PTS 3-R

TOWBARLESS TRACTOR

DESCRIPTION & SPECIFICATIONS

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I.- DESCRIPTION

A) INTRODUCTION

The PTS 3-R FMC model has been designed to tow aircrafts without the help of a towing bar. It has the possibility of clamping and moving an aircraft with 205 t. of maximum weight. A lot of aircrafts are included in this range so this tractor has a very big versatility.

The following aircrafts can be used with the PTS 3-R:

211 Model:

Aircraft	*Wheel diameter (pulg/mm)*		*Aircraft weight MTOW (TON)*	*Weight on NLG(KN)*	*Maximum tow strengh(KN)*
A 300/B2	40	1016	143	206	150.0
A 300/B4	40	1016	141	206	150.0
A 310/200	40	1016	133	206	150.0
B 767/200	37	940	160	215	186.8
B 727/200	32	813	95	88	127.0
B 757/200	31	787	100	150	137.8
B 757/200F	31	787	116	150	137.8
A 319	30	762	71	108	76.0
A 320/100	30	762	69	108	76.0
A 320/200	30	762	74	108	76.0
A 321/100	30	762	83	108	76.0
A 737/400	29	737	68	82	80.0
DC 9/MD 80	26	660	73	70	47.0
B 737/200	24	610	58	74	80.0

212 Model (all the previous types and also the following Fokker):

TIPO DE AVIÓN	*DIÁMETRO RUEDA(pulg/mm)*		*PESO AVIÓN MTOW (TON)*	*PESO SOBRE NLG(KN)*	*FUERZA MAX. DE TIRO(KN)*
F 70	22.5	570	40	4	32.0
F 100.75	22.5	570	44	4.5	32.0

PTS 3-R tractor is powered by a Diesel engine that works two hydraulic pumps, the first one for the propulsion movement (that supplies oil pressure to the hydraulic engine that propels the front axle) and the other one for the service movement (that supplies oil pressure to the fastening module, power steering, the brake system, the engine cooling circuit, the engine lubrication oil circuit and the hydraulic oil).

The tractor can reach the speed of 32 km/h (20 miles/h) if the charge on the front wheel is lower than 220kN.

The PTS 3-R design includes:

- Front axle steering for highly responsive manoeuvrability.

- Smooth two-wheel hydrostatic drive with advanced traction control system technology.

- Simple, fail-safe aircraft pick-up, utilizing patented rectangular guidance concept which reduces the number of control valve valves and cylinders (only 6 cylinders are used, 2 for clamping and releasing, 2 for retaining the wheel and 2 for lifting and towering) for uncomplicated operation and maintenance.

- Comfortable and roomy operator's cabin, with front-and-back facing fixed steering wheels and a driver's seat that manually rotates a full 180ºC.

- Optimized brake force distribution between front and back axle.

- An emergency steering system with secondary power supply back-up which allows unlimited towing distance.

- Environmentally friendly engine options.

- Integrated oversteering alerting device (OAD) for added safety which protects the nose landing gear at all times.

The unique PTS series pick-up configuration assures firm aircraft locking under all towing conditions – yet puts less stress on aircraft nose gear than other pushback/towing attachment system.

And, at every turn, FMC Airline Equipment's continuous design improvements and unmatched "life-of-the-product" support add even more to the package.

B) REFERENCES

The PTS 3-R complies with the majority of the important specifications and requirements set out in the following documents and publications. Other publications, such as ISO publications have been taken into account for the design of the PST 3-R towbarless tractor.

Mandatory documents:

- Directive 98/37/CE
- EN 1915- 1:2001- Land equipment. Basic safety requirement.
- EN 1915- 1:2001- Land equipment. Resistance and stability requirement.
- pr EN 12312-7:97- Specific requirements for aircraft movement equipment.

The following documents have also been taken into account:

- AHM 910 Basic requirements for aircraft ground support equipment.
- AHM 913 Basic safety requirements for aircraft ground support equipment.
- AHM 915 Standard controls
- AHM 957 Functional specifications for towbarless tractors.
- Rules SAE/ISO TLTV.
- Boeing and AIRBUS Documentation.

II. PRINCIPAL COMPONENTS

A) STRUCTURE

CHASSIS

The chassis is made by a welded structure of hot laminate steel, special steels, tubes and profile, It is projected to be as simple as possible, according to the safety and stability requirements.

(1) Fuel tank.

The fuel tank has a capacity of 120 litres.

It includes the following elements:

- 2 sword.
- Drain cap.
- Level sensor.
- Charge entrance.

(2) Hydraulic oil tank.

The Hydraulic oil tank has a capacity of 140 litres.

It includes the following elements:

- 1 sword.
- Drain cap with magnetic stick.
- Breather.
- Returning fluid filter (with filter gauge).
- 2 fluid outlet filters.
- Fluid outlet valve to the emergency pump.
- Minimum filling electric sensor
- Temperature and level indicator.

COVERS

The covers allow an optimal visibility in the pick-up and towing operations and an easy access to all the elements where maintenance is needed. It also protects these elements from external damages.

CABIN

(1) Driving position.

Position: centered in relation to the longitudinal axle of the vehicle.
Elements:
Rotating seat (180º).
Steering wheel and pedals.
Duplicated necessary controls.
Sun roof (it can be opened).

It also includes a seat for the assistant.

(2)Control panel.

It has been designed with enough capacity to admit all the standard and additional components.

The standard components in the panel are:

- Controls:
  - On/off key.
  - Emergency stop on all the services.
  - Driving controls.
  - Pick-up operation controls.
  - Emergency lights switch.
  - Lights switch.
  - Working lights switch.
  - Beacon control.
  - Thermic window switch (optional).

- Indicators:
  - Hour meter.
  - Fuel level indicator.
  - Battery charge indicator light.
  - Parking brake on indicator light.
  - Turn signals indicator light.
  - Thermic engine pre-heater indicator light.
  - Lights on indicator light.
  - Emergency pump on indicator light.
  - Engine failure indicator light: flashing (engine failure) or fixed (non-engine failure).
  - Hydraulic system failure indicator lights (light and buzzer get on at the same time, first in an intermittent way and later permanent): hydraulic oil low level in the tank and/or traction pump filter clogged and/or accumulators low pressure.
  - Information screen (synoptic) to the camping and towing operations, OAD state, NLG wheel contact. It has 20 leds and an OAD buzzer.
  - Information screen leds testing pushbutton.

  The symbols are the ones suggested by the AHM 915.
  Switches could have a lightning indicator.

(3)Other controls.

- Buzzer and turn signal lights controls.
  Built-in in the steering wheel.
- Console controls.
  In the console will be:
  - Heating, cooling (optional) or air conditioning (optional) controls.
  - Emergency motorized pump control.
  - Tractor wheel position indicator (optional).
  - Cabin power windows.
- Cabin lighting switch in the lights of the cabin.
- Windscreen wiper switch.
- Parking brake.

B) POWER UNIT

ENGINE

The standard engine is Deutz BF4M 1013C EUR 1 that includes integrated radiators. It is mounted in a transverse position.

It is a 4 cylinders engine with 4760 cm^3, a compression relation of 17.6 and a maximum nominal speed of 2300 rpm.

Power: 100 Kw / 2300 rpm.

Maximum torque 572 Nm a 1400 rpm.

PUMPS

The diesel engine is directly coupled to a hydraulic traction pump and a service pump.

- *Traction pump*: Rexroth, 125 cm^3/rev with electronic control.
- *Services pump:* gear type, with operation in open circuit and 38 cm^3/rev.

TRACTION PUMP

The tractor has frontal traction with a Rexroth variable flow hydraulic engine, of 160 cm^3/rev directly coupled to the axle.

D) WHEELS

Front wheels 355 / 65 R15, 10 bar of inflating pressure.

Rear wheels 250 / 60 R12, 10 bar of inflating pressure.

E) BRAKES

SERVICE BRAKE

It is actuated by the brake pedal in the operator's compartment. It works in frontal and rear wheels with aircrafts with a wheel size bigger than 32", the circuit is commanded by the hydraulic oil and it has a double installation.

PARKING BRAKE

It works on the front axle (negative type).

HYDROSTATIC BRAKE

It works automatically in the front axle when the foot is raised from the accelerator while the vehicle is moving.

Service and parking brakes are activated in the brake compact block (Rexroth).

F) STEERING

The steering is integrally hydraulic formed by an Orbitrol pump and 2 steering cylinders.

Orbitrol pump:
by ZF Hydraulic.
Swept volume 400 cm^3.

Direction cylinders:
by Glual.
Double effect cylinders.

G) AXLES

FRONT AXLE

The front axle is drive and steering. The KESSLER LT41VPL58 axle with shoe brake is mounted. The most important characteristics of this axle are: load capacity 138 KN, braking maximum torque 8 kNm and a total reduction 1: 25, 3. It includes a parking brake in the entrance of the differential

REAR AXLE

Double wheel rear axle in both sides of the chassis and disk brakes.

H) HYDRAULIC SYSTEM

PICK-UP HYDRAULIC CYLINDERS

The Pick-up has 6 hydraulic cylinders:

- 2 elevation cylinders, by Glual. Double effect and with a safety check valve in rod tube.
- 2 lock cylinders, by Glual. Double effect and have safety check valve in both tubes.
- 2 retaining wheel cylinders, by Glual. Simple effect with safety check valve.

EMERGENCY PUMP

There is a manual emergency pump, (or an optional electrical powered pump) for the emergency operation of services, steering, brakes and pick-up.

I) ELECTRIC SYSTEM

POWER SUPPLY

The voltage of all the electric system is 24 Vcc.

LIGHTS

The rear zone is the one where the pick-up system is located, and the frontal the opposite.

a) **1 driving place** (looking to the pick-up). It is the standard configuration.

- Rear:

- Parking lights (White).
- Main headlights .
- Turn signal lights.

- Frontal:

- Parking lights(red).
- Turn signals.
- Brake lights.
- Reverse gear light.
- Catadioptrics.

- On the cabin:

- 2 beacon.
- 2 working lights.
- 1 gauge light (opt.).

b) **Double driving place** (optional).

- Rear and front, both have:

- Parking lights(white and red).
- Main headlights.
- Turning lights.
- Brake lights.
- Reverse gear light.
- Catadioptrics.

- On the cabin:

- 2 beacon.
- 2 working lights.
- 1 gauge light (opt.).

WIRING

The wiring of the vehicle is implemented with the lowest possible number of sections.

To make the maintenance easier all the wires are marked. The power wires are separated.

J) PICK-UP

GENERAL

The mechanism of seizing and elevating the aircraft achieved with the frame and retaining spades activated by hydraulic cylinders, so that they can assure an effective fixture in the “push-back” and towing operations.

FRAME

The design improves the support of the wheels with a diameter greater than 32” and the process of loading the NLG on the pick-up.

WHEELS SEIZURE MECANISM

The system is designed according with the wheel diameters and the width of the aircrafts NLG formerly described.
There is a system of inductive sensors that inform the control about the wheel diameter of the NLG (only if it is greater or lower than 32”).
There is also a system of hydraulic work mechanism to the tighter retention of the aircraft wheels.
The use of the emergency hydraulic pump (electric or manual) can set the NLG free.

III. SAFETY AND EMERGENCY DEVICES

- Emergency stop pushbutton (only work on services) in the control panel (1 pushbutton).
- Emergency stop pushbutton in the chassis (1 or 2, optional).
- Emergency stop due to engine failure.
- Operating safety:
  - With service or parking brake working there is not pick-up movement.
  - Limitation of the traction and braking strength depending on the wheel size.
  - Limitation of the traction strength during the axle pick-up operation.
  - Pick-up can not be closed without an aircraft if there is an obstacle.
  - The direction of the travelling can not be inverted if the speed is higher than 1Km/h.
  - NLG wheel center safety (3 seconds).
  - Negative parking brake.
  - Cilindres safety check valve.
  - OAD.
  - If the starting engine is working the key can not be turned again in the starting direction.
  - Reverse gear buzzer.

IV. SPECIFICATIONS

	211	212
PERFORMANCE		
Maximum traction strength (1)	30 ± 2 KW	30 ± 2 KW
Maximum traction strength (2)	60 ± 2 KW	60 ± 2 KW
Maximum brake strength (1)	32 KW	32 KW
Maximum brake strength (2)	60 KW	60 KW
Traction effort in the retention mode	12 ± 2 KW	13 ± 2 KW
Drive speed (loaded)	12 Km/h	12 Km/h
Drive speed (unloaded)	25 Km/h	25 Km/h
Turning radius (swept)	9.2 m	9.8 m
Gradient capacity unloaded	5%	3%

(1) First stage, NLG diameter < 32”

(2) Second stage, NLG diameter > 32”

SHIPPING DATA		
Length	7.30 m	7.8 m
Width	3.10 m	3.10 m
Height (no cabin or air entrance)	1.70 m	1.70 m
Aprox. Weight	9000 Kg	9660 kg
OTHER DIMENSIONS		
Wheel base	3.0 m	3.0 m
Front track	2.6 m	2.6 m
Rear track	2.0 m	2.0 m
Ground clearance unloaded	120 mm	110 mm

CAPACITIES

Reserve hydraulic fluid	140 l	140 l
Fuel tank	120 l	120 l
Hydraulic fluid	ISO VG-68 (ISO VG-32 for temperature below 10ºC)	

NOTA: Being & Fokker NTO in process.

NOTA: OAD in process.

V. OPTIONS

- Air conditioning in the cabin.
- Electric powered pump for emergencies.
- Double driving place.
- Thermic windows.
- Cabin gauges.
- Differential lock.
- Wheel position indicator.
- Emergency pushbutton in the chassis.
- Batteries box.
- Emergency brakes and steering.