SEAL 428 Specifications

Shipboard Equipment

RECORDING (BASIC CONFIGURATION)		
	Sentinel SD & RD	**Sentinel MS**
Format	4 byte, SEG-D Rev. 1.0 or 2.1 demultiplexed, 32 bit IEEE, code 8058	
Tape media	Up to 6 drives, simultaneous and alternated modes Drive model: 3592	
Ethernet media	NFS protocol	
Maximum number of streamers	Unlimited (depending on server performance)	
Maximum number of seismic channels	Not limited by Sercel electronics	
Maximum recording capacity per streamer (with zero dead time and telemetry redundancy)	• 960 channels @ 12.5 m, Typical @ 2 ms* • 480 channels @ 12.5 m, Typical @ 1 ms*	
Maximum record length	Unlimited in continuous acquisition mode (depending on server hardware configuration)	
Sampling rate	1/2 ms, 1ms, 2 ms, 4 ms	1ms, 2 ms, 4 ms
Operation mode	continuous	
Maximum number of auxiliary channels	60 analog. Unlimited digital auxiliary channels	

DCXU-428	
Functions	• Ethernet connection to the server • Built-in high-voltage converter (power supply to streamer) • Remote or local operations • Connection to Deck safety devices (Emergency stop, warning lights) • Connection to the Streamer through a 2-m Deck cable Adaptor • Propagation of the GPS reference time • Auxiliary pair connection (bird, acoustic, modem, ...) • NAUTILUS® connection
Electrical specifications	• Output voltage : from 100 VDC to 600 VDC • Output current : Max. 2.5 A • Safety features : Current limitation, High Voltage leakage measurement
Physical specifications	• Weight : 18 kg • Length : 580 mm (without the rear panel connectors) • Width : 19" (482.6 mm) • Height : 2U (89 mm)

* minimum compression ratio required : 53 % (the figures depend on signal type, sea and environmental conditions and cannot be predicted)

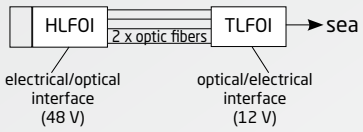
LCI-428	
Functions	• Ethernet connection to the server • Receiving navigation message (if using serial communications) • Receiving a physical T0 (pulse) • Low Line port for connecting an auxiliary line (AXCU) • Synchronized with GNSS time server connected to XDEV2 connector.
Physical specifications	• Weight : 4.1 kg • Length : 420 mm • Width : 19" (482.6 mm) • Height : 2U (89 mm)

GPS TIME SERVER	
Functions	• Acquisition synchronization between streamers. • Synchronization of acquisition and navigation systems in continuous acquisition mode • Maintain synchronisation within specification up to 3 hours without GPS
Physical specifications	• Length : 320 mm • Width : 19" (482.6 mm) • Height : 1U (44.5 mm)

DECK CABLES	
Length	Up to 100 m

STORAGE AND OPERATING CONDITIONS (SHIPBOARD)	
Operating temperature	+5°C to +40°C (41° to 104°F)
Storage temperature	-15°C to +55°C (5° to 131°F)
Operating humidity	10 to 90% relative humidity, non-condensing
Storage humidity	5 to 95% relative humidity Sercel recommends storing the DCXU-428 in dry conditions for about 24 hours before power on

In-Sea Equipment

LEAD-IN CABLE	
Functions	• Optical data transmission 
Physical specifications	• Cable Breaking strength : 300 kN ; 470 kN ; 570 kN • Maximum length : 1 900 m

HAU-428	
Functions	• 50 VDC (± 25 VDC) power supply for active channels for the two lines. • Tensile load measurement (0 to 70 kN) • High Voltage Lines and telemetry switches • High Voltage Lines mix
Physical specifications	• Outside diameter : 81 mm • Length : 277 mm • Connectors : standard Seal dia. 70 mm

HAPU-428	
Functions	• 50 VDC (±25 VDC) power supply for active channels for the two lines. • Tensile load measurement (0 to 70 kN). • High Voltage Lines and telemetry switches. • High Voltage Lines mix. • Factory-configurable Head Buoy Connector pin-out
Physical specifications	• Weight in sea water : 4.46 kg (9.83 lbs) • Width : 165 mm • Length : 277 mm • Connectors : standard Seal dia. 70 mm

LAUM-428	
Functions	• Data pre-processing • Data routing • Power distribution
Physical specifications	• Weight in sea water : 1 kg (2.2 lbs) • Spacing along the cable: 750 m @ 12.5 m @ 2 ms • Outside diameter: 53 mm • Length: 350 mm

FDU2F/FDU2M/FDU3F	
Functions	• Data transmission with CRC control 24 bits A/D conversion • D/A conversion with programmable bit stream
Full Scale Input Levels	@ G1600: 1.6 V RMS @ G400: 400mV RMS
Offset	0 (digitally zeroed)
Low Cut Filter	• SFA: 6.1 Hz analog + 2 Hz digital • Hydrophone - Sentinel SD / RD: 2 or 3 Hz analog (depending on section type) + optional 2 or 3 Hz digital • Hydrophone - Sentinel MS: 2 Hz analog + optional 2 or 3 Hz digital • Hydrophone - Sentinel HR: 4.8 Hz analog + optional 2 or 3 Hz digital
High Cut Filter	0.8 FN (linear phase)
Stop Band Attenuation	> 120 dB (above Nyquist)
Sample Rate	4, 2, 1 ms (0.5 ms option available for FDU2M and FDU2F)
Word Size	24 bits
Time Standard	True synchronous system

PERFORMANCE*	
Noise (3-200 Hz)	@ G1600: 700 nV RMS @ G400: 200 nV RMS
Instant Dynamic Range	124 dB
System Dynamic Range	136 dB
Distortion	-105 dB
Gain Accuracy	<0.1%
Phase Accuracy	20 µs
CMRR	110 dB

*** Typical @ 2 ms**

HEAD & TAIL POSITIONING BUOYS (TBC)	
Dedicated buoy power supply module	
Available power supply	40 to 50 V / 30 W
Current monitoring	
ON/OFF power supply remote control	

SENTINEL *SD*	
Section	
Section length	150 m
Stress member	Twaron/Vectran
Jacket material	Polyurethane 3.5 mm thick (5.2 mm over hydrophones)
Operating temperature	-10° C to +40° C
Storage/shipping temperature	-35° C to +50° C
Cable	**SD**
Diameter	59,5 mm
Section weight in air	419 kg
Hydrophone	**SFH**
Nominal Capacitance	32.5 nF ± 10% @ 20° C
Nominal Sensitivity	-192.9 dB ref to 1 V/µPa ± 1.5 dB (22.65 V/bar) @ 20° C
Streamer	
Maximum length -2D	15750 m/1260 channels
Maximum length - 3D	12000 m/ 960 channels

Connector diameter option	**Ø 50 mm**	**Ø 70 mm**

Channel spacing option	**12,5 m**	**6,25m**
FDU2F function	A/D conversion, data digitizing and tests	
FDU2F arrangement	Two channels per unit	
FDU2F per active section	6	12
Hydrophone arrays per section	12	24
Hydrophones per array	8	4
Array capacitance (nominal)	260 nF ± 10% @ 20° C	130 nF ± 10% @ 20° C
Array sensitivity	-194.1 dB ref to 1 V/µPa ± 1.0 dB (19.7 V/bar)@ 20° C	-195.15 dB ref to 1 V/µPa ± 1.0 dB (17.5 V/bar)@ 20° C

Cutoff frequency option	**2Hz**	**3 Hz**

Depth restriction option	**No**	**Yes**
Maximum operating depth	50 m	22 m
Maximum survival depth	250 m (5 days cumulative)	150 m (5 days cumulative)

Communication coils option	**2**	**4**

SENTINEL *RD*		
Section		
Section length	150 m	
Stress member	Twaron/Vectran	
Jacket material	Polyurethane 3.5 mm thick (5.2 mm over hydrophones)	
Operating temperature	-10° C to +40° C	
Storage/shipping temperature	-35° C to +50° C	
Cable	**RD**	
Diameter	55 mm	
Section weight in air	362 kg	
Hydrophone	**SFH**	
Nominal Capacitance	32.5 nF ± 10% @ 20° C	
Nominal Sensitivity	-192.9 dB ref to 1 V/µPa ± 1.5 dB (22.65 V/bar) @ 20° C	
Streamer		
Maximum length -2D	15750 m/1260 channels	
Maximum length - 3D	12000 m/ 960 channels	

Connector diameter option	**Ø 50 mm**	**Ø 70 mm**

Channel spacing option	**12,5 m**	**6,25m**
FDU2F function	A/D conversion, data digitizing and tests	
FDU2F arrangement	Two channels per unit	
FDU2F per active section	6	12
Hydrophone arrays per section	12	24
Hydrophones per array	8	4
Array capacitance (nominal)	260 nF ± 10% @ 20° C	130 nF ± 10% @ 20° C
Array sensitivity	-194.1 dB ref to 1 V/µPa ± 1.0 dB (19.7 V/bar)@ 20° C	-195.15 dB ref to 1 V/µPa ± 1.0 dB (17.5 V/bar)@ 20° C

Cutoff frequency option	**2Hz**	**3 Hz**

Depth restriction option	**No**	**Yes**
Maximum operating depth	50 m	22 m
Maximum survival depth	250 m (5 days cumulative)	150 m (5 days cumulative)

Communication coils option	**2**	**4**

SENTINEL *HR*	
Section	
Section length	150 m
Stress member	Twaron/Vectran
Jacket material	Polyurethane 3.5 mm thick (5.2 mm over hydrophones)
Operating temperature	-10° C to +40° C
Storage/shipping temperature	-35° C to +50° C
Cable	**SD**
Diameter	59.5 mm
Section weight in air	419 kg
Hydrophone	**SFH**
Nominal Capacitance	32.5 nF ± 10% @ 20° C
Nominal Sensitivity	-192.9 dB ref to 1 V/µPa ± 1.5 dB (22.65 V/bar) @ 20° C
Streamer	
Maximum length	6000 m

Connector diameter option	**Ø 50 mm**	**Ø 70 mm**

Channel spacing	**3,125 m**
FDU2F function	A/D conversion, data digitizing and tests
FDU2F arrangement	Two channels per unit
FDU2F per active section	24
Hydrophone arrays per section	48
Hydrophones per array	2
Array capacitance (nominal)	65 nF ± 10% @ 20° C
Array sensitivity	-196.95 dB ref to1 V/µPa ± 1.0 dB (14.2 V/bar)@ 20° C

Cutoff frequency	**4,8 Hz**

Depth restriction option	**No**	**Yes**
Maximum operating depth	50 m	22 m
Maximum survival depth	250 m (5 days cumulative)	150 m (5 days cumulative)

Communication coils option	**2**	**4**

SENTINEL® *MS* SOLID STREAMERS		
Field Digitalization Unit (FDUs)		
Arrangement	one per receiver point (3 channels)	
Functions	A/D conversion, data digitizing and tests	
FDUs per active section	12 (1 FDU per location)	
Spacing	12.5 m	
Hydrophones		
Standard model	Sercel Flexible Hydrophone (SFH) or Depth-Restricted SFH	
Nominal capacitance	32.5 nF ± 10% @ 20°C	
Nominal sensitivity	-192.9 dB ref to 1 V/µPa ± 1,5 dB (22.65 V/bar) @ 20°C	
Hydrophones array		
Cutoff frequency	2 Hz	
Groups per section	12	
Hydrophones per group	8	
Group capacitance (nominal)	260 nF ± 10% @ 20°C	
Group sensitivy	-194.1 dB ref to 1 V/µPa ± 1.0 dB (19.7 V/bar) @ 20° C	
Accelerometers		
Standard model	Sercel Flexible Accelerometer (SFA)	
Cutoff frequency	6.1 Hz	
Group capacitance (nominal)	42 nF ± 10% @ 20°C	
Group sensitivity	66 mV/g (6.73 mV/(m/s^2))	
Maximum length(*)	8100 m / 1944 channels (with full redundancy and 950 m lead-in) 12000 m / 2880 channels (without power / telemetry line redundancy, with 950 m lead-in)	
Communication coils	1	
Physical specifications		
Section length	150 m (measured at 13.3 kiloNewtons tension)	
Stress member	Twaron/Vectran	
Connector diameter	70 mm	
Jacket material	Polyurethane, 3.5 mm thick (5.2 mm over hydropones and accelerometers)	
Cable diameter	59.5 mm	
Section weight in air	425 kg	
Environmental specifications		
Operating temperature	-10° to +40°C	
Storage/shipping temperature	-35° to +50°C	
	Unrestricted	**Depth Restricted**
Maximum operating depth	50m	22 m
Maximum survival depth	250 m (5 days cumulative)	150 m (5 days cumulative)

(*) 12.5 m spacing only

Note: Sercel reserves the right to change its specifications without prior notice.
All specifications are typical at 25°C

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