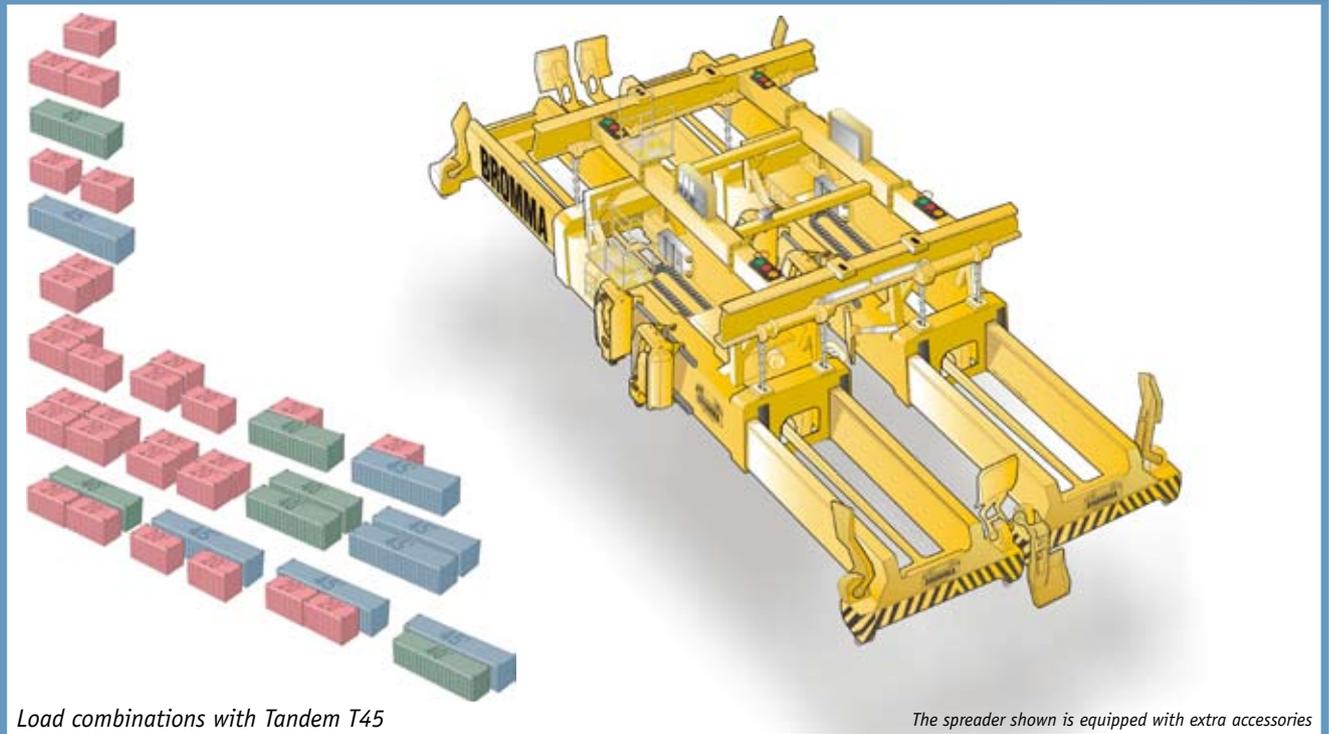


## Tandem™ T45 Separating Twinlift Ship to Shore Spreader



Load combinations with Tandem T45

The spreader shown is equipped with extra accessories

The Bromma Tandem T45 separating spreader offers terminals both the highest level of productivity and the highest level of versatility available today in ship-to-shore container handling.

The Tandem T45 spreader offers dynamic and unmatched loading and unloading capacity. It has the capacity and the flexibility to handle all possible combinations of 20, 40 and 45 foot containers both quickly and efficiently. The spreader will “twin-lift” 20, 40 or 45 foot containers side by side and it can also handle four 20 foot containers simultaneously and separate the two 20 foot containers longitudinally between 0 and 1.6 meters.

This spreader is also based on proven Bromma spreader design, as it uses the Bromma STS45 spreader as its standard base. Except for sufficient lifting capacity, there is no need for a special crane

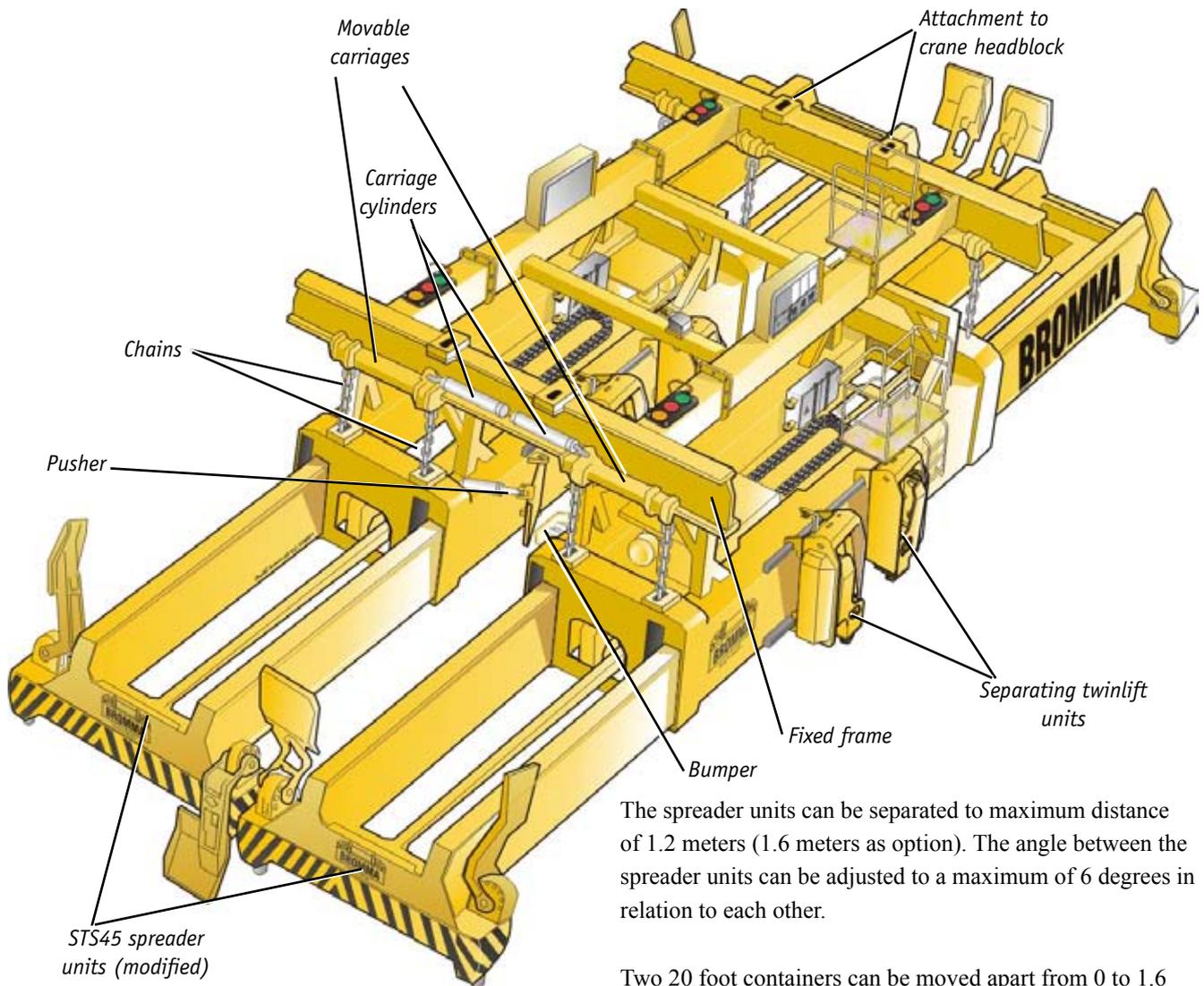
design. The Tandem T45 is able to handle both spreader units at the same time as well as controlling the two spreader units individually.

Made of high quality steel, the Tandem T45 spreader provides high lifting capacity with a low nominal tare weight thanks to the box design of the telescoping beams and the main frame. The spreader is designed in accordance with DIN 15018 H<sub>2</sub>B<sub>4</sub>. All components can be easily assembled, adjusted, removed and are accessible for inspection and maintenance.

The spreader comes with the SCS<sup>2</sup> Spreader Communications System, reducing and preventing downtime through improvements in the area of electrical connections. It will also shorten downtime through faster spreader fault diagnostics.

### MAJOR FEATURES

- Adjustable for all possible combinations of 20', 40' and 45' containers. Two containers, independent of size, can be lifted at the same time (for example one 40' and one 45' container), or four 20' containers
- Two 20' containers can be moved apart from 0 to 1.6 meters (0'-5') under full load
- Recessed end beams allow handling of lashing frames and hatch covers
- Automatic separating and scewing functions
- Chain system allows for lifting containers of different heights (up to 660 mm)
- Advanced communications system reduces downtime considerably
- Fast trouble shooting
- Fulfils design criteria among DIN 15018 H<sub>2</sub>B<sub>4</sub>, FEM 1.001 and British Standard BS 2573

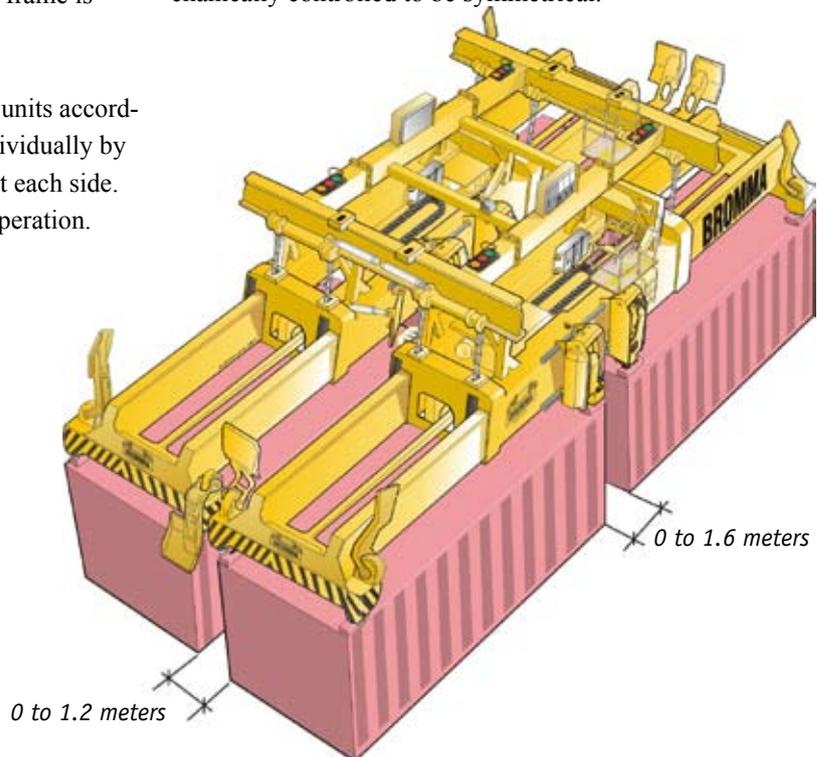


The Tandem T45 consists of two modified STS45 spreader units connected to a common fixed frame via chains and movable carriages. The chains make it possible to adapt the spreaders to containers of different heights. The frame is connected to the crane headblock.

To adjust the position of the individual spreader units according to the frame, the carriages can be moved individually by two hydraulic cylinders with memory function at each side. The cylinders can be synchronized for smooth operation.

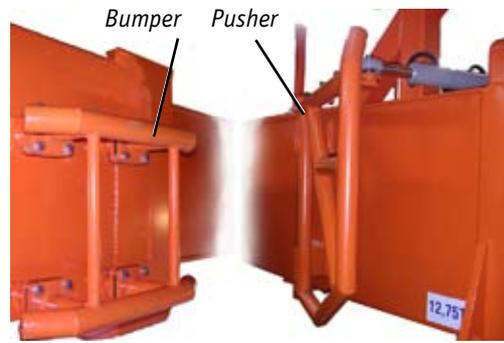
The spreader units can be separated to maximum distance of 1.2 meters (1.6 meters as option). The angle between the spreader units can be adjusted to a maximum of 6 degrees in relation to each other.

Two 20 foot containers can be moved apart from 0 to 1.6 meters under full load. The movement can be done at any time in the crane cycle, which means there is no stopping time to change the container spacing. The movement is mechanically controlled to be symmetrical.

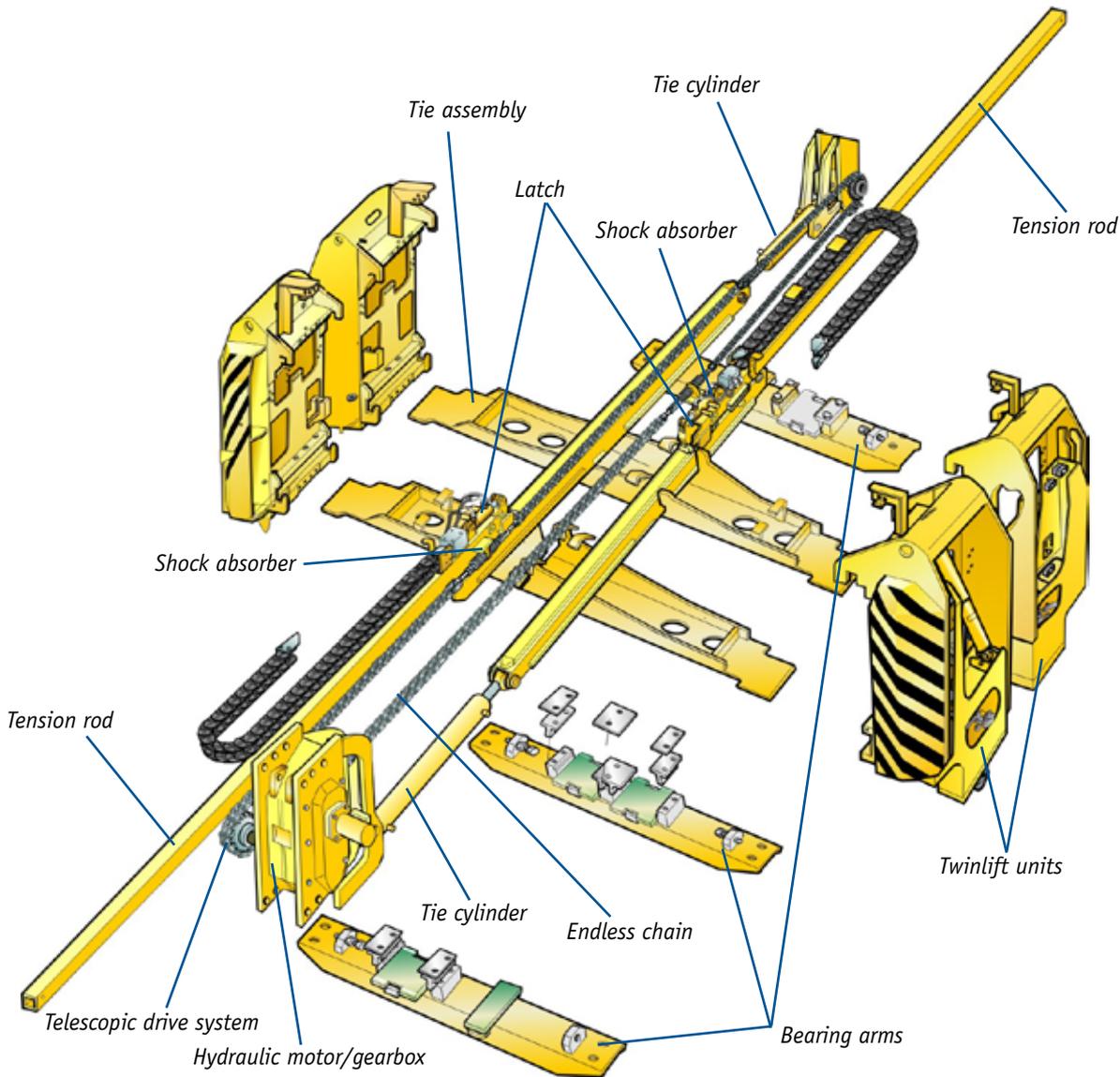


Each spreader unit is also at the inner side equipped with a hydraulically maneuvered pusher and a fixed bumper on the opposing spreader to force the spreaders apart when entering cell guides.

If a Bromma Tandem™ headblock is used the distance between the crane cable sheaves on the crane headblock can also be manually extended to increase balance.



## TELESCOPING SYSTEM



The telescoping system is driven by means of a hydraulic motor and a reduction gearbox connected to an endless chain. The endless chain is fitted with a Bromma design shock absorber at both ends. The shock absorber is designed to dampen the effects of impact on the spreader structure and components due to loads imposed to the spreader ends. The telescopic beams are running on sliding pads.

The telescoping system's ability of absorbing extreme loads mechanically provides the end user with a highly reliable spreader with increased life even under extreme load conditions.

The flexibility in the system allows for changes in spreader length up to  $\pm 15$  mm when handling distorted containers.

This system stops accurately in all positions. It is durable and strong but has low weight, is easy to maintain and has long service intervals. The telescoping positions are controlled by an absolute encoder (or proximity sensors, option) placed on the pedestal bearing.

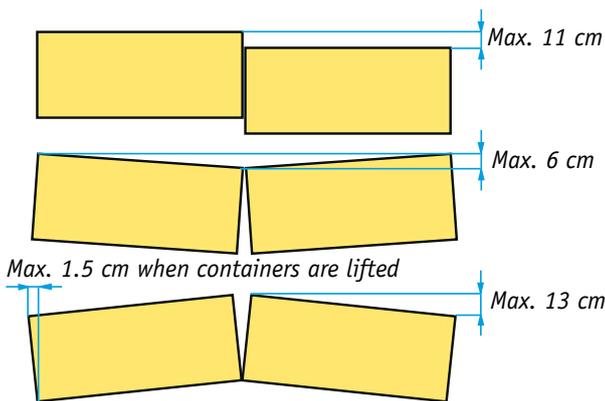
### ADJUSTABLE TWINLIFT SYSTEM

The STS45 separating twinlift spreader has an adjustable twinlift system consisting of a tie assembly, a telescopic drive system and four twinlift units. The twinlift units are sliding along welded rails on the spreader's main frame. The units are in their lower part attached to the ties. The movable twinlift units are held in pairs by the tie and connected to one tension rod each by means of a latch operated by a hydraulic cylinder.

In twin mode, the 20 foot distance between the twistlocks in the end beams and in the twinlift units is fixed for each side as both the tie and the telescopic beam are connected to the same tension rod.

The twin telescoping between 40 and 45 foot is driven by two cylinders, one for each side driving both the telescopic beams and the movable twinlift units.

The twinlift system is designed in such a way that certain irregularities between the two 20 foot containers are accepted as shown below.



### TIE ASSEMBLY

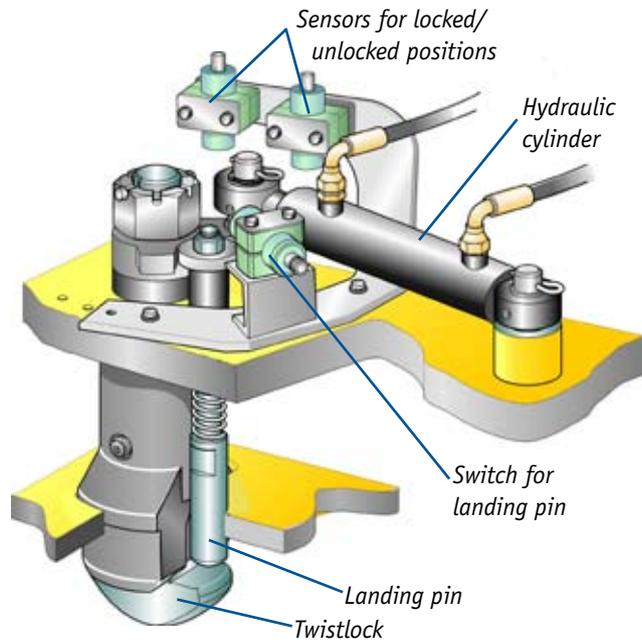
The tie assembly has two ties, two main cylinders and three bearing beams. The short ends of the ties are connected to the cylinders. The bearing beams support the tie assembly, tension rods and main cylinders. The mid part ends of the ties are connected to the twinlift units. When running the cylinders in or out the movements are transferred to the twinlift units.

### TELESCOPIC DRIVE SYSTEM

The telescopic drive system consists of two tension rods, two latches and two latch cylinders. The STS45 is equipped with two telescopic systems: one for twin telescopic mode and one for single telescopic mode. (Twin box up: Single-telescopic mode; Twin box down: Twin-telescopic mode).

In the twin-telescopic mode, when separating or contracting the two 20 foot containers, the movements are handled both by the telescopic system and the tie cylinders.

## TWISTLOCK SYSTEM



The spreader is latched onto containers by means of hydraulically operated floating ISO twistlocks.

Each twistlock is operated with a separate cylinder. Proximity sensors are used for locking, unlocking and landing pin function. The floating range is  $\pm 6$  mm in all directions. Each twistlock will incorporate a mechanical interlock to prohibit unlock operation when under load. The twistlock pins are proof load tested to 37 tonnes.

LED type signal lights are placed on each end of the spreader's main frame (optional), showing the driver when:

- the twistlocks are open,
- the spreader is properly engaged in the corner castings,
- all twistlocks are properly locked in the corner castings,
- the spreader is in twin mode (blue light).

Corresponding signals are provided to the crane cabin.

## FLIPPER ARMS



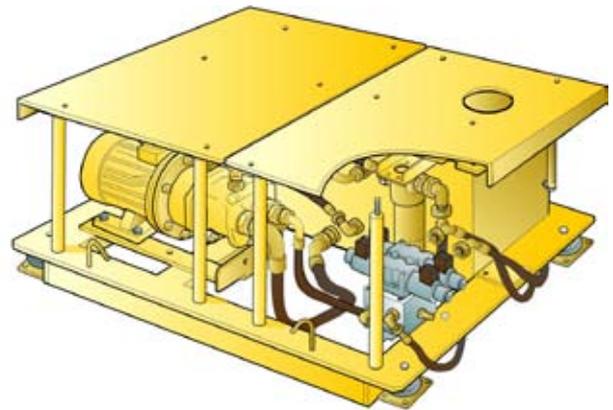
The spreader is equipped with eight powerful flipper arms, two middle flippers and two side flippers on each spreader.

The flippers are driven by actuators, thus providing positive damping to allow efficient gathering onto containers.

The opening torque for each arm is about 6,500 Nm providing a gathering capacity of about 160 mm. The arms are always under pressure and each arm has a shock relief valve. As soon as shock load ends, the arms return to preset position.

The flipper system is designed to give sufficient clearance between any part of the flipper in raised position and the ship's cell.

## HYDRAULIC POWER PACK



Each spreader unit is equipped with a complete hydraulic unit. The unit consists of a tank, a pump, an electrical motor, valves and a filter, altogether shock mounted in a sturdy frame with protection covers. These units serve, besides the movements on each spreader, also the movements of the carriage cylinders on each side.

The foot and flange mounted three phase cage induction electric motor corresponds to the major worldwide standards. The motor gives 7.5 kW at 50 Hz and 9 kW at 60 Hz and the protection grade is IP 55 (suitable for most climates).

To achieve maximum durability a robust piston pump is used. The pump has low noise level and is easy to service.

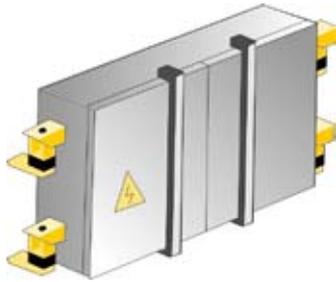
The oil tank has an open design and is easy to clean and inspect. The tank holds 150 litres and the oil level is clearly shown in the sight glass.

The hydraulic oil is filtered through an externally mounted 10 micron absolute rated line filter. Additionally, another 10 micron absolute rated return line filter is mounted inside the oil tank. The hydraulic oil meets the requirements of ISO code 17/15/13 cleanliness classification.

The power pack is designed to work under various conditions and the oil type has to be chosen according to local demands.

Oil is distributed to hydraulic valves on the main frame to control the telescoping and twinlift. Oil is also distributed to the end beams via hoses that are well protected inside the cable chains and tension rods. The hydraulic valves for flippers and twistlocks are placed in the end beams.

## ELECTRICAL SYSTEM



The power required to operate the spreader's electrical components is obtained from the crane. All electrical components on the spreader are designed to withstand loads imposed during container handling operations and suitable for a marine environment.

The spreader is supplied with CANopen slave units based on a standard field bus system. This enhances the possibility of monitoring each I/O point and reduces the number of cables needed and the replacement time for connecting sensors and actuators to the controls.



*CANopen box*

The electrical components are mounted in a stainless steel cabinet, IP65, one cabinet on each spreader unit. All cables are well protected in cable chains.

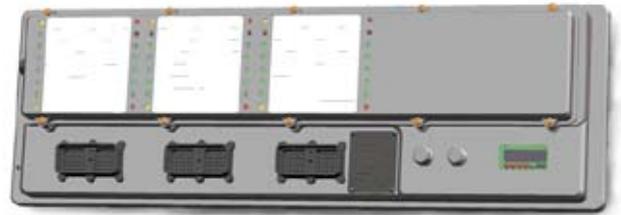
For reliability reasons Bromma recommends the use of 24 VDC on all controls.

The electrical safety features to protect and ensure proper handling of containers are as follows:

- Spreader cannot be hoisted unless all four twistlocks are fully "Locked" or "Unlocked". (Provided the crane controls have a hoist permit safety circuit.)
- Spreader twistlocks can only be "Locked" or "Unlocked" when all four corners are properly seated on a container or hatch cover.

As a monitoring and diagnostic system, Bromma recommends the use of the SCS<sup>2</sup> Spreader Communications System. However, a PLC system or a relay based system can also be used.

## MONITORING AND DIAGNOSTIC SYSTEM SCS<sup>2</sup>



For monitoring and diagnosing the Tandem T45 ship to shore spreader, Bromma recommends the SCS<sup>2</sup> Spreader Communications System. It is comprised of physical nodes for the crane and spreader, a crane-spreader communications protocol, sensors and switches, as well as two kinds of software. The SCS<sup>2</sup> can connect to a wide variety of host controllers including PLCs, DCS and PC-based control systems.

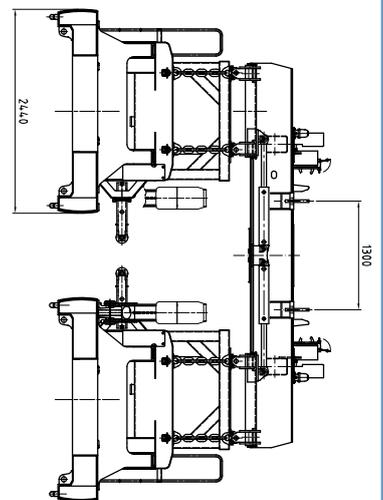
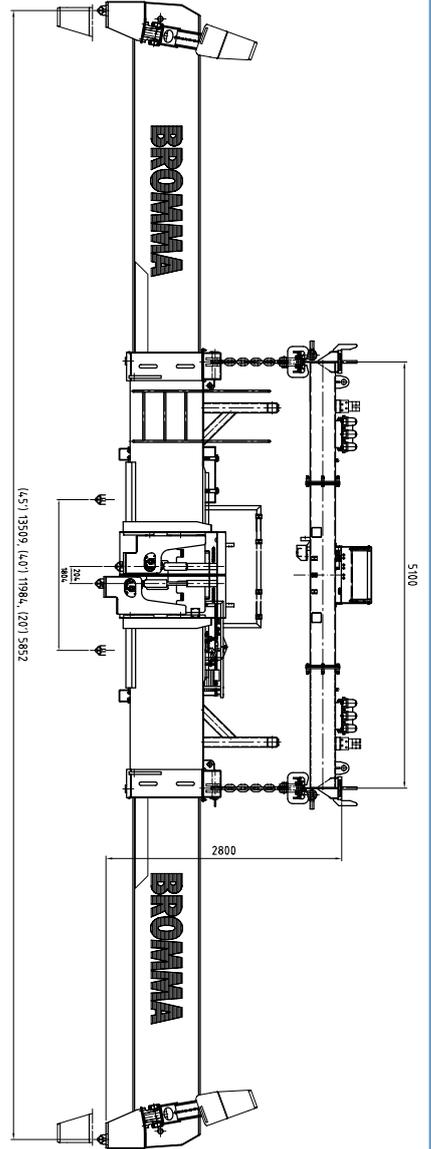
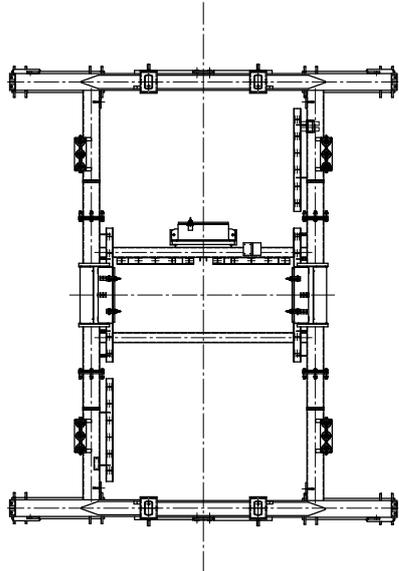
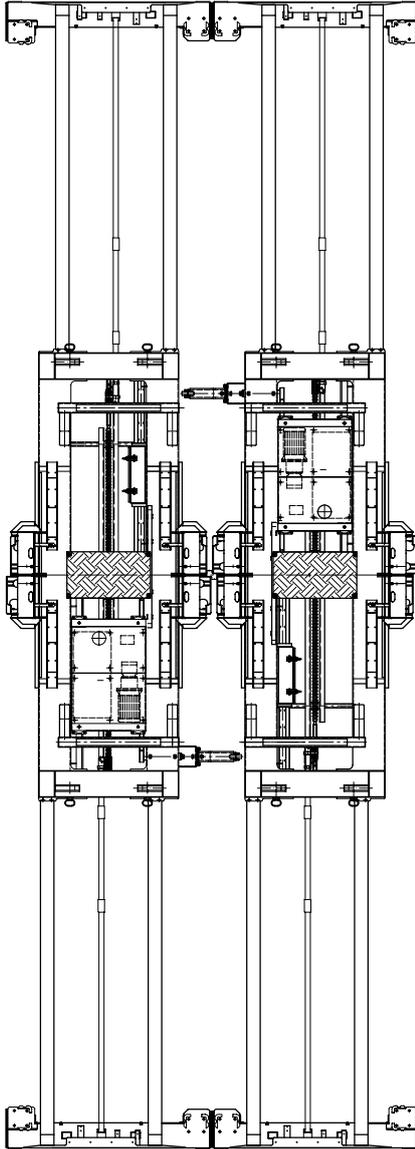
The SCS<sup>2</sup> system delivers advanced monitoring and diagnostic information, which means that service staff can react faster to fault events. Instead of investigating possible sources of fault events one by one, the SCS<sup>2</sup> gives service technicians specific, precise information, enabling them to quickly solve the problems occurred.

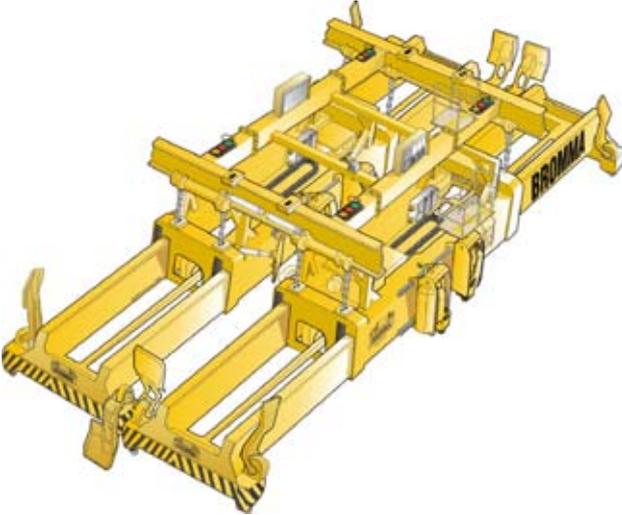
The SCS<sup>2</sup> system simplifies handling of the spreader and prevents fault events. It also eliminates or minimizes junction boxes, terminal strips, terminal ends, relays, and DIN rails – areas where wire breakage is common. Conventional wiring is reduced.

With the SCS<sup>2</sup> system the crane can automatically recognize the type of spreader used (Bromma single or tandem spreader) and change configuration. Thus no extra setup is needed when the type of spreader has been changed.

Two SCS<sup>2</sup> nodes are placed on the frame, one for each spreader unit. The SCS<sup>2</sup> system comes as standard with all Bromma ship to shore systems.

# DIMENSIONAL DRAWINGS – TANDEM T45



TECHNICAL DATA	TANDEM T45
	
<b>Load capacity under spreader:</b> (According to DIN 15018 H <sub>2</sub> B <sub>4</sub> )	2 x 51 tonnes 4 x 32.5 tonnes
<b>Spreader tare weight:</b>	Approximately 31 tonnes (without extra equipment)
<b>Total spreader height:</b>	Approximately 2900 mm
<b>Telescopic motion:</b>	From 20' to 45' in approximately 30 seconds
<b>Tandem separating:</b>	1000 mm in 10 seconds
<b>Container height difference (loading/unloading):</b>	2' / 660 mm (standard)
<b>Skewing:</b>	±20°
<b>Skewing speed:</b>	1° in 2 seconds
<b>Twinlift unit up/down:</b>	Approximately 8 seconds
<b>Twin expand/retract:</b>	Approximately 16 seconds
<b>Flipper Arm speed:</b>	180° in 3–5 seconds
<b>Twistlock:</b>	ISO floating
<b>Twistlock rotation:</b>	90° in approximately 1 second
<b>Working pressure:</b>	100 bar / 160 bar

TECHNICAL DATA	TANDEM T45
<b>Hydraulics:</b>	System pressure 100 bar / 160 bar  Piston pump pressure compensated and power controlled  Shock valve setting telescoping 70 bar  Shock valve setting guide arm 200–250 bar
<b>Power supply:</b>	400/230 VAC 50 Hz or otherwise as agreed
<b>Max power consumption:</b>	15 kW
<b>Control voltage:</b>	24 VDC
<b>Control system:</b>	SCS <sup>2</sup>
<b>Electrical cabinet:</b>	Stainless steel IP65
<b>Surface conditioning:</b>	Sand-blasted SA 2.5  50 microns 2-component zinc epoxy  70 microns 2-component MIO epoxy  40 microns 2-component acrylic epoxy  40 microns 2-component acrylic epoxy
<b>Design criteria:</b>	DIN 15018 H <sub>2</sub> B <sub>4</sub> ; FEM 1.001; British Standard BS 2573
<b>Manuals:</b>	Full service and repair manual supplied
<b>Warranty:</b>	1 year

This specification is subject to alterations without prior notice.

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