

SPOOLER - MBB-20

BASIC EQUIPMENT DATASHEET



DESCRIPTION:

The MBB-20 spooler is a versatile equipment studied and manufactured by PCSC for use with small lengths of cables or optical fibre cables, where a reduced weight shall be handled and so the dimensions can be reduced.

MBB-20 is also well suitable for activities of cable recoiling and coiling for any relocation activity as small reels can be settled directly on the equipment thus avoiding major risks.

TECHNICAL DATA

Equipment Maximum Dimension:

- *Length:* 4.0 m
- *Width:* 3.0 m
- *Height:* 2.0 m

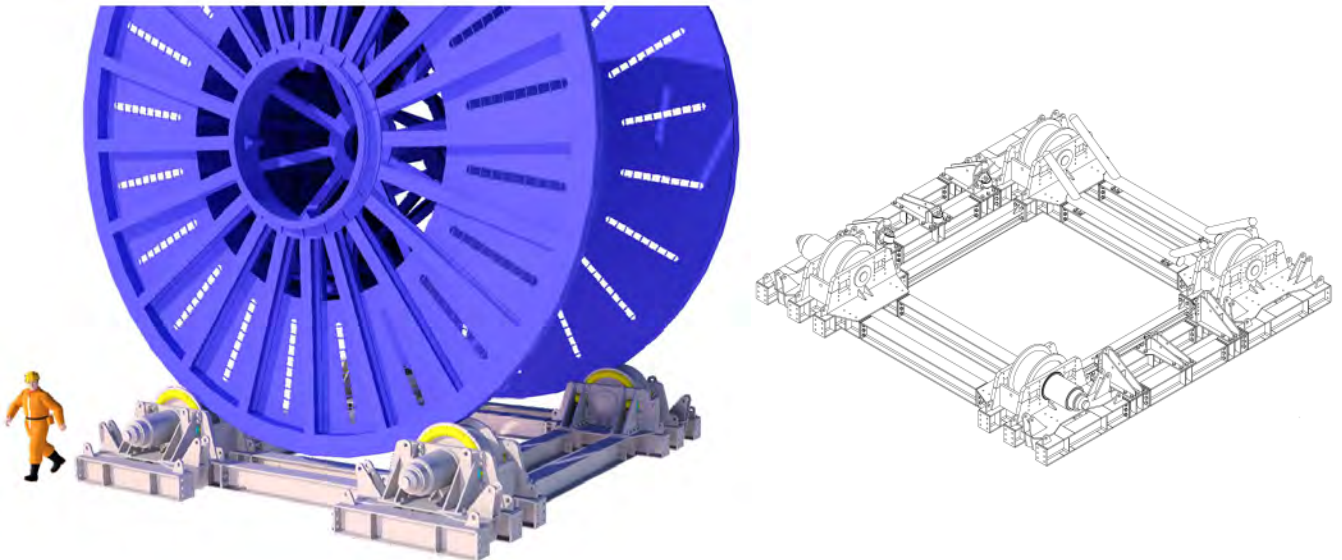
- *Weight (complete structure):* 4.0 T

Additional Data:

- *Maximum allowable load* : 20.0 T
- *Maximum speed coiling/laying* : 2.5 Km/h
- *Maximum allowable reel diameter* : 3.0 m
- *Minimum allowable reel diameter* : 1.0 m
- *Maximum allowable reel width* : 3.0 m
- *Minimum allowable reel width* : 1.0 m

SPOOLER - MBB-220

Basic Equipment Datasheet



DESCRIPTION:

The MBB-220 spooler is a versatile equipment studied and manufactured by PCSC for use with cables supplied in reels and it may be used either for cables and umbilical.

MBB-220 grants the proper cable uncoiling using the supply reel that can be settled directly on the equipment thus avoiding major risks.

The main chassis is hosting n. 4 groups of wheels motorized by 2 reduction-hydraulic engines.

The equipment is suitable and certified by RINA for handling up to 220T loading.

TECHNICAL DATA

Equipment Maximum Dimension:

- *Length:* 8.0 m
- *Width:* 8.0 m
- *Height:* 1.5 m

- *Weight (complete structure):* 30 tons

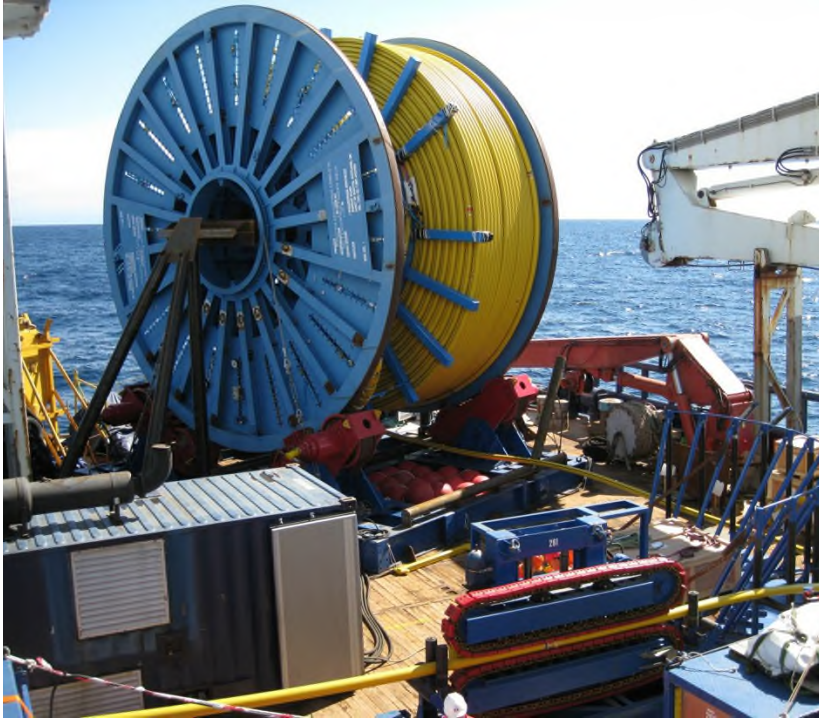
Additional Data:

- *Maximum speed coiling/laying:* 2.5 Km/h
- *Maximum speed during laying:* 2.5 Km/h
- *Maximum speed salvaging:* 2.5 Km/h

- *Maximum allowable reel diam.:* 10.0 m
- *Minimum allowable reel diam.:* 5.0 m
- *Maximum allowable reel width:* 8.0 m
- *Minimum allowable reel width:* 2.3 m

SPOOLER - MBB-440

Basic Equipment Datasheet



DESCRIPTION:

The MBB-440 spooler is a versatile equipment studied and manufactured by PCSC for use with cables supplied in reels and it may be used either for cables and umbilical.

MBB-440 grants the proper cable uncoiling using the supply reel that can be settled directly on the equipment thus avoiding major risks.

The main chassis is hosting n. 4 groups of wheels motorized by 4 reduction-hydraulic engines. Vertical Coiling System.

The equipment is suitable and certified by RINA for handling up to 440T loading.

TECHNICAL DATA

Equipment Maximum Dimension:

- *Length:* 14.7 m
- *Width:* 9.7 m
- *Height:* 14.0 m

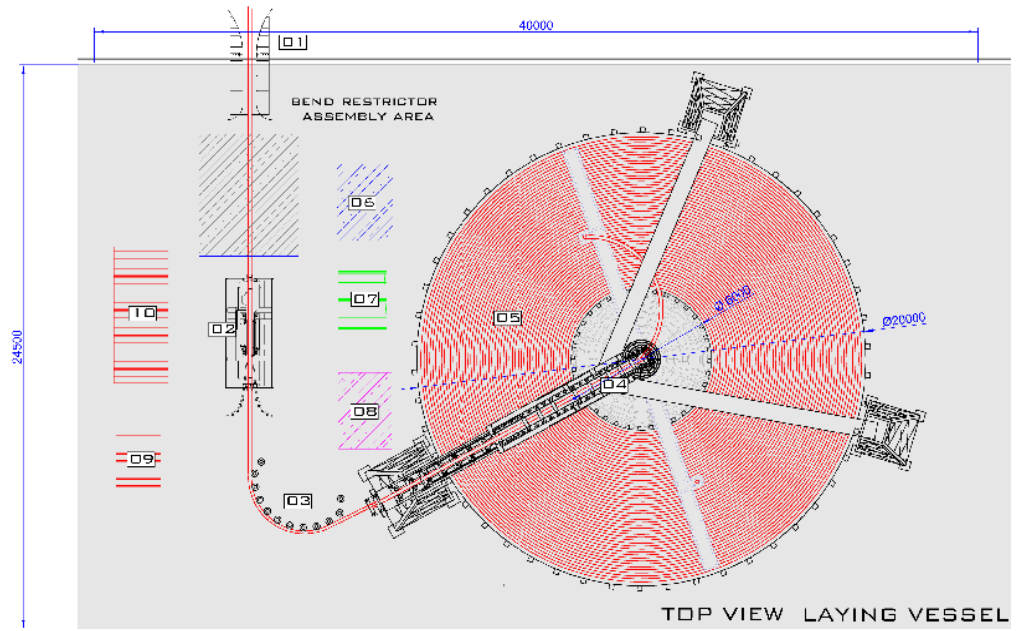
- *Weight (complete structure):* 60 tons

Additional Data:

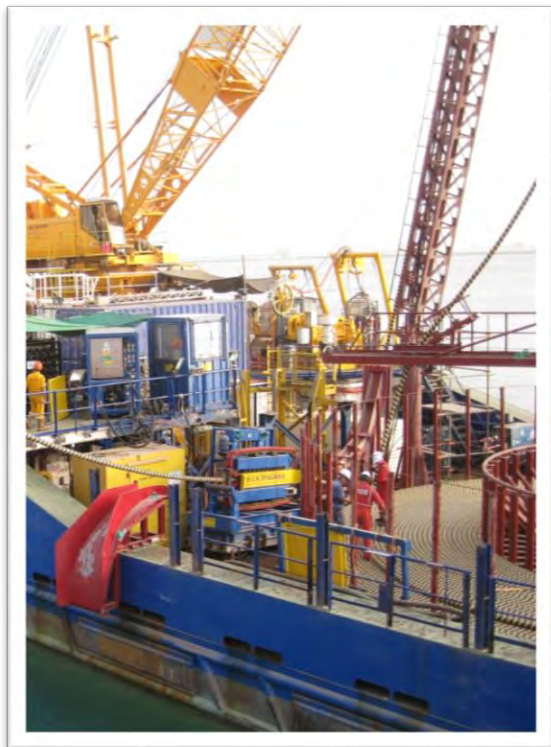
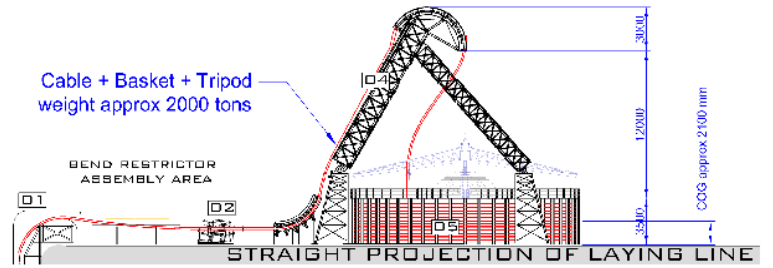
- *Maximum speed coiling/laying:* 2.5 Km/h
- *Maximum speed during laying:* 2.5 Km/h
- *Maximum speed salvaging:* 2.5 Km/h

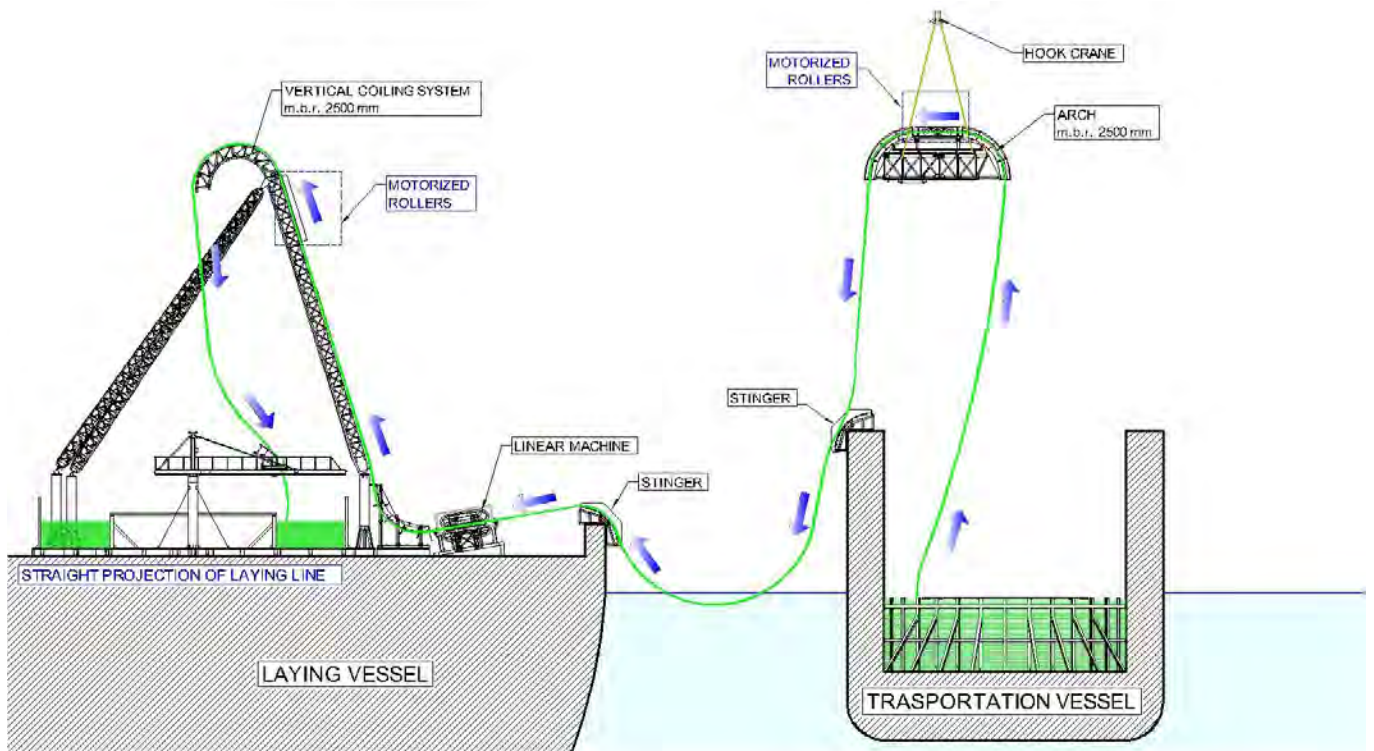
- *Maximum allowable reel diam.:* 12.0 m
- *Minimum allowable reel diam.:* 5.0 m
- *Maximum allowable reel width:* 8.0 m
- *Minimum allowable reel width:* 2.3 m

Cable Basket and Vertical Coiling System

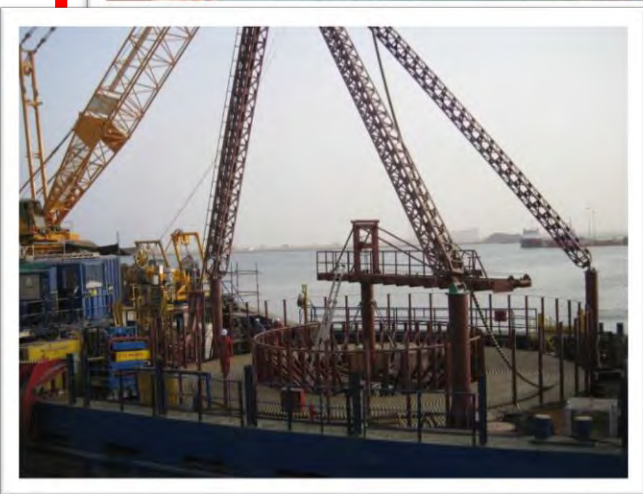
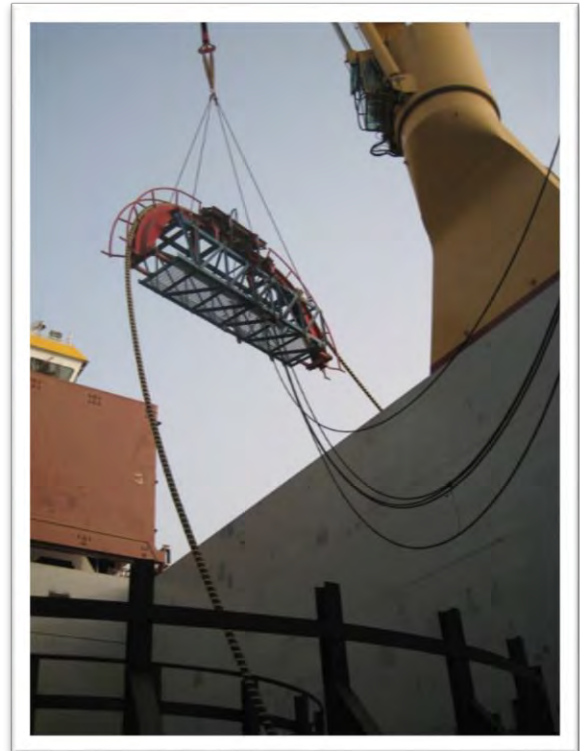


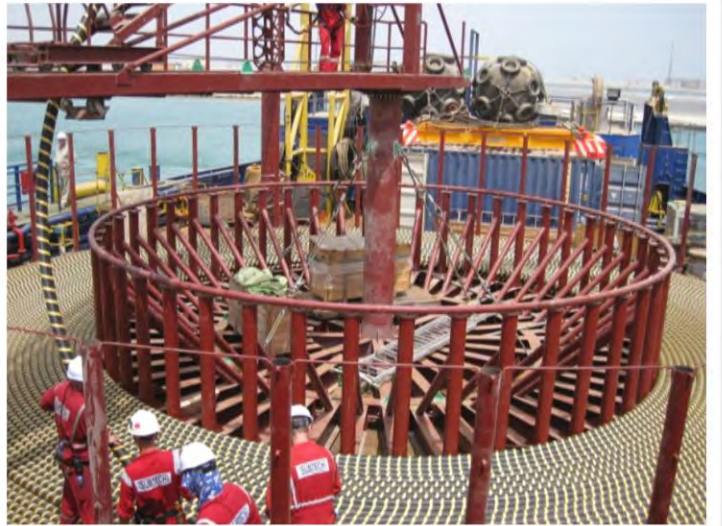
01	STINGER - R3000
02	LINEAR MACHINE
03	ELBOW
04	TRIPOD - H 12000 MM
05	CABLE BASKET - Ø 13000 M
06	HYDRAULIC UNIT
07	POWER GENERATOR
08	REMOTE CONTROL ROOM
09	CONTAINER 10"
10	CONTAINER 20"
DESCRIPTION	





SKETCH NOT IN SCALE





VERTICAL COILING SYSTEM - VCS/01

Basic Equipment Datasheet



DESCRIPTION:

Vertical Coiling System is studied and manufactured by PCS for use with cables supplied in basket. VCS grants the proper cable uncoiling without applying torsion stresses to cables from basket and avoiding the need of a turntable or carousel reduces the necessity to use larger vessel for the activities. With possibility to suit different types of basket diameters this equipment is a very versatile solution for cables laying.

It is composed by a basement, a main tower, an horizontal mast with cable guide and the Lower curve cable guide. Safety Fastening is granted by six wire ropes placed on diagonal and on vertical.

TECHNICAL DATA

Dimension:

- *Length:* 7.96 m
- *Width:* 5.56 m
- *Height:* 15.87 m

- *Weight (complete structure):* 8.5 tons

Additional Data:

- *Maximum speed coiling/laying:* 1.5 Km/h
- *Maximum speed during laying:* 1.5 Km/h
- *Maximum speed salvaging:* 1.5 Km/h
- *Minimum bending radius:* 2.5 m
- *Maximum allowable basket diam.:* 8.0 m

*Possibility to reduce the height to 12.87m
Weight of this configuraton 8.0 tons*

VERTICAL COILING SYSTEM - VCS/T/02

Basic Equipment Datasheet



DESCRIPTION:

Vertical Coiling System in tripod configuration is studied and manufactured by PCS for use with cables supplied in basket or reel when cable is then transpoiled onto basket. VCS grants the proper cable uncoiling without applying torsion stresses to cables from basket and avoiding the need of a turntable or carousel reduces the necessity to use larger vessel for the activities. In addition, basket diameters may be modified to different type of cable lengths. It is composed by a basement basket, tripod with cable guide, a Lower curve cable guide and a coiling arm for transpoiling operation.

TECHNICAL DATA

Dimension:

- *Length:* 17.50 m
- *Width:* 18.70 m
- *Height:* 22.60 m

- *Weight (complete structure):* 53.5 tons

Tripod: 12.5 tons
Basket: 41.0 tons

Additional Data:

- *Maximum speed coiling/laying:* 1.5 Km/h
- *Maximum speed during laying:* 1.5 Km/h
- *Maximum speed salvaging:* 1.5 Km/h
- *Minimum bending radius:* 2.5 m
- *Maximum allowable basket diam.:* 16.6 m

HYDRAULIC POWER UNIT - HPU-C10

Basic Equipment Datasheet



DESCRIPTION:

Hydraulic units are essential to generate power for all laying equipment. P.C.S. has availability of different motorization, according to the power needed by a specific outfit to be used. The remote control allows a better and safer operations for the equipment.

TECHNICAL DATA

Dimension:

- *Length:* 1.0 m
- *Width:* 1.0 m
- *Height:* 1.6 m

- *Weight:* 525 Kg

Additional Data:

- *Required power supply:* 415/440V 3ph 50/60 Hz
- *Electric motor power:* 10kW
- *Full load current:* 23 A
- *Max flow rate*
 - 35 l/min - 50Hz
 - 42 l/min - 60Hz
- *Max pressure:* 200 bar
- *Hydraulic oil cooler:* oil/sea water
- *Max coiling water consumption:* 10 l/m
- *Oil Tank:* 100 lt

VERTICAL COILING SYSTEM - VCS - BOTTOM ELBOW

Basic Equipment Datasheet



DESCRIPTION:

Vertical Coiling System is studied and manufactured by PCS for use with cables supplied in basket.

Bottom Elbow is used in the lower part of the VCS to guide cable towards the Tensioner.

TECHNICAL DATA

Dimension:

- *Length:* 3.34 m
- *Width:* 0.86 m
- *Height:* 3.50 m

- *Weight :* 1.27 tons

Additional Data:

- *Minimum bending radius:* 2.5 m

STINGER S 2000

Basic Equipment Datasheet



DESCRIPTION:

The Stinger is the essential mean to facilitate the cable lay from the deck and grant the correct angle exit, according with the minimum bending radius imposed by cable/umbilical manufacturer.

TECHNICAL DATA

Dimension:

- *Length:* 2.46 m
- *Width:* 1.25 m
- *Height:* 2.30 m

- *Weight:* 1,20 tons

Additional Data:

- *Minimum bending radius:* 2.0 m
- *Max width for cable entrance:* 0.4 m
- *Height (cable entrance):* 0.88 m
- *Bearing Length on the deck:* 1.43 m

STINGER - S 3000

Basic Equipment Datasheet



DESCRIPTION:

The Stinger is the essential mean to ease cable lay from the deck and grant the correct angle exit, according to the minimum bending radius imposed by cable/umbilical manufacturer.

TECHNICAL DATA

Dimension:

- *Length:* 4.70 m
- *Width:* 2.30 m
- *Height:* 4.37 m

- *Weight:* 6,37 tons

Additional Data:

- *Minimum bending radius:* 3.0 m
- *Max width for cable entrance:* 1.0 m
- *Load capacity:* 20 tons max
- *Height (from the deck):* 2.17 m
- *Height (cable entrance):* 1.64 m
- *Bearing Length on the deck:* 2.20 m

LINEAR MACHINE - LM-2WP

Basic Equipment Datasheet



DESCRIPTION:

The LM has the essential purpose to maintain the correct residual tension on the cable, working as brake during cable laying or as pulling winch while loading the cable on board. The 2 vertically opposed crawlers allow the cable pass through mantaining the required amount of grip pressure.

TECHNICAL DATA

Dimension:

- *Length:* 2.86 m
- *Width:* 1.51 m
- *Height (from the deck):* 1.67 m

- *Weight:* 2,75 tons

Additional Data:

- *Required Power Supply:* 415/440V 3ph
50/60 Hz
- *Max wheel opening:* 400 mm
- *Max lock pressure:* 2 tons
- *Pulling force:* 2 tons
- *Max Speed:* 2.4 km/h
- *Maximum cable diameter:* 300 mm
- *Minimum cable diameter:* 12 mm
- *Cable entrance height:* 1000 mm

LINEAR MACHINE - LM-3WP

Basic Equipment Datasheet



DESCRIPTION:

The LM has the essential purpose to maintain the correct residual tension on the cable, working as brake during cable laying or as pulling winch while loading the cable on board. The 2 vertically opposed crawlers allow the cable pass through mantaining the required amount of grip pressure.

TECHNICAL DATA

Dimension:

- *Length:* 3,00 m
- *Width:* 2,44 m
- *Height:* 2,59 m

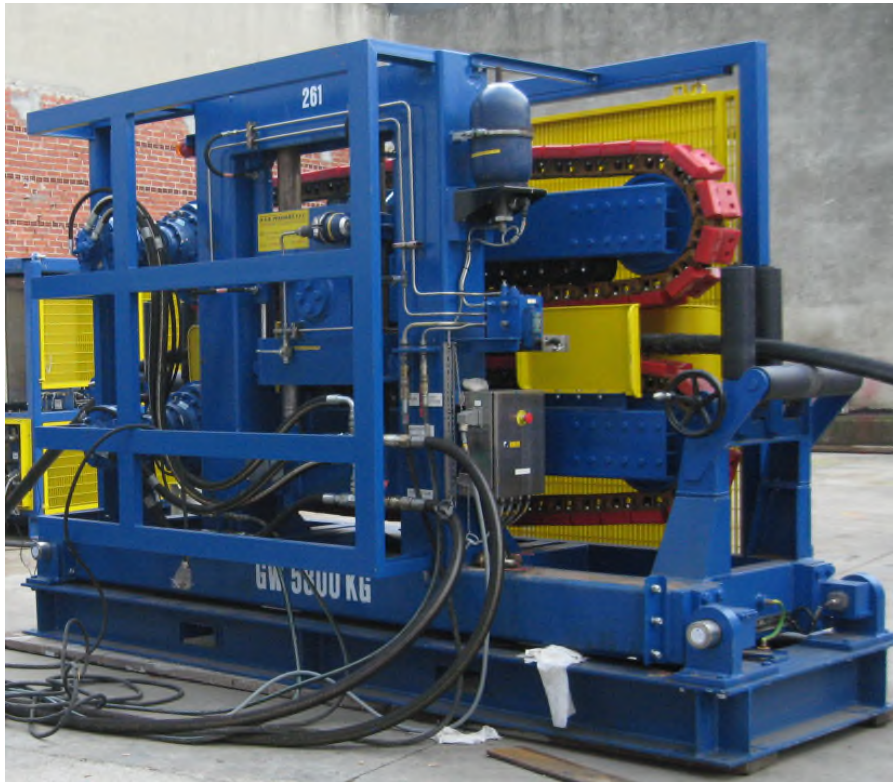
- *Weight:* 7,00 tons

Additional Data:

- *Required Power Supply:* 380/440V 3ph
50/60 Hz
- *Max wheel opening:* 400 mm
- *Pulling force:* 2,5 tons
- *Max Speed:* 2,4 tons
- *Maximum cable diameter:* 220 mm
- *Minimum cable diameter:* 12 mm
- *Cable entrance height:* 1100 mm

LINEAR MACHINE - LM-10 - TENSIONER

Basic Equipment Datasheet



DESCRIPTION:

The LM has the essential purpose to maintain the correct residual tension on the cable, working as brake during cable laying or as pulling winch while loading the cable on board. The 2 vertically opposed crawlers allow cable pass through maintaining the required amount of grip pressure.

The LM 10 hosts comprises 2 opposed crawlers with polyurethane moulded pads, driven by a 75kW Electro- Hydraulic Power Unit connected to the 200kW power generator Perin GEPD250 Super Silent.

The equipment includes a Remote Control Unit (RCU) to select direction and control tracks speed, equipped with readout meters, grip & compression values, speed and tension.

TECHNICAL DATA

Dimension:

- **Length:** 3.85 m
- **Width:** 1.60 m
- **Height (from the deck):** 2.54 m

- **Weight:** 5,5 tons

Additional Data:

- **Pad Opening:** 400 mm (max).
- **Grip Length:** 1.8 m
- **Max Lock Pressure:** 11 tons/m
- **Max Pulling Force:** 10 tons
- **Max Speed @ 60Hz:** 1.5 km/h
- **Coefficient of Friction (assumed)** 0.5
- **Maximum cable diameter:** 200 mm
- **Minimum cable diameter** 40 mm
- **Cable entrance height:** 1300 mm

LINEAR MACHINE - LM-10 - HPU (Hydraulic Power Unit)

Basic Equipment Datasheet



DESCRIPTION:

Hydraulic units are essential to generate power for all laying equipment. P.C.S. has availability of different motorization, according to the power needed by a specific outfit to be used. The remote control allows a better and safer operations for the equipment.

This Electro-Hydraulic Power Unit provides 75kW to drive the LM-10

HPU (Hydraulic Power Unit) is connected to the Tensione LM 10 by a set of 10m long hoses, with quick disconnection coupling fitted at both ends.

TECHNICAL DATA

Dimension:

- *Length:* 2.35 m
- *Width:* 1.20 m
- *Height:* 2.20 m

- *Weight:* 2,7 tons

Additional Data:

- *Required power supply:* 415/440V 3ph 50/60 Hz
- *Electric motor power:* 75kW
- *Full load current:* 129 A
- *Max flow rate*
 - 140 l/min - 50Hz
 - 170 l/min - 60Hz
- *Max pressure:* 250 bar
- *Hydraulic oil cooler:* oil/sea water
- *Max coiling water consumption:* 50 l/m
- *Oil Tank:* 400 lt

LINEAR MACHINE - LM-10 - RCU - Remote Control Room

Basic Equipment Datasheet



DESCRIPTION:

RCU (Remote Control Room) is a console that allows remote operating and control of the Tensioner. It can be set in "automatic" operation or in "manual".

The Tensioner LM 10 includes a Remote Control Unit (RCU) located inside the Control Cabin, to select direction and control tracks speed, equipped with readout meters, squeeze values, speed and tension.

TECHNICAL DATA

Dimension:

- *Length:* 1,60 m
- *Width:* 1.60 m
- *Height:* 2.45 m

- *Weight:* 1,1 tons

HYDRAULIC POWER UNIT - HPU-C20

Basic Equipment Datasheet



DESCRIPTION:

Diesel engine driven hydraulic units are essential to generate power for all laying equipment. P.C.S. has availability of different motorization, according to the power needed by a specific outfit to be used. The remote control allows a better and safer operations for the equipment.

TECHNICAL DATA

Dimension:

- *Length:* 1.85 m
- *Width:* 1.10 m
- *Height:* 2.00 m

- *Weight:* 1.040 Kg

Additional Data:

- *Diesel engine max power:* 21 kW at 3000 rpm
- *Engine cooling:* Air cooled
- *Fuel tank:* 40 l
- *Max flow rate:* 60 lpm
- *Max pressure:* 300 bar
- *Hydraulic oil cooler:* oil/sea water
- *Max cooling water consumption:* 20l/m
- *Hydraulic Oil Tank:* 130 lt

HYDRAULIC POWER UNIT - HPU-C30

Basic Equipment Datasheet



DESCRIPTION:

Diesel engine driven hydraulic units are essential to generate power for all laying equipment. P.C.S. has availability of different motorization, according to the power needed by a specific outfit to be used. The remote control allows a better and safer operations for the equipment.

TECHNICAL DATA

Dimension:

- *Length:* 2.10 m
- *Width:* 1.15 m
- *Height:* 1.60 m

- *Weight:* 1.350 Kg

Additional Data:

- *Diesel engine max power:* 31 kW at 1500 rpm
- *Engine cooling:* Air cooled
- *Fuel tank:* 100 l
- *Max flow rate:* 75 lpm
- *Max pressure:* 300 bar
- *Hydraulic oil cooler:* Oil/Air
- *Hydraulic Oil Tank:* 180 lt

HYDRAULIC POWER UNIT - HPU-C300

Basic Equipment Datasheet



DESCRIPTION:

Diesel engine driven hydraulic units are essential to generate power for all laying equipment. P.C.S. has availability of different motorization, according to the power needed by a specific outfit to be used. The remote control allows a better and safer operations for the equipment.

TECHNICAL DATA

Dimension:

- *Length:* 6.00 m
- *Width:* 2.43 m
- *Height:* 2.60 m

- *Weight:* 9.000 Kg

Additional Data:

- *Diesel engine max power:* 315 kW at 2100 rpm
- *Engine cooling:* Liquid cooled
- *Fuel tank:* 300 l
- *Max flow rate*
 - 2x260 lpm at 2000 rpm
 - 1x165 lpm at 2000 rpm

- *Max pressure:* 300 bar
- *Hydraulic oil cooler:* Water/Oil
- *Hydraulic Oil Tank:* 1200 lt

CONTAINER WORKSHOP-OFFICE

Basic Equipment Datasheet



DESCRIPTION:

Special Container with particular scaffolding and work-bench equipped for:

- Emergency workshop work
- Tools for subsea Power & FOC cables joints and connections on platform, Chinese fingers, tapes, connectors, etc.
- Accessories & tools for umbilical joints, hydraulic valves, hydraulic hoses, etc.
- Accessories and equipment for pull-in/lay-down with tirlors, hydraulic unit, dynamometers, log-in, clamps, slings, snatch block, etc.
- Electric accessories (standard and explosion-proof), plugs, connections, lighting for night work on platform, etc.
- Marine equipment (shackles, slings, ropes, marker buoys, swivel, clamps, etc.)
- Spare parts and material
- Various check instrument
- Office arrangements with AC supply, laptop and printers

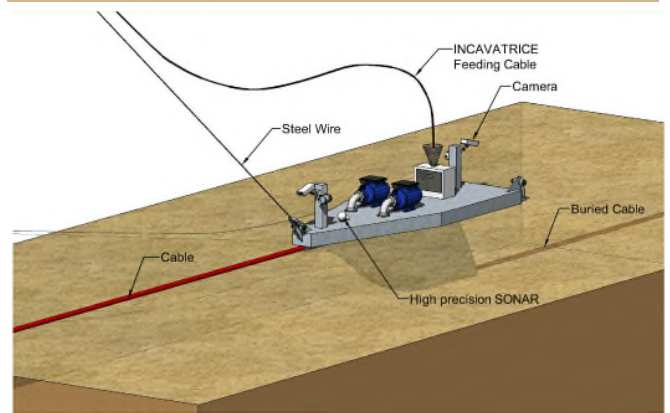
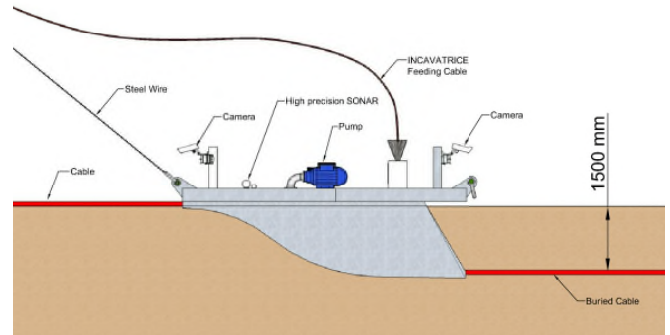
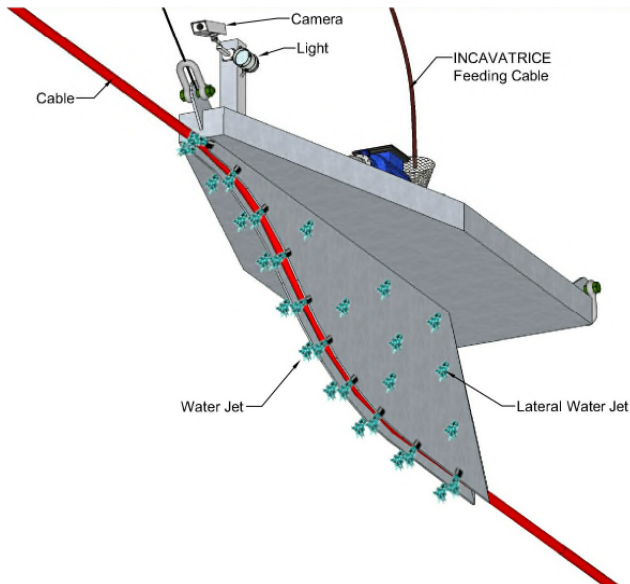
TECHNICAL DATA

Dimension:

- *Length:* 6.06 m
- *Width:* 2.44 m
- *Height:* 2.59 m

- *Weight:* 7,5 tons

INCAVATRICE MOD. FS1 - STANDARD - JET BASIC EQUIPMENT DATASHEET



DESCRIPTION:

The "INCAVATRICE Mod. FS1-Jet" has been designed to work on cables diameter up to 150 mm in sub soil with hardness less up to 50 kPa.

Mod. FS1-Jet works emulsifying the subsoil by means of water-jet coming from provided nozzles and pushing down the cable along its routing to the defined burial depth

TECHNICAL DATA

Dimension:

- Length: 6.50 m
- Nucleus Width: 0.20 m
- Outer Width with flaps: 2.50 m
- Underwater Weight: 8 tons

Additional Data:

- Max soil hardness 40.0 kPa
- Max burial depth 1.5 m
- Max operating depth: 100.0 m
- Max burial speed: 500.0 m/h
- Max pulling during burial 5.0 T
- Minimum Bending Radius: 3.0 m
- Elbows radius (loops): 50.0 m
- Length of subsea umbilical 600.0 m

“MANINA” - SPECIAL REMOTE CUTTING TOOL

Basic Equipment Datasheet



DESCRIPTION:

The special remote cutting tool has been purposely studied and manufactured by PCS to help operation of underwater cable cut thus avoiding the need of divers operation.

This tool allow a safe and precise cut of the submarine cables and consequent lifting to the vessel for the jointing operation.

All activities are remotely controlled and therefore the risk for divers is greatly reduced. A specific hydraulic unit and umbilical allow a safe and reliable operation in any condition.

TECHNICAL DATA

Dimension:

- *Length:* 2.0 m
- *Width:* 1.2 m
- *Height:* 1.4 m

- *Weight:* 550 Kg

Additional Data:

- Working pressure: 250 bar
- Max admissible water depth: 100 m
- Max cable diameter for cut: 180 mm

“MANINA” - Hydraulic Power Unit HPU - C7 MAN

Basic Equipment Datasheet



DESCRIPTION:

Electrically driven hydraulic power units are essential to generate power for all laying equipment. P.C.S. has availability of different motorizations, according to the power needed by a specific outfit to be used. The remote control allows a better and safer operation for the equipment.

Hydraulic Power Unit HPU - C7 MAN normally is used with PCS “MANINA” Special remote cutting tool.

TECHNICAL DATA

Dimension:

- *Length:* 2.00 m
- *Width:* 0.65 m
- *Height:* 1.60 m

- *Weight:* 600 Kg

Additional Data:

- *Required power supply:* 415/440V 3ph 50/60 Hz
- *Electric motor power:* 7.5 kW
- *Full load current:* 16 A
- *Max flow rate*
 - 26 l/min - 50Hz
 - 31 l/min - 60Hz
- *Max pressure:* 250 bar
- *Hydraulic oil cooler:* oil/air
- *Oil Tank:* 100 lt

MOBILE LABORATORY for MV and FO cables jointing operations Basic Equipment Datasheet



DESCRIPTION:

Our mobile laboratory is always mobilised for jointing operations on Medium Voltage and Fibre Optic cables jointing. Inside the laboratory the ambient temperature is kept under continuous control by a special equipment to avoid extreme conditions that may affect jointing operations on submarine cables.

The laboratory has been designed and manufactured by PCS in order to receive cables to be jointed without modifying the internal conditions allowing anyway an easy opening in case of cables emergency abandonment.

TECHNICAL DATA

Dimension:

- *Length:* 5.80 m
- *Width:* 2.20 m
- *Height:* 2.30 m

- *Weight:* 1.47 tons

POWER GENERATOR - PERIN 7000S

Basic Equipment Datasheet



DESCRIPTION:

PCS equipment are feeded by Hydraulic Unit. It is also available Power Generator suitable to produce from 6 to 250 kW.

The Power Generator PERIN 7000S is equipped with DEUTZ engine type TCD 2013 L06-4v N 10738208.

TECHNICAL DATA

Dimension:

- *Length:* 4.40 m
- *Width:* 1.70 m
- *Height:* 2.24 m

- *Weight:* 4,0 tons

Additional Data:

- *Nominal power PRP:* 250 kVA
- *Nominal Voltage:* 400 V
- *Frequency:* 50 Hz
- *Sound pressure at 7m:* 70 dB
- *Fuel Capacity:* 460 lt Diesel
- *Main Thermal magnetic switch:* ABB Tmax T5 N 400 R400

MEGOHMETER



DESCRIPTION:

PPCS has availability of several equipment for check and testing on power and optical cables. Such equipment are used both after installation and during laying operations. Applying this control instruments, PCS guarantee the cable proper functioning and the accurate job execution.

Megger is a not ageing test of the cable; such equipment verify the cable insulation. The PCS megohmmeters are portable units, fitted into a rugged construction site casing with cover, operating on battery and on AC current. The test with Megger has to be done before start up, lay down, after each pull-in and from switch box to switch box.

TECHNICAL DATA

Models:

N. 4 C.A.6547 "CHAUVIN ARNOUX"

Insulation measurements:

- ✓ 500V – 2TΩ
- ✓ 1000V – 4TΩ
- ✓ 2500V – 10TΩ
- ✓ 5000V – 10TΩ

OTDR - Optical time-domain reflectometer

Basic Equipment Datasheet



DESCRIPTION:

PCS has availability of several equipment for check and testing on power and optical cables. Such equipment are used both after installation and during laying operations. Applying this control instruments, PCS grants the proper cable functioning and the accurate job execution.

An optical time-domain reflectometer (OTDR) is an optoelectronic instrument used to characterize an optical fiber and to provide the suitable information concerning fibre length and dispersion values that shall be respected. An OTDR is the optical equivalent of an electronic time domain reflectometer.

Test procedure for non-destructive testing of optical fiber cable has to be made prior to start-up / laydown, after each pull-in and for system testing after connections – junction box to junction box.

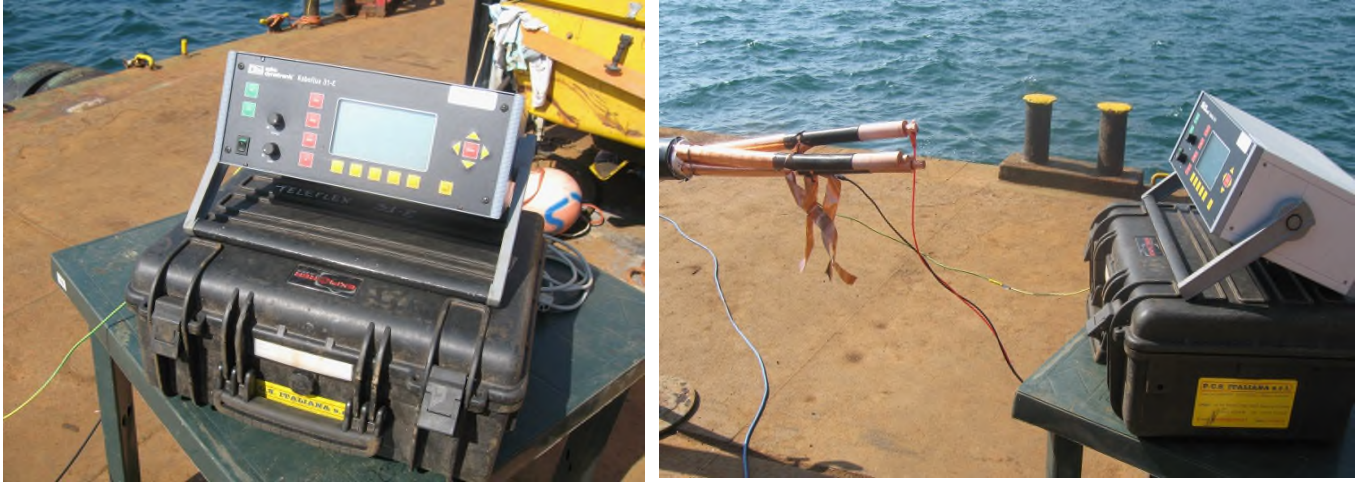
TECHNICAL DATA

Models:

n.2 type OF-500 "FLUKE" - 60km

n.1 type OFM-100 "FLUKE" - 100km

TDR - TELEFLEX



DESCRIPTION:

PCS has availability of several equipment for check and testing on power and optical cables. Such equipment are used both after installation and during laying operations.

Applying this control instruments, PCS guarantee the cable proper functioning and the accurate job execution.

Teleflex is a not ageing test of the cable; such equipment verify the length and integrity of the power cable.

The test with Teleflex has to be done before the start up, every shift change (during laying) in absence of rain, at laying completion, after each pull-in and from switch box to switch box.

TECHNICAL DATA

Models:

N. 1	Interflex 130 "Intereng"	55 Km
N. 1	T01/4 "Seba KTM"	20 Km
N. 1	T30-E "Seba KTM"	100 Km

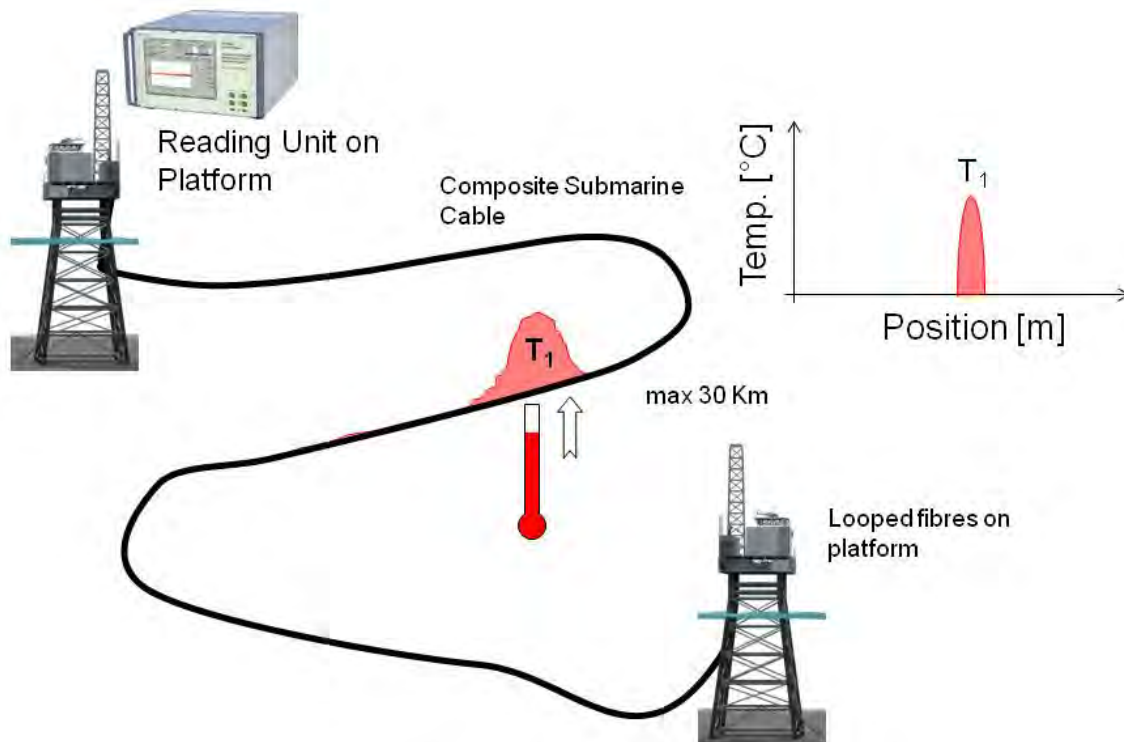
Δ -TEST

Δ -TEST instrument is owned by PCS and it is used for check of stress and temperature variation into cables working on the optical fibre elements.



The instrument works by monitoring into the fibre (at defined intervals to be properly set prior to the start of monitoring) the temperature value inside the cable. This value is recorded by an algorithm that calculates the frequency inside the cable which then revert this data into a temperature value.

As the cable has specified working temperatures to be kept according to the load applied to the cable itself, the temperature monitoring can give a good idea about cable working conditions at the time of the monitoring.



The value recorded by the instrument can be affected by the strain inside the fibre in the event of a mechanical stress applied on the fibre itself (as in this case due to the anchor dragging on the cable).

For this reason into the provided readings has been considered a 15% of strain effect which has been used to cool the temperature readings directly revealed on the cable.

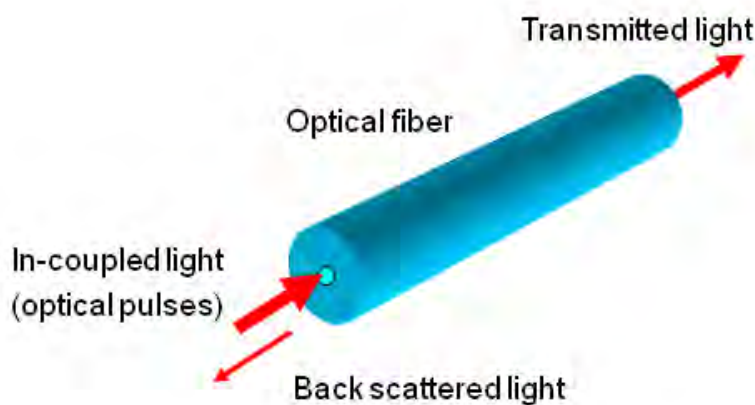
The incidence of the strain effect can be turned in the event that variation in power load can be directly monitored in order to verify directly the temperature variation according to the load changement.

Cable temperature is one of the basic information to understand how the system is working and PCS on-line temperature & stress monitoring system provides an enhanced safety of the distribution network and an immediate localization of any anomaly in cable.

This system is applicable to any existing and new cable/umbilical with inner optical single mode fibre and monitoring can be carried out in complete safety avoiding production shut down.

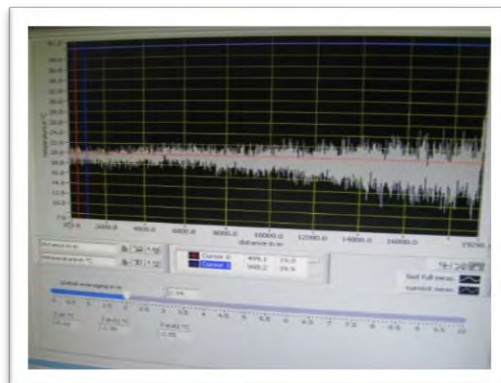
The system works on the principle of reflectometry technique to evaluate the backscattered frequency signal sent into an optic fibre loop.

Such frequency values are transformed into temperature and stress results that are evaluated by PCS technicians and software to provide the stress value in fibre and define the ΔT (Delta Temperature) variation that can confirm or assess the cable conditions.



The process of monitoring a composite cable takes advantage of the fact that the optical fibre is in close contact with the cores thus the temperature monitoring is much easier as external factors have less impact on readings.

According to the engineering cable data provided by Customers and the actual value related to the cable in service, the operating temperature can be assumed, following the definitions provided in IEC 287 standard.



Δ-TEMP

PCS, thanks to its extensive capabilities and know-how on installation of submarine cables, has implemented an innovative instrument and software solution to evaluate cable temperature on composite submarine cables by means of the optical fibre element running into the cable formation: Δ-TEMP instrument.



MONITORING SYSTEM AND DAMAGE LOCATION

The process of monitoring a composite cable takes advantage of the fact that the optical fibre is in close contact with the cores thus the temperature monitoring is much easier as external factors less impact on the readings. According to the engineering cable data provided by Customers and the actual value related to the cable in service, it can be assumed the cable temperature, following the definitions provided in IEC 287 standard.

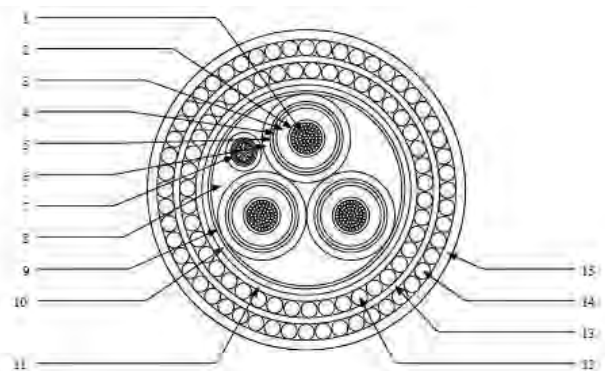
Considering the heat developed by each of the three cores wrapped with optical element and enclosed within binder or inner sheath, the cable temperature is slightly higher than the working conductor temperature.

It has to be considered that conductors insulation does not work as thermal insulation but as electric insulation and it has a normal working temperature of 90° C that has to be maintained not to damage the dielectric capabilities of the material and consequently the cable.

15 kV 133% I.L., 70 sq mm three-core EPR composite cable
 Water-blocked compacted circular Cu
 Cu tape screen separate PE jacket with fillers, anti-teredo
 PP String bedding, galvanized steel double wire armor, PP string serving

Description

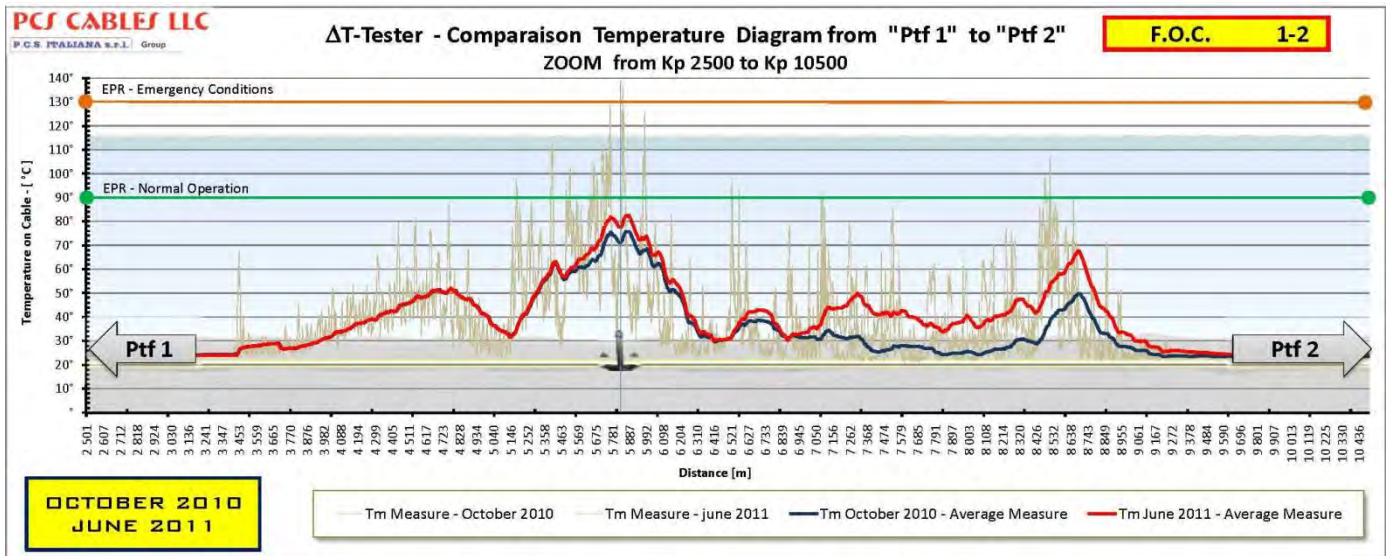
- | | | | |
|----|---------------|----|------------------|
| 1 | Conductor | 2 | Conductor screen |
| 3 | Insulation | 4 | Core screen |
| 5 | Tape screen | 6 | Core jacket |
| 7 | Optical unit | 8 | Fillers |
| 9 | Binder tape | 10 | Anti-teredo |
| 11 | Armor bedding | 12 | Armor |
| 13 | Separator | 14 | Armor |
| 15 | Serving | | |



According to a previous monitoring, a “t” temperature will be identified in reason of the cable characteristics, available data of power load and any external factor that may impact on the frequency readings (i.e. ambient temperature, water temperature, etc.). This “t” reading will be kept as reference .

By additional scheduled readings, the reference “t” value can be adjusted according to variations in power load that modify the cable conductor temperature or to variation of the ambient values that may partially affect the cable temperature variation.

Matching the different results deducted from the external affecting factors (such as power load and ambient temperature), the readings results will be tuned to the “t” reference in order to verify the ΔT that clears if any modification in actual cable temperature has incurred.

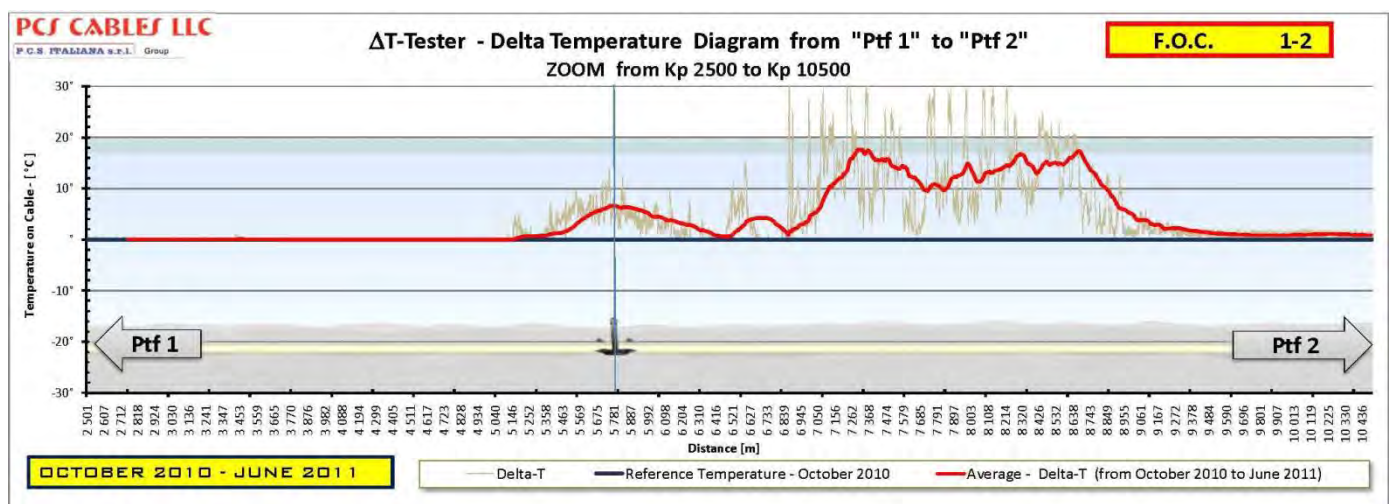


The ΔT increase warns about the insulation that is less capable to dissipate conductor heat due to intrinsic causes like a reduced thickness due to extreme ageing or external causes like an anchor damage.

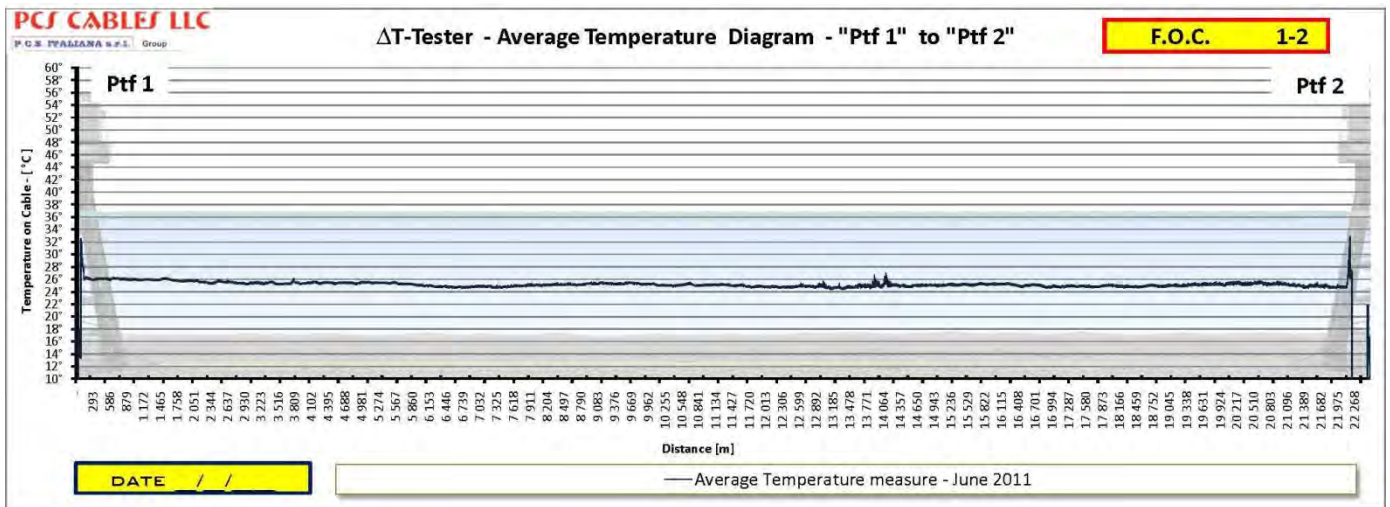
In consideration of normal cable design and IEC 228 standard, the maximum conductor temperature for continuous load is 90°C.

In the event that a composite cable is working at its full load, the cable temperature would be around 90° as ambient water temperature will mitigate the “oven” heating factor keeping the cable temperature very close to the conductor temperature.

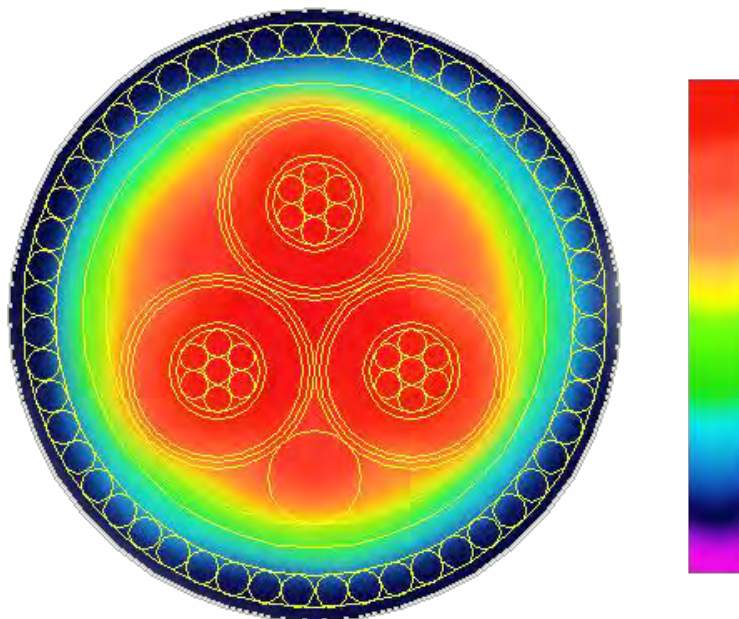
Following the load information and relevant temperature of the conductor, the results of the frequency/temperature monitoring can identify if any unpredictable increase of temperature are present in the cable and by means of several readings, evaluate the amplitude of the ΔT variation.



The system detects and monitor the temperature in the working cable and if no external factors are affecting the cable, the reading values will confirm the working temperature within the range of the international standards. This information can be useful to understand if there is availability for a power increase in cable and anyway to be kept as reference value to verify the system situation in further readings campaign.



EXAMPLE OF TEMPERATURE INSIDE CABLE



Considering the heat developed by each of the three cores wrapped with optical element and enclosed within binder or inner sheath, cable temperature is slightly higher than working conductor temperature.

It has to be considered that conductors insulation work as electric insulation not as thermal and it has 90° C normal working temperature shall be maintained to prevent dielectric degradation of the insulation material and consequent cable fault.

HVA28

Ultra-compact and universal VLF High Voltage Test Set

The b2 electronic GmbH high voltage testing **HVA28** offers outstanding features in terms of size, weight, ruggedness, safety and ease of use. Testing of medium voltage cables, rotating machines and transformers was never that easy.

Short Facts

- VLF and DC Output
- Sheath Test
- Sheath Fault Location
- Vacuum Bottle Test



14kg

10 μ F

IP67

DDD[®]



USB
Bluetooth



Colour
Display
4.3"

Features

- Output voltage 28kV_{peak}, 20kV_{rms}
- Pure sinusoidal output voltage (load-independent)
- Output current 20mA max.
- Highest test capacity of 10 μ F
- Ultra light and compact weight (14kg)
- Total protection – unbreakable, watertight, dustproof, chemical resistant and corrosion proof case
- Protection class IP67 (with closed lid)
- Unlimited and continuous duty cycle
- Large Colour display (4,3")
- Cable testing according: CENELEC HD 620/621, IEEE 400.2-2004, IEEE 400-2001, etc.
- Programmable test sequences
- USB and Bluetooth connections
- Upgradable with partial discharge diagnostic system (optional)
- Upgradable with tan delta diagnostics
- Integrated 12kV transient protection (50Hz)
- Dual Discharge Device (DDD[®]), both integrated and automatic discharge devices
- Easy exchangeable HV cable
- Intuitive menu operation
- Sheath Test
- Sheath Fault Locating (in combination with Earth Fault Locator)
- Vacuum Bottle Test

HVA28

Type		HVA28
Article number		SH0219
Input Voltage		100 – 240 V 50/60 Hz /400 (VA)
Output Voltage	Sinusoidal	0 – 28 kV peak, 20 kV rms
	DC	± 0 – 28 kV
	Squarewave	0 - 28 kV
	Accuracy	± 1%
	Resolution	0.1 kV
Output Current		0 – 20 mA (Resolution 1 µA) Accuracy: ±1%
Resistance Range		0.1 MΩ...5 GΩ
Output Frequency		0.01 ... 0.1 Hz in steps of 0.01 Hz (default 0.1 Hz) - auto frequency
Output Load		0.5 µF @ 0.1 Hz @ 20kV rms 5.0 µF @ 0.01 Hz @ 20 kV rms 10.0 µF maximum Capacitance! ¹
Sheath Test	Max Test Voltage	10 kV
	Trip Current	0.1 mA – 5.0 mA
Sheath Fault Location ²	Max Test Voltage	10 kV
	Pulse/Period	1:3 / 4 s, 1:5 / 4 s, 1:5 / 6 s, 1:9 / 6 s
Output Modes		AC (VLF) Symmetrical and load independent across full range, DC (plus or negative polarity), Burn-/Fault Condition or Fault Trip Mode, Jacket / Sheath Testing
Safety		50Hz 12kV Feedback Protection / Dual Discharge Device (internal)
Memory		50 Test Records Stored
Metering		Voltage and Current (True rms and / or peak), , Capacitance, Resistance, Time, Flashover Voltage
Duty		Continuous! No thermal limitation for operating time.
HV Cable		4 m with Alligator clamps
Software		"HVA Control Center"
Computer interfaces	Bluetooth	standard
	USB	standard
Environmental conditions		Storage: -25°C to +70°C Operating: -5°C to +45°C Humidity: 5-85% non condensing
Dimensions L x W x H		Pell Case 1430, 430 x 240 x 340 mm
Weight		14 kg
Upgrades (Optional)		Partial Discharge System / Tangens Diagnostic System

¹ At lower frequency and voltage

² in combination with locating device (not in scope of supply)

Options

- Tan Delta Diagnostics System
- Partial Discharge Diagnostics System PD30

Scope of delivery

- HVA28 Testing Device
- HV cable 4m
- Power and earthing cable
- Accessory bag
- USB stick
- Operating manual

HVA94

Compact and universal VLF High Voltage Test Set

Large output load capability up to 10 μF^1

The **HVA94 cable tester** by **b2hv** is a portable 0.1 Hz VLF cable test system for the **testing of medium and high voltage cables**.

With its weight of **128 kg** the hipot tester provides an excellent power-to-weight-ratio.

The powerful output is capable of driving **capacitive loads** of up to **10 μF** .

At maximum output voltage cables with a **length** of up to **33 km** can be tested.

- Sinusoidal: **0 – 94 kV** peak, 0 – 66 kV rms
- DC: $\pm 0 - 90$ kV
- Squarewave: 90 kV

The HVA94 cable tester offers various **operating modes**.

Cable testing, cable sheath / jacket testing, sheath fault location, cable fault conditioning (burning), vacuum bottle test.



The following features make the high voltage HVA94 cable tester the **outstanding cable test system** of its class:

- Predefined standard-compliant cable test sequences
- Symmetrical sine wave high voltage
- RMS measurement of output voltage and current
- Measurement of capacitive and resistive load
- Automatic and load dependent frequency selection (0.01 Hz – 0.1 Hz)
- Display of current test time
- Integrated real-time scope function
- Self-explanatory, multilingual software
- Automatic measurement reporting
- Report storage via RS232 (USB optional)
- PC software (HVA Control Center) for data analysis and storage
- Flashover detection and ultra fast switch off
- Flashover voltage measurement
- Time optimized burning mode
- No regular maintenance required

The fully comprehensive **safety features** of the highvoltage cable tester guarantees protection for operator and test instrument.

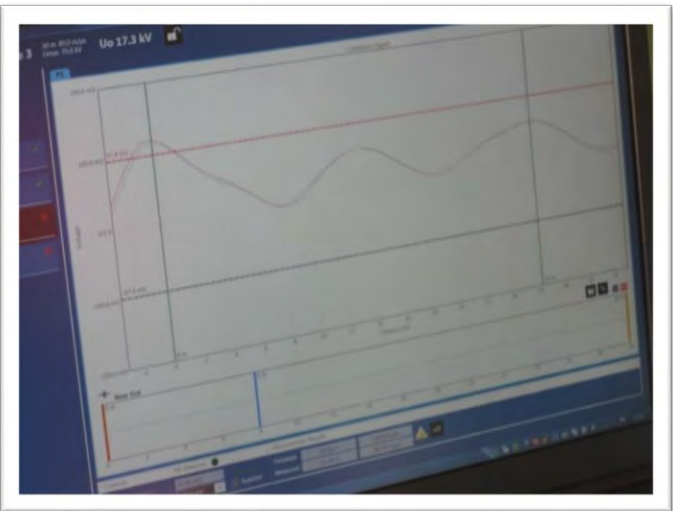
- > Short circuit protected output
- > 12 kV feedback protection
- > Signal lamps for active / inactive high voltage
- > Status display of safety functions
- > Integrated discharge circuit (DDD®) for device under test
- > Main switch with key-lock
- > Emergency-off button on front panel

A SINGLE insulation tester for NUMEROUS applications:

- > Cables: XLPE , PE, EPR, PILC, etc.
- > Capacitors
- > Switchgear
- > Transformers
- > Rotating machines (IEEE 433)
- > Isolators
- > Bushinas

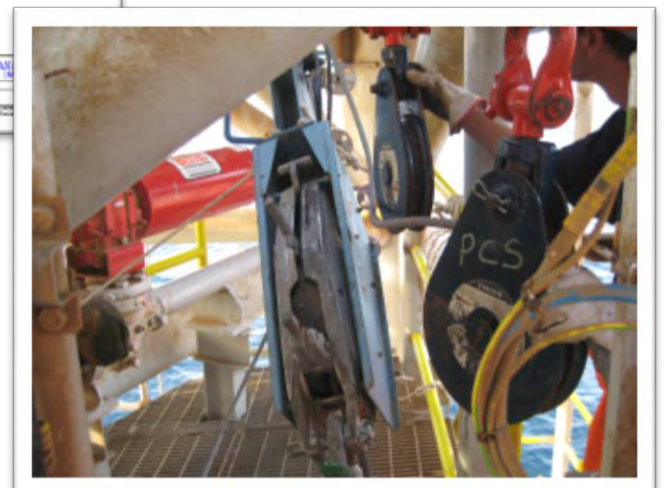
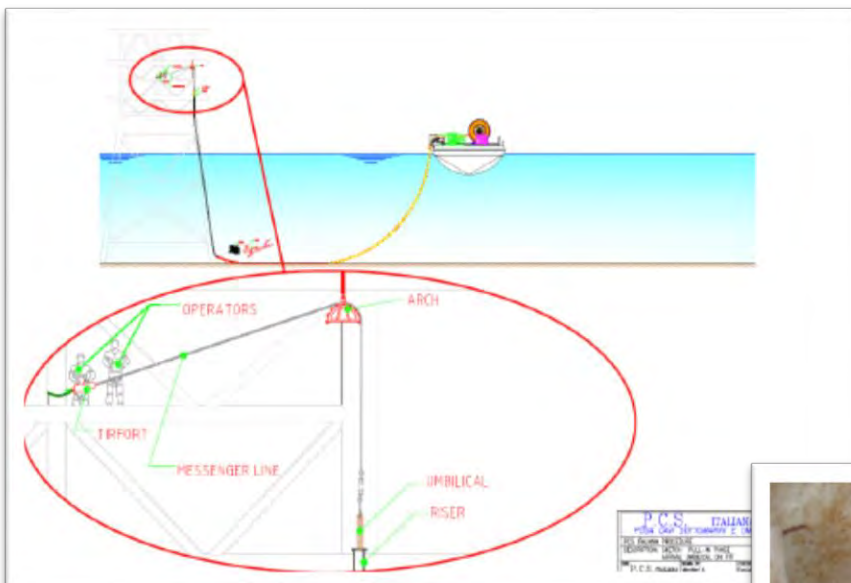
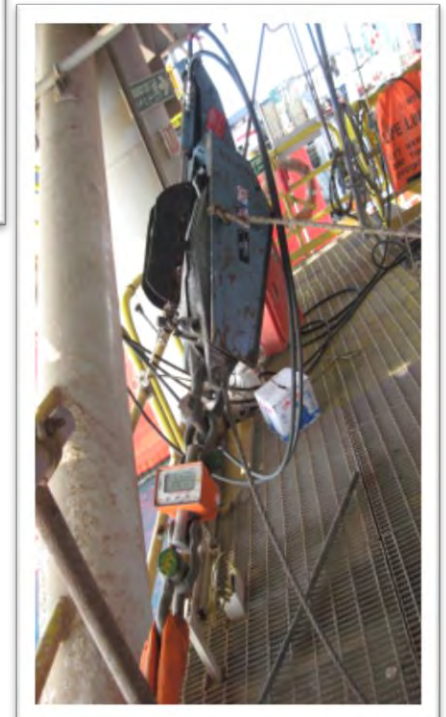
Type	HVA94	
Article number	SH0211	
Input Voltage	210 – 240 V 50/60 Hz (3.0 kVA)	
Output Voltage	Sinusoidal	0 – 94 kV peak, 66 kV rms
	DC	± 0 – 90 kV
	Squarewave	90 kV
	Accuracy	± 1 %
	Resolution	0.1 kV
Output Current	0 – 65 mA (Resolution 1 µA) Accuracy: ± 1 %	
Resistance Range	0.1 MΩ...5 GΩ	
Output Frequency	0.01 ... 0.1 Hz in steps of 0.01 Hz (default 0.1 Hz) – auto frequency selection	
Output Load	0.75 µF @ 0.1 Hz @ 66 kV rms (Approx 2,500 m of cable) ² 1.0 µF @ 0.1 Hz @ 64 kV rms (Approx 3,300 m of cable) ² 1.2 µF @ 0.01 Hz @ 57 kV rms (Approx 4,000 m of cable) ² 10 µF @ 0.01 Hz @ 23 kV rms (Approx 33,000 m of cable) ² 10 µF maximum Capacitance! ¹	
Output Modes	AC (VLF) Symmetrical and load independent across full range, DC (plus or negative polarity), Burn-/ Fault Condition or Fault Trip Mode, Jacket / Sheath Testing	
Safety	50 Hz 12 kV Feedback Protection / Discharge unit	
Memory	50 Test Records Stored	
Metering	Voltage an Current (True rms and / or peak), Capacitance, Resistance, Time, Flashover Voltage	

Duty	Continuous! No thermal limitation for operating time.	
HV Cable	7.5 m with Alligator clamps on end (other options available on request)	
Software	„HVA Control Center“	
Computer interfaces	RS232	•
	USB	Optional
Environmental conditions	Storage: -25°C to + 70°C, Operating: -5°C to + 45°C	
Dimensions L x W x H	650 x 445 x 610 mm (Excl. Carry Handle), also as 19" version available	
Weight	128 kg	
Upgrades (Optional)	Tan Delta TD60, Partial Discharge System PD90	
¹ At lower frequency and voltage ² Based on a typical cable: 300 pF/m		

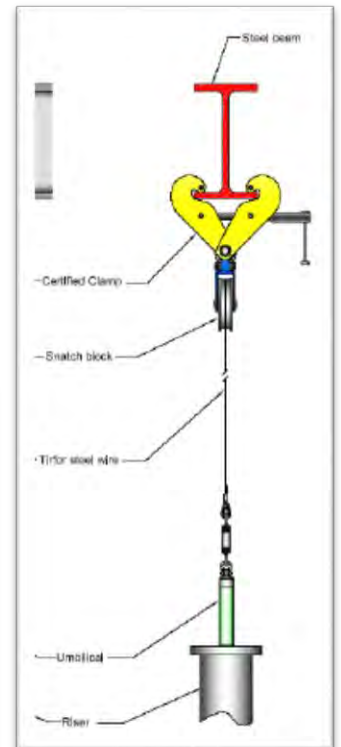
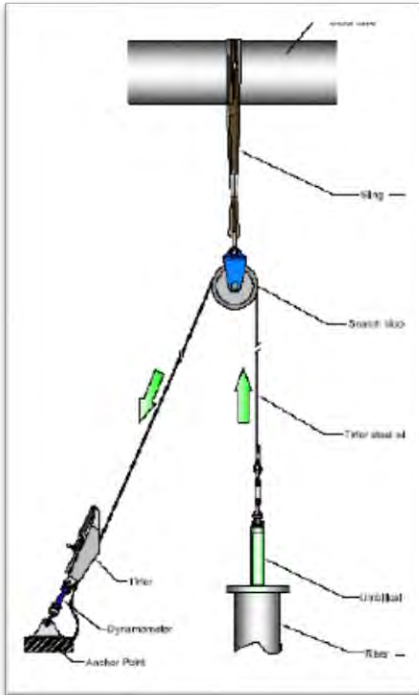


PULL-IN EQUIPMENT

THE PULL-IN EQUIPMENT IS COMPRISING HYDRAULIC TIRFORS UP TO 5T CAPACITY AND MOTORIZED TIROFS UPTO 3200KG CAPACITY, ELECTRO-HYDRAULIC UNIT TO BE CONNECTED TO THE TIRFORS AND IS COMPLETED BY DINAMOMETERS UP TO 50KN TO CHECK CONTINUOUSLY THE PULLING FORCE APPLIED TO THE CABLE DURING THE PULL-IN OPERATIONS.



FURTHERMORE, OUR PULL-IN EQUIPMENT COMPRISES POWER GENERATORS 3-6KW, BASKETS TO TRANSFER THE EQUIPMENT TO PLATFORMS AND ANCILLARIES SUCH AS: SPECIFIC CLAMPS AND STEEL CABLES TO INSTALL THE EQUIPMENT ON PLATFORM.



CABLE PULLING WINCH – ARGANO DI TIRO PER CAVI



Azionato idraulicamente da un motore diesel. Montato su una base carrellata. Indicatore dinamometrico che consente la disinserzione automatica del tiro appena si raggiunge la forza di tiro desiderata. Freno negativo incorporato. Dotato di occhio centrale per il carico e scarico da automezzo.

This hydraulic winch powered by a diesel motor. Mounted on a wheeled base. Complete with pulling force indicator and automatic block fro when the maximum set pulling force is reached. A negative brake blocks the cable everytime the operator releases the commands and a central eyelet makes unloading/loading easy.

Dati tecnici	Technical data	VM 10000 RIS
Forza tiro max	Max pulling force	10.500 kg
Forza tiro continua	Cont. pulling force	10.000 kg
Velocità di tiro	Pulling speed	0-50 m/min
Velocità stesura	Feeding speed	0-50 m/min
Capacità bobina	Drum capacity	1.000 m
Diametro fune	Cable diameter	16 mm
Motore diesel	Diesel motor	Lombardini
Modello	Type	LDW2204
Potenza CV	Horsepower HP	48
Peso senza fune	Weight	2.600 kg
Lunghezza con timone	Length with coupling	3.800 mm
Lunghezza	Length	3.200 mm
Larghezza	Width	1.850 mm
Altezza	Height	1.700 mm



Ø Fune Ø Rope	Lunghezza Length	Carico rottura Breaking strength
16 mm	1000 m	21.300 kg

HLU HYDRAULIC UMBILICAL LABORATORY

Our HLU is a laboratory purposely studied and manufactured by PCS to provide suitable support during umbilical installation activities, for any repair work and emergency contingencies, search and localization of medium/hard type of damages

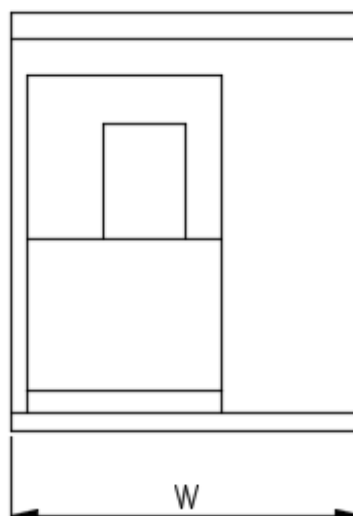
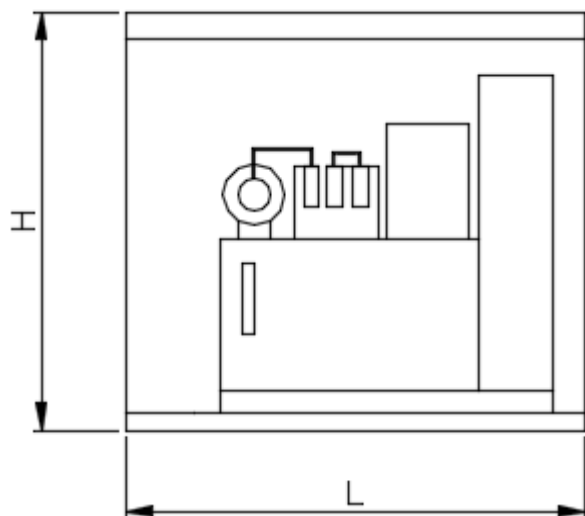
Including the following functions:

- Hydraulic power unit comprising n. 3 independent hydraulic pumps 16 l/min 70 MPa
- Data-log system, to records pressure sets
- System for glycol/transaqua analysis
- Equipment for umbilical temperature monitoring
- Pumping system for pipes/hoses flushing with filtering
- Localization of medium/hard damages.



Dimension:

Length	2,40m
Width	2,00m
Height	2,10m
Weight	1500kg

**Hydraulic system:**

Max pressure	70 MPa
Flow rate	16 lt/min
Tank	1200 lt

Electric system:

Power :	15kW
Supply:	400V/ 50Hz

HLU-W HYDRAULIC UMBILICAL LABOR. WALLED

Our HLU is a “WALLED” laboratory purposely studied and manufactured by PCS to provide suitable support during umbilical installation activities, for any repair work and emergency contingencies, search and localization of medium/hard type of damages

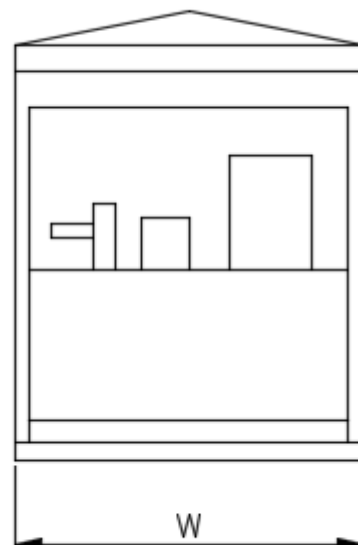
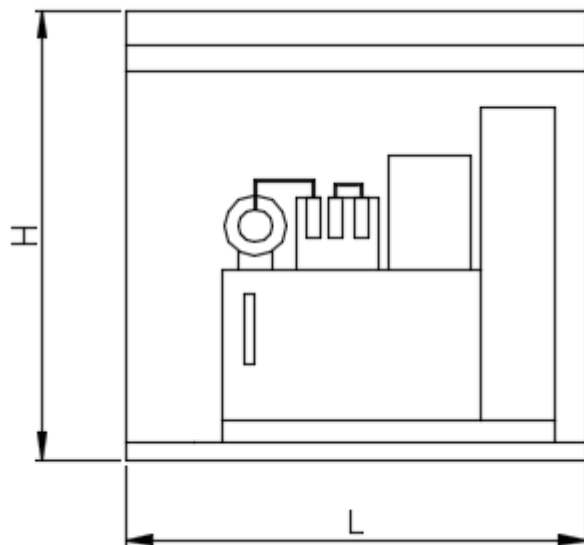
Including the following functions:

- Flowing system for flushing pipes/hoses up to 8lts/min at 350 Bar
- Analysis of glycol/transacqua contamination grade
- Automatic and manual pressure tests till 700 Bar
- 4 contemporaneous tests lines
- Recording and reports of all tests parameters
- Data-log system, to records pressure sets
- Pumping system for pipes/hoses flushing with filtering
- Localization of medium/hard damages.



Dimension:

Length	1,60m
Width	2,20m
Height	2,15m
Weight	1200kg

**Hydraulic system:**

Max pressure	35 MPa
Flow rate	8 lt/min
Tank	500 lt

Electric system:

Power :	15kW
Supply:	400V/ 50Hz