment	m^2s^{-1}	
028	m_2	2'nd order Moment	m^2s^{-2}	
029	m_3	3'th order Moment	m^2s^{-3}	
030	m_4	4'th order Moment	m^2s^{-4}	
031	m_{-1}	1'st order negative Moment	m^2s	
032	m_{-2}	2'nd order negative Moment	m^2s^2	
033	V_{p1}	Primary Wave Velocity	m/s	
034	L_{p1}	Primary Wave Length	m	
035	C_{g1}	Primary Wave Group Velocity	m/s	
036-N		For future use		

Note1: Parameters 017 to 022 will only be calculated if the spectrum is directional.
Note2: Direction convention: waves are approaching from the direction given.

MIROS	Doc.Type **PARAMETER DEFINITION** **MIROS DATA BLOCKS**			Page 1 of 1
Doc. No.: **DF/CV/UK**	Rev. 2	Check: HL	Appr: SM	Date: 15.03.2000
Doc Title:	**Data Block CV - Current from Miros Wave Radar**			

This data block contains surface current data from a Miros Wave and Surface Current Radar.

Param. No.	Param. Code	Parameter Name	Unit	Remarks
001		Reserved		
002	Cv1	Current Speed, Direction 1	m/s	
003	Cv2	Current Speed, Direction 2	m/s	
004	Cv3	Current Speed, Direction 3	m/s	
005	Cv4	Current Speed, Direction 4	m/s	
006	Cv5	Current Speed, Direction 5	m/s	
007	Cv6	Current Speed, Direction 6	m/s	
008	Dir1r	Orientation of Vector 1 rel. to Vessel Heading	deg	
009	Dir1t	Orientation of Vector 1 rel. to True North	deg	
010	CM	Current Speed	m/s	
011	CDr	Current Direction rel. to Vessel Heading	deg	
012	CDt	Current Direction rel. to True North	deg	
013	DirSpr	Direction Change (in sampling period)	deg	
014	CD	Current Direction rel Wave Radar	deg	
015-N		For future use		

All values for parameter 002 to 012 and 014 are normally one hour and thirty minutes mean. Parameter 013 covers the same period.

Direction conventions:

For parameter 002 to 007:

NEGATIVE value: surface current is approaching from the direction indicated.

UNSIGNED value: surface current is flowing in the direction indicated.

For parameter 011, 012 and 014:

surface current is flowing in the direction indicated.

Parameter 009 and 012 will be given a value if the system is connected to a gyro compass or the system is installed on a fixed platform.

Parameter 013 will be given a value if the system is connected to a gyro compass and the system is mounted on a floating platform. The value represents standard deviation of vessel heading in the averaging period for the current data and may be used as a quality indicator.