1. DESCRIPTION

SCORPIO building maintenance units (BMU) are designed for high-rise buildings or building with facades difficult to access, covering heights of **200 m or more.** With a cradle for **two people**, SCORPIO BMUs ensure fast and safe operation.
Recessed facades can be accessed using articulated cradles.

The installation consists of:
– a **mobile single jib traversing trolley** with lifting and control mechanisms
– a **working cradle** suspended from the trolley by four independant galvanised steel wire ropes
– a **double rail track***

All the operations are powered using a MAGTRON remote control unit :
– lifting and lowering the cradle
– traversing the trolley
– slewing of the turret and the spreader bar
– optional telescoping of the jib and/or the vertical mast
– traversing of the cradle under the lattice jib

The SCORPIO machine conforms to EU Directives and is manufactured in accordance with ISO 9001

TÜV CERT
DIN EN ISO 9001:2000
Certificat : 01 100 6535

2. THE SCORPIO RANGE

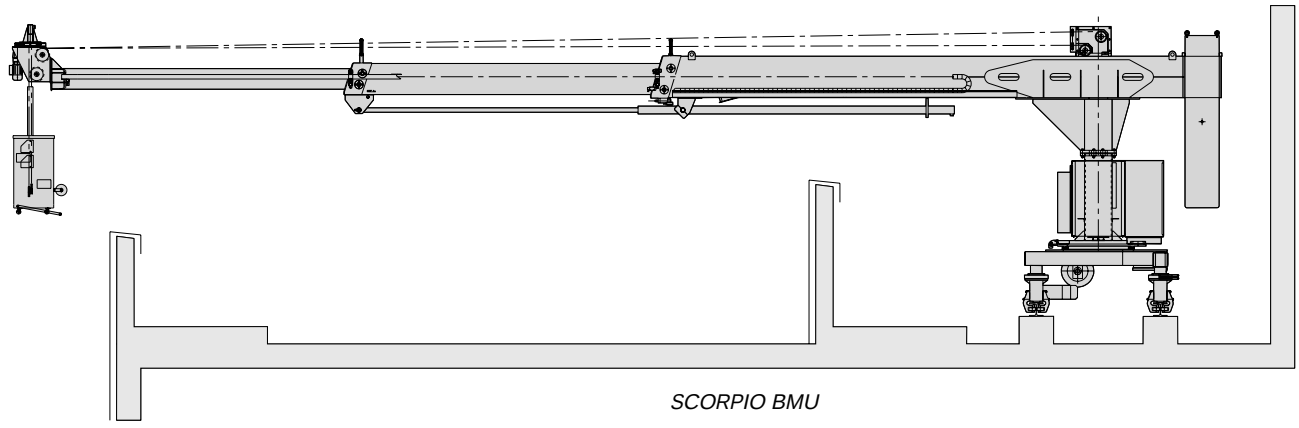
2.1 Standard series

Standard machines (series Sc300, Sc500 and Sc600) can have:
- a fix jib up to 12 meters with a trolley of 1500 mm and 1800 mm (wheel span)
- a telescopic jib up to 16 meters with a trolley of 2500 mm

2.2 Special series

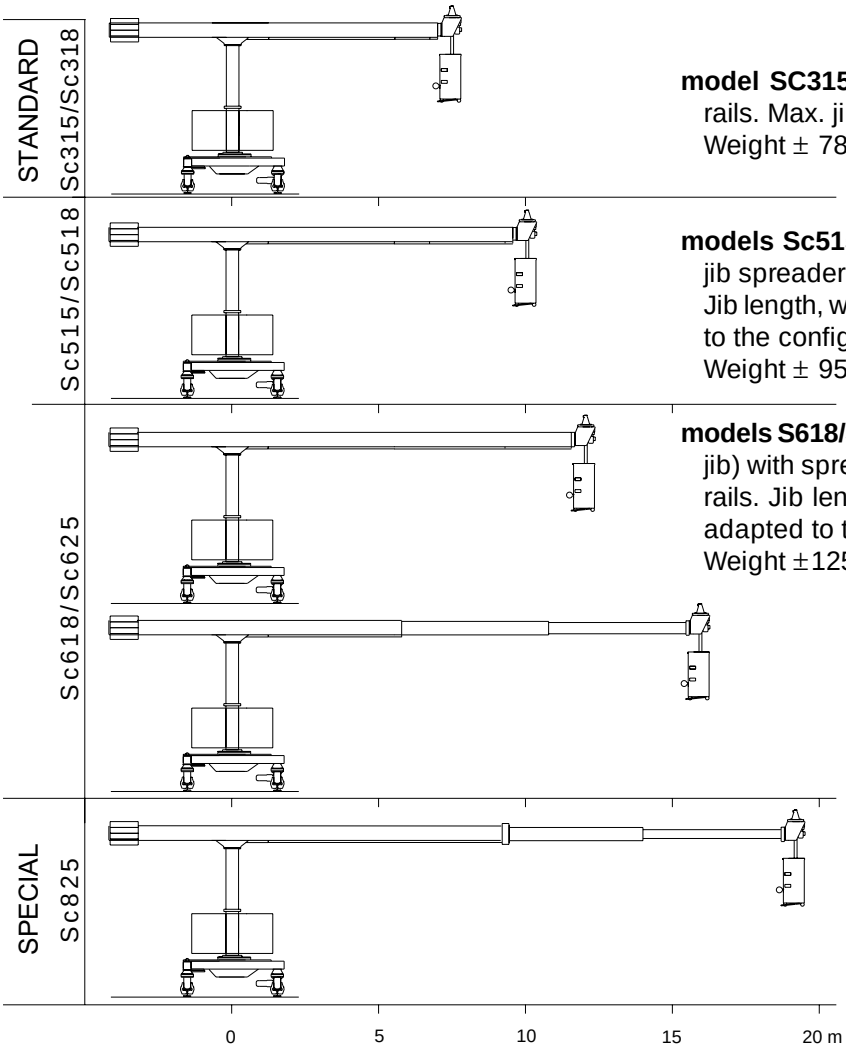
Secalt offers 2 series of **special machines** (series Sc700 and Sc800) with variable length (telescopic jib).
Maximum length of the jib will be 22 meters.

This type of machine **provides optimum access to every part of the building, particularly in the corners.** The end of the jib is fitted with a spreader bar which enables the cradle to be rotated to bring it parallel to the building. This type of machine offers a high level of comfort to operators.
Each case will be individually studied by Secalt engineering department in cooperation with the architect to meet the exact requirements:
- length of jib to cover all the glazed areas of the building,
- lifting height to cover the glazed areas,
- height of parapet.



SCORPIO BMU

** for details of tracks, please see technical sheet T-528*



model SC315/Sc318: machines with slewing ring, on rails. Max. jib length 7.5 m. Max. height 200 m*.
Weight ± 7800 kg.

models Sc515/Sc518: machines with fix or telescopic jib spreader bar and slewing ring. Traversing on rails. Jib length, working height* and height of mast adapted to the configuration of the building.
Weight ± 9500 kg.

models S618/S625: single jib machines (fix or telescopic jib) with spreader bar and slewing ring. Traversing on rails. Jib length, working height* and height of mast adapted to the configuration of the building.
Weight ±12500 kg.

models S725/S730:
single jib machines ("lattice" girder) with spreader bar and slewing ring. Traversing on rails. Cradle traverses along the jib. Optional telescopic mast for increasing or decreasing the jib height. Jib length and working height* and height of mast adapted to the configuration of the building.
Weight ± 20000 daN.

models S825/S830:
single jib machines (fix or telescopic jib) with spreader bar and slewing ring. Traversing on rails. Optional telescopic mast for increasing or decreasing the jib height. Jib length, working height* and height of mast adapted to the configuration of the building.
Weight ± 25000 kg.

The above drawings show:
- *special machines Sc300, Sc500, Sc600, Sc700 and Sc800 with the maximum of their capacity.*

Max. suspended load : articulated cradle AC3 + working load limit + weight of wire ropes = ± 900 kg.

** Above a lifting height of 40 meters, anchor plugs attached to the facade or continuous guides are necessary to limit the movement of the cradle caused by the wind. The cradle stops automatically at each anchor plug when being lowered or lifted (for details see technical sheet T-517).*

3. IDENTIFICATION OF MACHINES

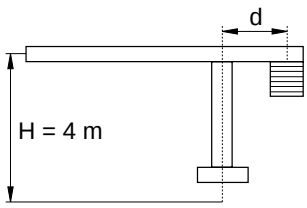
Sc = SCORPIO machine
3 m cradle
for 2 people

Sc **5** **15** **B** **B =** rails

3, 5, 6, 8 = single jib machine,
with or without telescopic jib
7 = single jib, with "lattice" girder.

All SCORPIO have a **slewing ring**

15 = fixing distance 1500 mm
18 = fixing distance 1800 mm
25 = fixing distance 2500 mm
30 = fixing distance 3000 mm (special machine)



4. STANDARD SCORPIO MACHINES - SUMMARY TABLE

model	maximum working height m						standard length of jibs m												distance	fixing distance mm	
	60	80	100	120	180	240	3	3,5	4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	d	1500	1800
Sc 315B	X	X	X	X	X	X	X	X	X	X	X	X	X	X					1250	X	
Sc 318B	X	X	X	X	X	X									X	X			1750		X

model		maximum working height m						standard length of jibs m											distance	fixing distance mm	
		60	80	100	120	180	240	3,5	4	4,5	5	5,5	6	6,5	7	7,5	8	9	10	d	1500	1800
Sc 515B	R	X	X	X	X	X	X									X	X			1250	X	
Sc 518B	R	X	X	X	X	X	X											X	X	1750		X

model		maximum working height m						standard length of jibs m												distance	fixing distance mm	
		60	80	100	120	180	240	5	6	7	8	9	10	11	12	13	14	15	16	d	1800	2500
Sc 618B	R	X	X	X	X	X	X							X	X					1750	X	
Sc 618B T1 5/7	R	X	X	X	X	X	X	X	X	X										1750	X	
Sc 618B T1 6/9	R	X	X	X	X	X	X		X	X	X	X								1750	X	
Sc 618B T1 7/11	R	X	X	X	X	X	X			X	X	X	X	X						1750	X	
Sc 618B T2 5/9	R	X	X	X	X	X	X	X	X	X	X	X								1750	X	
Sc 625B T1 8/12	R	X	X	X	X	X	X				X	X	X	X	X					2500		X
Sc 625B T1 9/13	R	X	X	X	X	X	X					X	X	X	X	X				2500		X
Sc 625B T1 10/14	R	X	X	X	X	X	X						X	X	X	X	X			2500		X
Sc 625B T2 6/12	R	X	X	X	X	X	X		X	X	X	X	X	X	X					2500		X
Sc 625B T2 7/14	R	X	X	X	X	X	X			X	X	X	X	X	X	X	X			2500		X
Sc 625B T2 8/16	R	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	2500		X

R = rotating spreader bar

5. MAIN COMPONENTS OF A SPECIAL SCORPIO MACHINE (see figure 3)

1. Mast
2. Powered slewing ring
3. Traversing trolley
4. Jib
5. Powered roller frame
6. Geared motor with brake
7. Rear roller frame (not powered)
8. Guide wheel
9. Reel for power supply cable
10. Guide for power supply cable
11. Counterweight
13. TWIN-TIRAK hoist with double wire rope reeler
14. Geared slewing motor
16. Overload limit device
17. Trolley control box
18. Upper limit safety device
19. FINAL upper limit safety device
21. Suspension rope
22. Cradle
23. Support roller
24. Anti-collision bar
25. Swivel castor
26. Cradle control box
28. Side beam
28.1 Side beam motor
28.2 Spreader bar slewing ring
28.3 Spreader bar arm

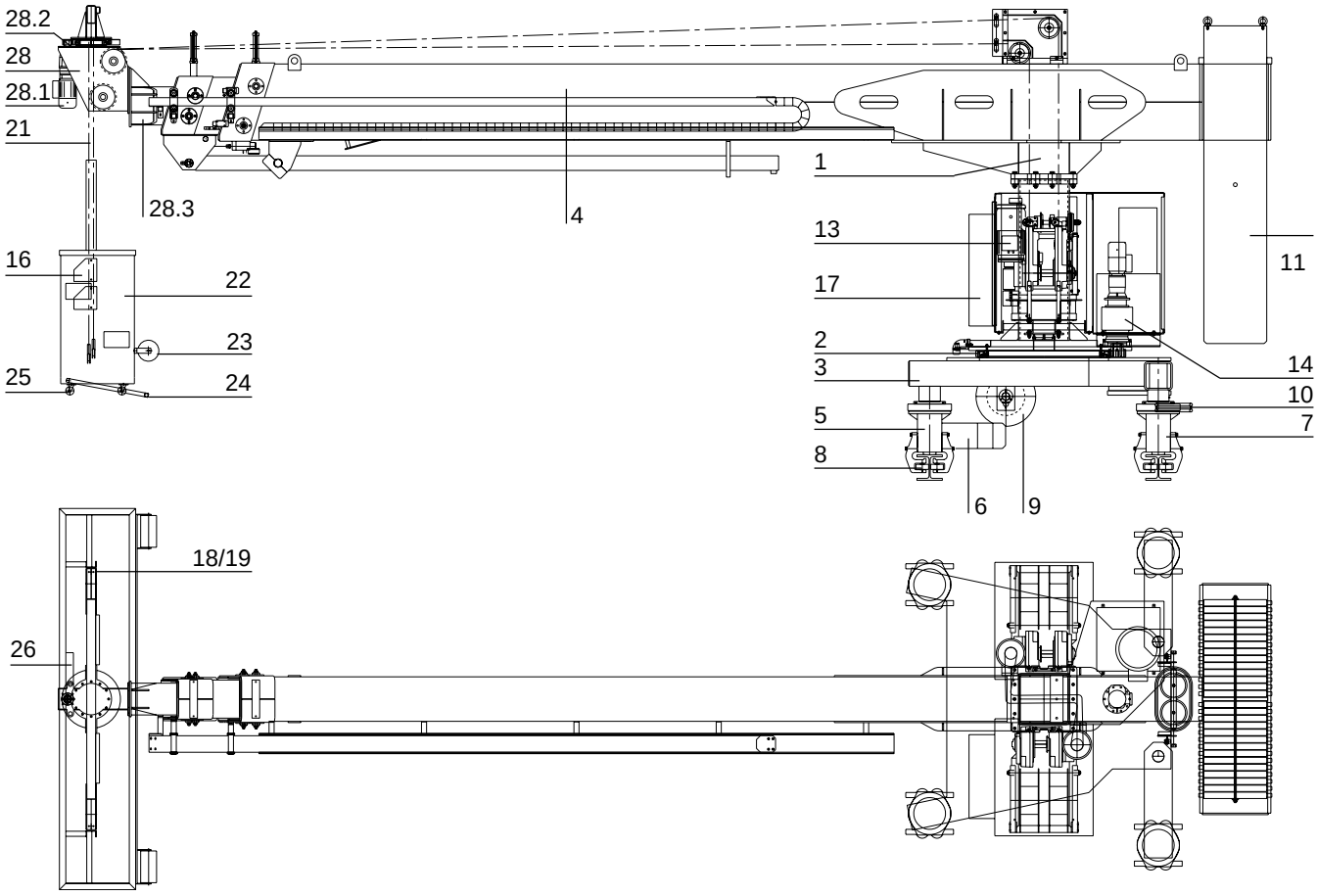


Fig. 3
SCORPIO BMU on rails

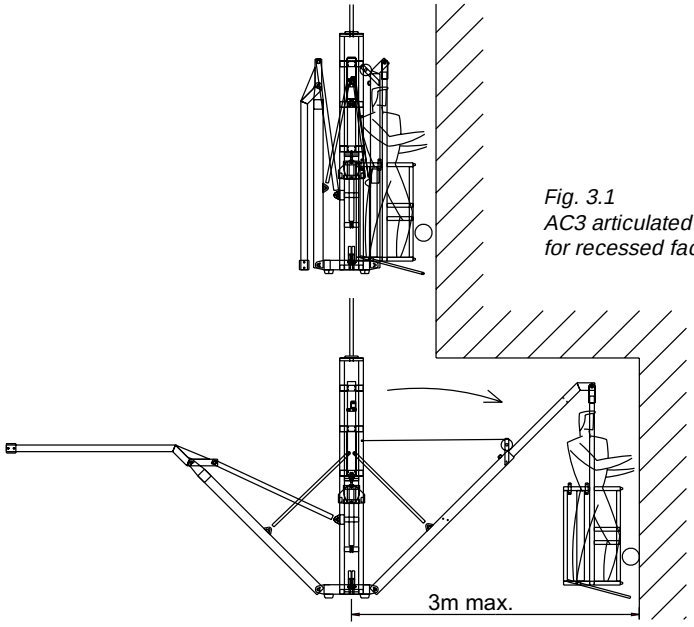


Fig. 3.1
AC3 articulated cradle for recessed facades

6. DESCRIPTION OF THE COMPONENTS

6.1. Traversing trolley

The lower trolley (3) is a tubular structure with hot dip galvanised protection.
The trolley (3) and the mast (1) are connected by a powered slewing ring (2).

6.2. Traversing system

Traversing by gear motors, speed 8 m/min.
The trolley is fitted with 4 wheels polyurethan covered giving smooth and silent traversing and a good grip.
From the series Sc625 upwards these wheels box are in steel. Generally, only the 2 wheels on the facade are powered.
The trolley is guided along the track by guide wheels (8) placed laterally on the roller frames (Fig. 5).

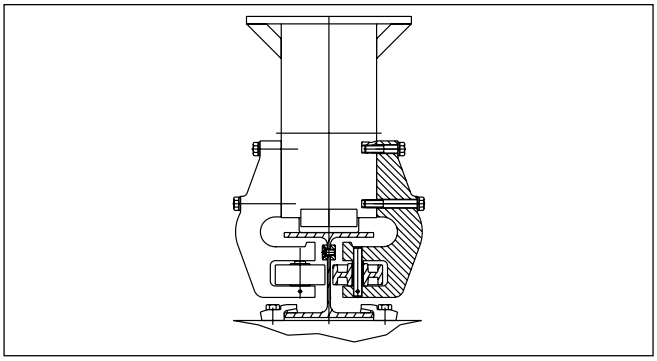


Fig. 5 - Traversing on rails

6.3. Lifting mechanism

The lifting mechanism (13) consists of two TWIN-TIRAK model T-1000 hoists, manufactured by the TRACTEL Group and specially designed for SECALT building maintenance units. The wire rope travels in an "S" shaped path around the two adhesion pulleys (Fig. 6). The TWIN-TIRAK hoist is fitted with an overspeed safety brake which operates if the cradle descends too fast, and a disc brake, which is opened electrically as soon as the power is supplied to the motor.

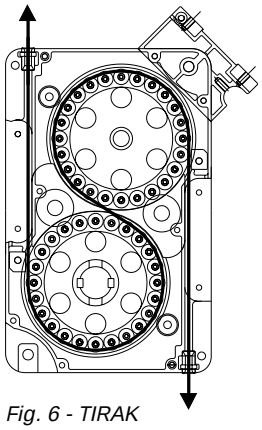


Fig. 6 - TIRAK lifting mechanism

6.4. Jib

– The single jib can be fix or telescopic (1 or 2 telescopic parts).

6.5 Spreader bar

The spreader bar on the special machines is fixed at the head of the jib. It enables the cradle to be rotated of about 140º. On series S700 machines the spreader bar moves along the lattice girder.

6.6 Telescopic mast

The telescopic mast (optional on the series S700 and S800) reduces to the height for parking position.

6.7 Electrical circuit

The electrical circuit consists of the following main items

a) On the building (supplied by the customer)
- the main switch, located on the roof
- power supply points, 3-phase + earth, positioned along the track and protected by a 30 mA differential circuit-breaker

b) On the trolley
- the power supply cable for connecting the trolley to the power points. This cable is stored on a reeler (9) under the trolley.
- an electrical box with a remote control for the trolley

c) On the cradle
- a MAGTRON control box
- an auxiliary control box.

6.8. Cradle

The **standard cradle** (22) is a tubular aluminium structure, cladded in perforated aluminium panels. Length 3 m. Capacity 240 kg max.

The **special articulated cradle** (Fig. 3.1) is designed for recessed facades up to 3 m. Another, lighter version is available for recesses up to 2 m (see technical sheet T-527).

Two foam rollers (23) allow the cradle to rest lightly against the facade (max. effort 25 daN) and absorb the swinging movements of the cradle. Four swivel castors (25) fitted to the base of the cradle ease transport on the ground.

An anti-collision bar (24) fitted under the cradle prevents collision with obstacles when lowering.

6.9. Wire ropes

The cradle is suspended from the jib by four steel wire ropes (21), Ø 8.4 mm, type E8 (5x26 + greased PP), minimum guaranteed breaking load 5150 daN. When the wire ropes have passed through the hoist they are wound on powered double reels (13.1), driven by the output shaft of the hoist, via a chain and pinion system.

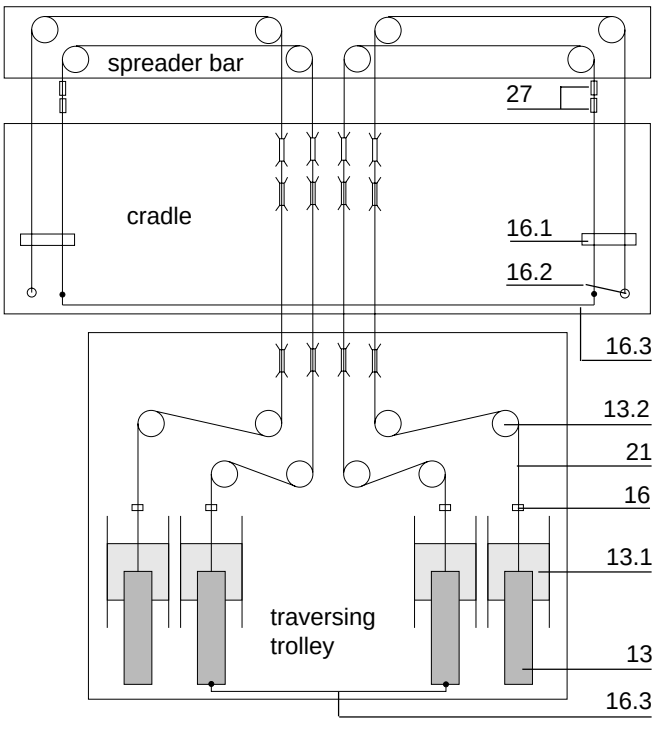


Fig. 7 - Diagrammatic representation of the wire ropes standard machine

13 TWIN-TIRAK hoist
13.1 Wire rope reeler
13.2 Return pulley
16 Slack wire rope safety device
16.1 Overload safety device
16.2 Insulated attachment
16.3 MAGTRON link
21. Suspension wire rope
27. Transducer

7. ELECTRICAL EQUIPMENT

In order to meet customers' requirements during installation, reduce maintenance costs and improve the efficiency of operators, the design of our electrical equipment uses the most modern techniques :

- programmable logic controller (PLC)
- MAGTRON patented remote control system
- microprocessor card, developed by SECALT for the remote control of the trolley
- display units to assist with control and maintenance.

7.1 Control circuit

The equipment is controlled by a TELEMECANIQUE TSX 37-10 programmable controller (PLC) with commands via :

- 1 trolley remote control panel with a 20-function keypad
- 1 cradle remote control panel with MAGTRON 4020

The PLC performs three essential functions:

a) Control of the various operating sequences
b) Handling faults
c) Decoding the trolley and cradle control signals.

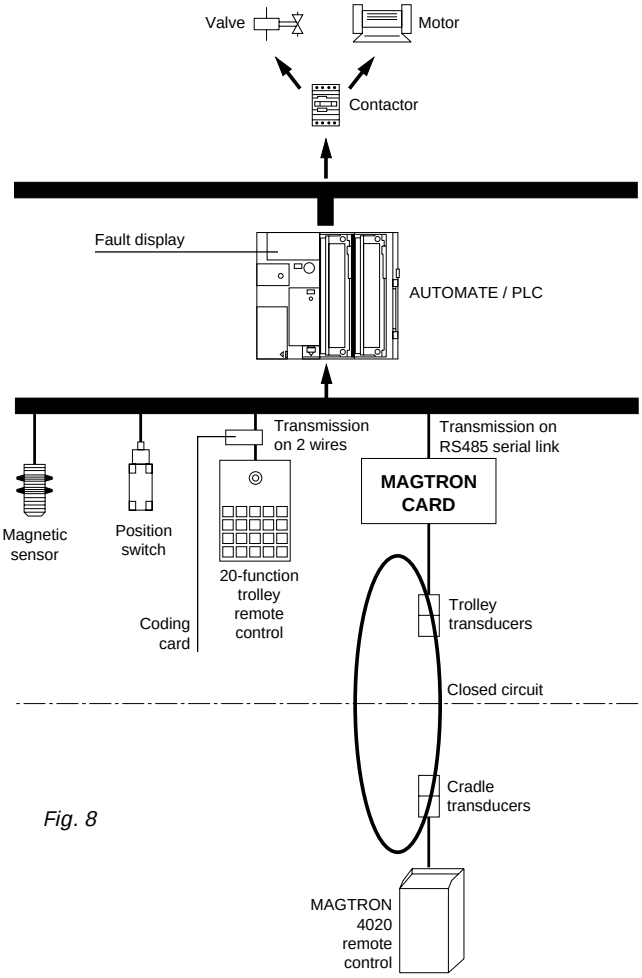


Fig. 8

7.2 MAGTRON remote control

The MAGTRON system is used for duplex transmission of data and telephone signals between the cradle and the trolley, by induction of the magnetic field in a **closed circuit created by the steel carrying wire ropes** (Fig. 8). The signals are transmitted by 4 transducers (1 transmission/1 reception on the cradle and on the trolley).

7.2.1. Advantages of the MAGTRON system

- transmission of commands via the standard metal suspension rope, removing the need for a pendant electrical cable or a special suspension cable with integrated electrical wires;
- MAGTRON does not need a special frequency band;
- as the transmission medium is the metal wire rope and not radio waves, MAGTRON is much less sensitive to interference created by other devices and does not itself cause interference to other systems (electronic or data processing systems, etc);
- MAGTRON control is exclusively for our machines, whereas radio remote control systems are used by many other applications, with the possible risk of there being 2 radios of the same frequency on 2 neighbouring sites;
- control voltage reduced to 10 V, thus preventing any risk of electrocution;
- the telephone and the display to assist with control are provided as standard;
- one MAGTRON model covers our whole range of BMUs;
- the MAGTRON cradle control box is easy to remove in order to protect it from adverse weather conditions and prevent improper use of the machine.

The MAGTRON equipment has been the subject of a safety analysis (APAVE no. 9454079) [French organisation] which guarantees that a system failure will not cause a dangerous situation such as the loss of the emergency stop or the transmission of an incorrect command.

7.3 Telephone and alarm system

7.3.1 Trolley/cradle telephone

The MAGTRON remote control is fitted with a telephone (106) for communication with the trolley telephone, using the principle of alternate transmission.

7.3.2 Control office telephone (option)

Telephone link between the cradle and the building's control office (using the principle of alternate transmission).

7.3.3 Control office alarm (option)

In the event of a fault, an alarm (1 volt-free contact) is sent automatically to the control office or the technical room.

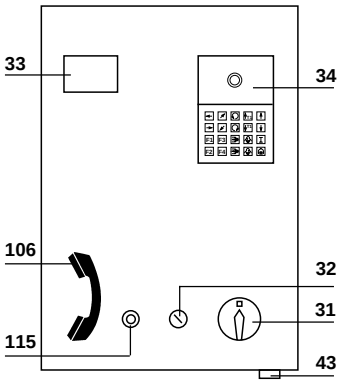
7.4 Controls

The equipment has two control panels :

- 1 main control panel (112) on the cradle (Fig. 11)
- 1 control panel (Fig. 9) on the trolley for switching to work phase and for backup operations in the event of failure of the main panel.

The control panel is selected using the key switch (32) on the main control box.

The electrical enclosure is fitted with a heater to prevent condensation.



7.4.1 Main control box

31. Main switch
32. Lockable rotary switch for TROLLEY control or CRADLE control
33. PLC display
34. Trolley remote control
43. Buzzer
106. Telephone
115. Call cradle

Fig. 9 - Main control box and trolley remote control

7.4.2 MAGTRON remote control in the cradle (Fig. 11)

113. MAGTRON control keypad (identical commands to those of the trolley remote control)
104. Display
106. Telephone
114. Charger

7.4.3 Cradle auxiliary control box (Fig. 10)

42. Emergency stop
102. Start/Stop MAGTRON
103. Lower anti-collision bar shunt

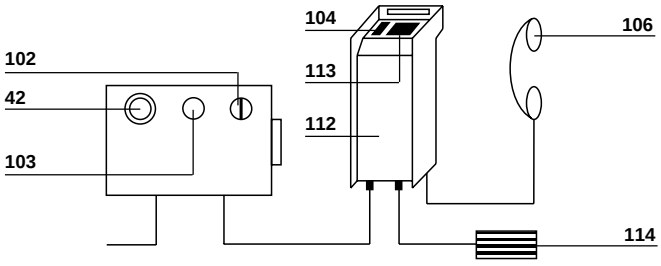


Fig. 10 - Cradle auxiliary control box *Fig. 11 - Cradle control box*

7.5 Power supply to cradle MAGTRON control box

The cradle assembly is supplied by a NI/MH (nickel hydride) main battery with a capacity of 9 hours. Recharging takes 3 hours.

A NI/CD (nickel cadmium) automatically back-up battery which provides one hour operation is brought into operation when the main battery is flat so that the user can take the cradle back up to the roof.

8. SAFETY DEVICES

To ensure safe operation without danger to personnel, the machine is fitted with a number of safety devices which monitor the correct operation of the various components and operate in the event of a breakdown or fault.

8.1. Safety devices on the cradle
- emergency stop
- lower anti-collision bar
- overload safety device
- cradle anti-tilt safety device

8.1.1 Optional safety devices on the cradle
- upper anti-collision bar

8.2 Safety devices on the trolley
- emergency stop
- cradle upper safety limit switch
- cradle FINAL upper safety limit switch
- spreader bar slewing
- slack wire rope safety device
- end of wire rope safety device
- electrical supply cable end limit switch
- traversing end limit switch
- turret slewing
- overspeed
- emergency lowering handle
- phase order safety device
- manual lowering in the event of a power break
- telescopic jib retraction/extension
- telescopic mast retraction/extension

8.2.1 Optional safety devices on the trolley
- jib anti-collision device
- anemometer (wind speed indicator)
- detector for presence of rail or concrete guide

8.3 Self-test safety devices
- on the MAGTRON
- on the trolley remote control
- on the contactors

9. FAULT MANAGEMENT

9.1 Display on the PLC
The faults listed below are handled by the TSX 37-10 PLC and shown on the display (33).
The display can also be temporarily assigned to the following maintenance functions :
- display of the state of the PLC I/O
- display of faults on the I/O cards
- display of codes sent by the trolley or cradle remote controls

CODES DEFAUTS - FAULT CODES

00	Machine prête *Machine ready*	17	Mou de câble *Slack wire rope detector*
01	Arrêt d'urgence chariot *Trolley emergency stop*	18	Bimétal TIRAK *TIRAK heat sensor*
02	Arrêt d'urgence plate-forme *Platform emergency stop*	19	Magnétiques moteurs *Magnetic motor protection*
03	Arrêt d'urgence phonie chariot *Trolley phone emergency stop*	20	Défaut E/S automate *PLC system I/O fault*
04	Arrêt d'urgence phonie plate-forme *Platform phone emergency stop*	21	Défaut RS485 *RS485 faulty*
05	Défaut test feedback *Feedback test faulty*	22	Détecteur de rotation *Slewing detector*
06	Défaut test entrées chariot *Trolley inputs test faulty*	23	Défaut contrôles télécommande *Pendant control card faulty*
07	Défaut test entrées plate-forme *Platform inputs test faulty*	24	Défaut pile automate *PLC battery fault*
08	Défaut test RS485 / Arrêt d'urgence *RS485 / Emergency stop test faulty*	25	Barre anticollision haute *Upper anti-collision bar*
09	Fin de course ultime haut *Final upper limit switch*	26	Anticollision droit sur flèche *Jib right anti-colllision*
10	Survitesse *Overspeed*	27	Anticollision gauche sur flèche *Jib left anti-collision*
11	Fin de câble *End wire rope detector*	28	Anémomètre *Wind speed indicator*
12	Contrôleur de phases *Phase control*	29	
13	Défaut contacteurs *Power relay faulty*	30	Demande de start *Start required*
14	Fin de course manivelle *Limit switch handle*	40	Manque fin de course haut *No upper limit switch*
15	Surcharge *Overload*	41	Manque sélection chariot ou plate-forme *No selection of trolley or cradle*
16	Barre anticollision basse *Lower anti-collision bar*		

⚠ **Les défauts 2 et 23 restent mémorisés jusqu'au prochain start.**
The faults 2 and 23 are memorised until next start.

9.2 Display in the cradle
This display provides the operator with information on :
- the battery capacity
- the state of the sensors fitted on the cradle
- the control fault codes.