

**SECTION B: TECHNICAL SPECIFICATION**  
**For the spreaders of Rockas STS number 2**

**1. OBJECT OF THE TENDER**

The object of the tender is the procurement of one (1) electro-hydraulic telescopic devices (single spreaders) and their installation and commissioning on two PANAMAX STS cranes, at the Container Terminal of Thessaloniki Port, with a lifting capacity of 45 tons at the twist locks of the device with the capability to handle  $\pm 10\%$  eccentric load along the longitudinal and traverse axis of a 40-ft container.

Each spreader will be fully compatible with the electrical and electronic systems (power and automation) of the STS Crane #2 and the Supplier will be responsible for connecting and putting the spreaders into normal operation. For this reason, the bidder must obtain all the required technical information in order to submit a complete technical proposal.

The spreaders will be secured with pins to the existing head blocks, which are permanently suspended by wire ropes and will be fully compatible with the existing power and control systems.

**2. Requirements**

The spreaders shall meet the following minimum requirements:

- They will be heavy-duty, manufactured according to:
  - (a) DIN 15018 class H2B4 or EN equivalent
  - (b) FEM regulations for this application. The offer should include:
    - Class of utilization - U6
    - Spectrum class of loading - Q3
    - Group classification - A7
- They will be of modern technology, made of steel and of high quality and durability materials, particularly where the most severe stresses occur. They will be new and not used, without flaws or defects and capable of operating at full load in unfavorable weather conditions of rain, wind, humidity. The whole structure should be designed for high reliability, long service life and working in a close to the sea environment.
- They will be of the telescopic type and must be capable of lifting ISO containers of 1x20, 1x40, 1x45 feet. The design must be such as to facilitate handling of vessel hatch-covers. They should also be equipped with four (4) hooks or lugs at the corners for 10 tons each which will be used to lift heavy loads or containers with damaged corner castings.

- They will be equipped with the appropriate sockets for power supply and fast connectors for the control circuits. The power or control plug of the cable of the corresponding crane will be connected to these.

- The spreaders will be controlled from the operator's cabin where indications of the twist locks (locked – unlocked) and of the spreader position (properly landed, ready to lock the keys) will be available.
- All electrical and mechanical equipment should be well protected, so that there is maximum protection against possible damage, and installed in such a way as to facilitate inspection and maintenance.
- The CE marking and the actual lifting capacity (SWL) will be indelibly marked on the devices.

### **3. Communication protocol**

Communication between the spreader and the crane should be done either with a commercially available 2 or 4 wire open system, included in the signal and power cable or with direct signals as it is today. Closed "black box systems" will not be accepted. Note that the central PLC of crane has limited communication with the spreader. The spreader must be able to operate without any changes to the existing PLC program.

### **4. Metal construction**

Each Spreader will be constructed in accordance with DIN and FEM regulations. The construction will be such that the maximum lifting capacity is achieved with a minimum of construction own weight, which must be specified in the offer in kg.

Each spreader should be designed in such a way so that each component can be easily accessible in order to facilitate maintenance and repairs. All components must be manufactured and installed in such a way that they can be easily mounted, dismantled, adjusted, monitored and maintained.

The construction fatigue study will be based on 1,000,000 service cycles.

Each spreader consists of the fixed and the telescopically moving part.

Vibration damping components must be installed at the points where the chain (or belt) is attached to the telescopic beams, in order to cushion (absorb) the blows that the spreader receives.

Special provision should exist to reduce friction between the contact surfaces of the fixed and telescopic parts.

Telescoping of the spreader will be controlled by limit switches. Additionally, safety devices should ensure that the spreader remains in the selected telescope size.

Each spreader will be equipped with suitable lifting lugs at its four corners, which will be used to lift with wire ropes either over height containers or containers with damaged corner castings. The lifting capacity of each lug will be 10 tons.

It is clarified that on these gantry cranes the load suspension wire ropes go through a system of four pulleys, mounted on the four-spreader corners. The axes of said pulleys are parallel to the longitudinal axis of the spreader and the longitudinal distance between them is 4,900 +/- 5 mm while the traverse distance is 750 +/- 1 mm. Therefore, for the offered spreaders, the axles of their pulleys should be aligned with the longitudinal axis and comply with the aforementioned distances. In any case, the offered spreaders should be perfectly compatible with the existing pulley systems on the cranes.

### **5. Lifting capacity of the spreaders**

The lifting capacity of the spreaders should be:

Single Lift: At least 1 x 45 tons, with a uniform distribution of the load

The lifting capacity of the spreader at the twist locks with a load eccentricity of  $\pm 10\%$  along the longitudinal and traverse axis of the container, should be 45 metric tons.

The own weight of each spreader should be specified in the bid.

### **6. Spreader telescope system**

The telescopic system should be robust, of low own weight, able to stop accurately by electrically operated stoppers in all sizes (20, 40 & 45 feet), easy to maintain and with long service life. The extension time from 20' to 40' should be given and should be less than 30 seconds.

It is desirable that the telescope motion is driven either by chain or by belt. A mechanical medium (e.g. high strength plastic material) should assist the extension or retraction of the beams from 20' to 40'. The chain motion should be implemented with a gearbox and cog system (sprocket). The bid must include a detailed description of the telescope system operation.

The extension-retraction of the spreader will be controlled by limit switches. Additionally, safety devices should ensure that the spreader remains in the selected telescope size.

### **7. Twist locks**

Each spreader will be equipped with four twist locks, according to ISO standard, one for each corner, for single lift operation, which will be controlled from the operator's cabin. The twist locks shall be of the universal type with a floating system mounting. They will also be equipped with robust industrial inductive switches able to

withstand high impact loads which will indicate their position (locked-unlocked). The tolerance of the floating system in all directions should be given in mm and rotation time (0-90°) in seconds. The spreader should be equipped with electric and mechanical interlocks independent of the containers to prevent accidental rotation of the twist locks.

The mechanical interlocking will be part of the nut of the rotating element. These interlocks must prevent the operator from unlocking a lifted container or the hoisting operation, until the twist locks are locked or unlocked. The use of the rotating part of the twist lock by itself with the corner casting of the container as the mechanical interlock is not acceptable.

Each twist lock must be certified for load greater than 35 tons. Twist lock operation to attach the spreader to the container will be done with an electrical system controlled from the operator's cabin. Indicators on the spreader will indicate if the twist locks are locked, unlocked and if the spreader has landed properly on the container.

All twist locks must be uniquely identified by an engraved number which will be visible without having to remove the twist lock from the spreader. Also, the twist locks should be able to operate for at least 200,000 moves. The number of moves should be extendable after the twist locks have been inspected for cracks.

It should be possible to manually unlock the twist locks without power supply, especially when the spreader is on a container within the vessel. The bid should include a detailed description and specify the locking time of the twist locks.

## **8. Vibration damping system**

It is desirable that each spreader is equipped with a shock absorbing and noise reduction system, which must be tested and achieve a significant reduction in impact force (value given in %) and noise (value given in dBA). It may be of mechanical, hydraulic or other equivalent type. The bid should include:

- (a) detailed technical data
- (b) functional characteristics
- (c) detailed drawings
- (d) advantages of the applied method over others

The technical description and data included in the bid, should document the superior quality, the operating efficiency and the ease of maintenance of the offered system.

## **9. Flippers**

The spreaders will be equipped with robust pivoting guides (flippers) arranged at their corners in order to facilitate alignment with the container(s). They will be operated two (2) on the land side or water side.

The following data should be specified in the bid:

- torque of each flipper in Nm (minimum value 5000)
- collection distance of the container in mm
- whether a protection system from impact loads exists
- lifting-lowering time (0-180°) in seconds (maximum value 6)

The flipper system should be designed so that operation in the vessel cells is possible when the flippers are down. The flipper mechanisms must not protrude in order to reduce the probability of being hit when the operator moves the spreader. It will be possible to lift all the flippers with a single button.

#### **10. Electrical system - automation - safety devices**

Each spreader will be fully compatible with the electrical and electronic systems (power and control), under the contractor's sole responsibility for the connection and operation with the STS cranes of the CT/THPA SA.

The power cables will be routed so that they are protected against hits and damages. Wherever possible, they will be installed into galvanized steel pipes of appropriate cross-section. Each electrical component (cables, fittings) will be characterized by a code. The code will be written in indelible characters on a plastic label attached on the cable or fitting. Especially for cables, a label will be attached at both ends. The same code will be used in the drawings in order to facilitate their identification. The cables within the telescopic section will be flexible and chemically resistant to grease and oil.

The technical offer should include full details regarding the electrical part of the spreader, such as voltage, power, cross-sections of cables, etc. as well as the protective devices for safe operation, maintenance and repair. Its function will be based on securely mounted suitable micro-relays. The on-board PLC must be of the closed - industrial type robust and vibration-resistant (the relevant certificate should be provided). The panels must be resistant to strong impact stresses, mounted on anti-vibration pads. Also, the electrical panels (minimum degree of protection IP66) should be installed in a vertical (upright) position to prevent water ingress. The cable glands will be made of metal.

The voltage of the auxiliary electric circuits of the spreader should be specified.

It is desirable to have the possibility to operate the telescope and the twist locks locally on the spreader.

The following interlocks must be implemented for the spreader:

1. The twist locks shall not turn if all four corners of the spreader have not landed on the container
2. The container shall not be lifted if all the twist locks have not been locked
3. The twist locks shall not unlock if the container has been lifted
4. LED indicator lights that will be visible to the operator of the crane, with 3 colors (indicative: Red = Unlocked, Green = Locked, White = Landed).

All sensors of the above interlocks and indications should be of the proximity type (inductive or capacitive).

In addition, they should be connected with plugs (to be easily replaced) and have on-off LED indicators. The electrical panel, cable distributors, hydraulic valves, etc., should be mounted in such a way that makes it impossible for the support bolts to become loose or break.

A special basket where the spreader cable is collected should be a permanently installed on the spreaders (as is the case with the existing ones). The cable collection system should be described in detail. It is mandatory that the baskets on the spreaders are mounted with anti-vibration supports.

The cable and wire marking will be indelible and the numbering will correspond exactly to the as built electrical diagrams.

The design of the electrical systems should be such as to provide satisfactory safety to avoid accidents both during operation and during maintenance or repair. All the details regarding the electric circuits (voltage, power, cable cross-sections, etc.) should be given in the technical offer.

#### **11. Additional Systems (Prices must be stated in the offer)**

1. The spreader optionally shall be equipped with a Twin Twenty Detection System (TTDS), so that, when two containers 20' containers are under the spreader they are not seen as one 40' container and hoisting by the external twist locks is prevented. **(option)**
2. The spreader shall be equipped with a diagnostic system of the manufacturing company with industrial color display with shock certification, which will show the problems in the operation of the spreader with operation and fault indications in the various subsystems of the spreader. This system will include the operating parameter values, the values of all the sensors and allow the technical personnel to operate the spreader from this diagnostic system when trouble-shooting faults. All the details regarding this system should be provided in the technical offer. **(option)**
3. The spreader shall be equipped with a non-resettable counter for each twist lock. **(option)**

#### **12. Paint Preparation and painting**

The painting of the spreaders must be suitable for marine environment and will be executed after preheating the surfaces to remove oils, moisture, dirt which will then be sandblasted SA 2 ½ according to European standards or newer, which should be specified in the offer. Then, immediately and without delay, the Primer layers should be applied. The final Paint should ensure the protection of the spreaders in the highly corrosive conditions they will be exposed for 10 years of operation at least.

Before the coating, the spreaders will undergo sandblasting SA 2 ½, according to the Swedish Standards 055900, and immediately afterwards they will be painted with a protective two-component EPOXY LINK RICH PRIMER. The paint will be applied in two layers, and the final thickness of dry film should be at least 70µm.

The safe working load (SWL) of the spreader shall be indelibly indicated on both sides.

Finally, the paint will be suitable to protect the spreader from the marine environment.

For all the above, a detailed description of the painting procedure is required (application, quality, thickness, etc. of the paint). The contractor will provide THPA SA with certificates for the paint application from an internationally recognized body. The final color should be consistent with the existing paint color of the cranes in the Container Terminal / THPA, shall be selected by THPA SA and agreed before signing the contract.

### **13. Certificates**

The participants are required to provide a certificate attesting that devices to be delivered are according to DIN 15018 class H2B4, and that the safe working load (SWL) is at least 50 tons (including the twistlocks).

### **14. Documentation**

The spreaders, when delivered, shall be accompanied by the following books and drawings:

1. One (1), for each device, illustrated book of operating instructions intended for the crane operator (OPERATOR'S MANUAL), in Greek.
2. Two (2) illustrated books for inspections, settings, maintenance and repairs (MAINTENANCE and WORKSHOP MANUAL) written in Greek or English. These books shall include an extensive list of possible faults, causes and recovery actions. They should be provided in electronic format also (CD-ROM).
3. Two (2) illustrated books of spare parts (SPARE PARTS BOOK) in Greek or English.
4. Spreader Maintenance Record
5. A complete set of all the construction drawings, which will refer to all the mechanical, electrical, automation and hydraulic circuits, the metal structure, generally to all the mechanisms of each device. The drawings will be delivered in such a form so that they can be easily reproduced. The internal configuration or assembly of

the parts of the spreaders shall be clearly shown in the drawings. The electrical diagrams will refer to both supply voltages (24V & 220V).

The offer must be accompanied by a detailed description of the structure and content of the above books and drawings or an electronic copy similar to those that will be delivered with the spreaders.

## **15. Tools**

The supplier is obliged to deliver for each spreader one set of all the special tools, which may be needed for their maintenance.

## **16. Inspections-Tests**

Upon delivery of the spreaders the following inspections and tests will be carried out in the presence of the contractor:

- Inspection and compliance check of the spreader construction with the contract and the bid of the contractor
- Normal operation tests
- Measurement of the extension-retraction time from 20' to 40' size and vice versa
- Measurement of the rotation time (90°) of the twist locks and of the flippers (0-180°).
- Test of limit switches and safety systems
- Static loading test with a load of 50 metric tons, uniformly distributed
- Static loading test with a load of 45 metric tons, with  $\pm 10\%$  eccentricity in the longitudinal and traverse axis
- Static loading test with a load of 40 metric tons, suspended from the lugs of the spreader.

The test loads will be provided by THPA SA.

- Before inspecting and testing of the spreaders, the contractor - with personnel and own means and being solely responsible - will proceed to their electrical connection to the crane to fully ensure the proper transmission of signals.
- Immediately after the delivery of the spreaders, the contractor is required to provide for at least three (3) days experienced personnel who will monitor their operation at the initial stage and will intervene, when necessary, to repair any faults.

During this period the same staff will train the personnel of THPA SA in the operation, maintenance and repair of all the individual systems (safety-electrical-electronic-hydraulic and mechanical).



If the spreaders are equipped with a fault diagnostic system using a PLC, particular emphasis shall be given on training the personnel on this subject.

The training will be done in Greek, and if an interpreter is needed such an expense will be borne by the contractor.

#### **17. Contractor's obligations**

(HSE requirements, work in customs controlled area, responsibility for accidents or damages)

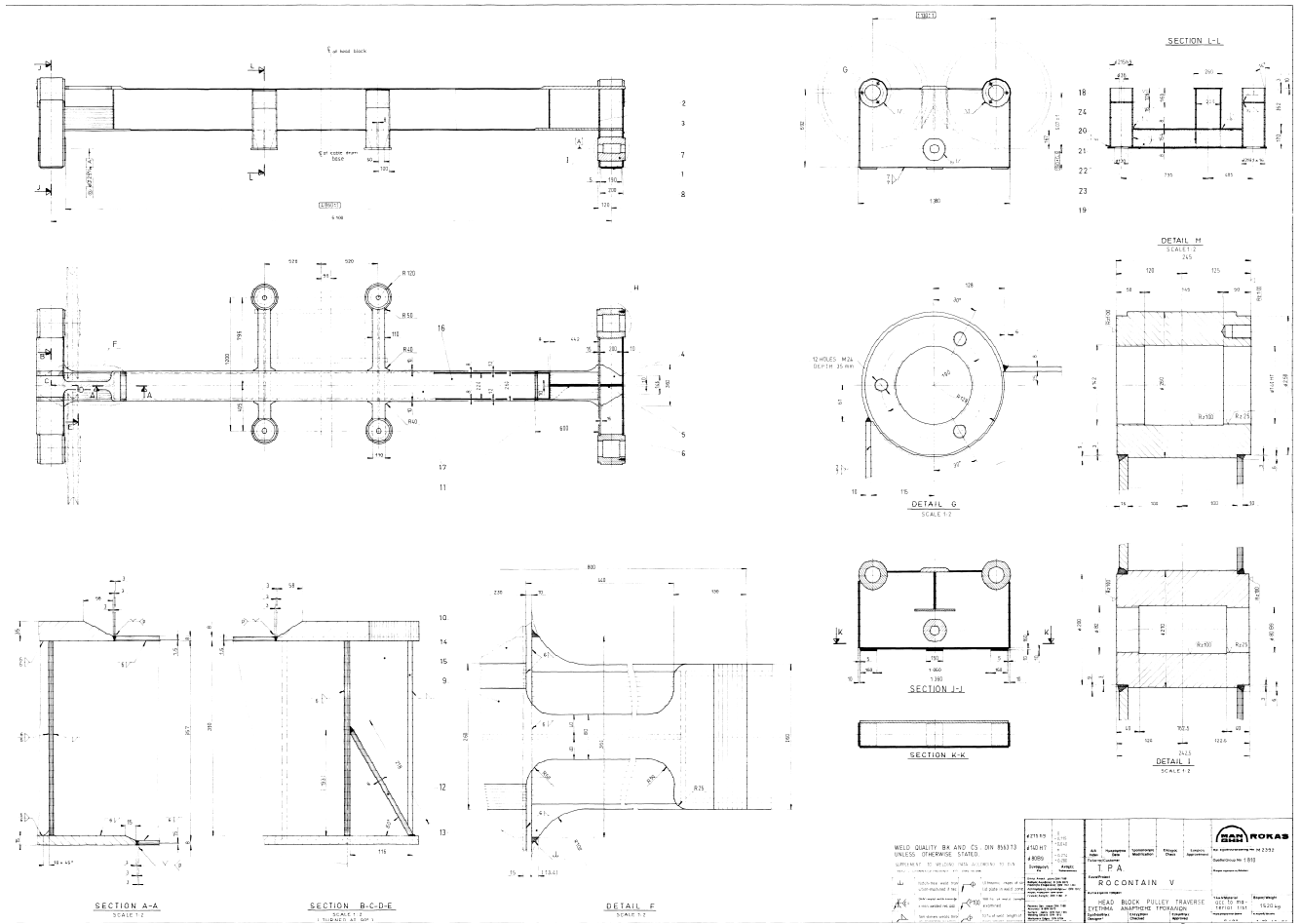
#### **Attachments**

1. Annex I - Table of main technical characteristics
- (2. Annex II - E.E.E.S.)

**ANNEX I  
TABLE of MAIN TECHNICAL CHARACTERISTICS**

DESCRIPTION	MU	MANUFACTURER'S REPLY
Factory - Type		
Spreader own weight	kg	
Spreader lifting capacity with uniform load (SWL)	kg	
Spreader lifting capacity with $\pm 10\%$ eccentric load (40-ft container)	kg	
Spreader lifting capacity with suspension attachments (lugs-hooks)	kg	
Time to telescope from 20 ft. to 40 ft.	s	
Flippers torque / rotation (up-down) time	Nm / s	
Twistlocks rotation time (90°)	s	
Twistlocks type		
Twistlocks mounting type / Micromotion range	mm	
Motor power / Degree of protection	kW / IP	
Pump volume output / pressure	l/min bar	
Oil tank capacity	l	
Electrical panel degree of protection	IP	
Power and control voltage	V	
Accreditation body for CE marking		

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## HEAD BLOCK SCHEMATIC



ΣΥΝΑΕΣΗ ΚΑΛΩΔΙΟΥ ΤΡΟΦΟΔΟΣΙΑΣ SPREINTER  
I/T No 2

α/α	ΚΑΕΜΟΚΙΒΩΤΙΟ +Υ2M2 ΜΗΧ. ΑΝΥΨΩΣΗΣ ΑΡ. ΚΑΕΜΑΣ	ΤΡΟΦΟΔΟΣΙΑ ΑΙΤΟΥΡΓΙΑ	ΚΑΕΜΟΚΙΒΩΤΙΟ SPREINTER ΑΡ. ΚΑΕΜΑΣ	ΑΡ.ΚΑΛΩΔΙΟΥ	
1.	1 - X1	R	L1	1 - 31	
2.	2 - X1	S	L2	2 - 32	
3.	3 - X1	T	L3	3 - 33	
4.	4 - X1	L - 220 V	L	4	
5.	5 - X1	N	N	5	
6.	13 - X1	FLIPPER S5 ↑	41	6	
7.	14 - X1	FLIPPER S5 ↓	42	7	
8.	15 - X1	FLIPPER S6 ↑	43	8	
9.	16 - X1	FLIPPER S6 ↓	44	9	
10.	17 - X1	FLIPPER S7 ↑	45	10	
11.	18 - X1	FLIPPER S7 ↓	46	11	
12.	19 - X1	FLIPPER S8 ↑	47	12	
13.	6 - X1	FLIPPER S8 ↓	48	13	
14.	9 - X1	TWISTLOCKS LOCK	51	14	ΕΝΤΟΛΗ
15.	10 - X1	TWISTLOCKS UNLOCK	52	15	ΕΝΤΟΛΗ
16.	11 - X1	ΑΝΑΠΤΥΞΗ	30	16	ΕΝΤΟΛΗ
17.	12 - X1	ΣΥΜΠΤΗΣΗ	29	17	
18.	3 - X2	ΑΝΤΑΙΑ ΕΝΤΟΛΗ	85	18	
19.	4 - X2	TWISTLOCKS LOCKED ΚΟΚΚΙΝΑ	57	19	ΕΝΑΕΙΣΗ
20.	5 - X2	TWISTLOCKS UNLOCKED ΠΡΑΣΙΝΑ	58	20	ΕΝΑΕΙΣΗ
21.	6 - X2	SPREINTER ON CONT. ΛΕΠΡΑ	36	21	ΕΝΑΕΙΣΗ
22.	7 - X2	20'	80	22	
23.	8 - X2	30'	81	23	
24.	9 - X2	35'	82	24	
25.	10 - X2	40'	83	25	
26.	12 - X2	ΤΡΟΦΟΔΟΣΙΑ 48 V	90	26	
27.	2 - X2	SPREINTER NEAR CONT.	86	27	
28.					
29.					
30.					

**Spreader Cable pinout**