TECHNICAL SPECIFICATION

TREPEL 20 ton PALLET/CONTAINER LOADER

TYPE PCL 200/56

C O N T E N T S

1. CRITERIA OF APPLICATION

The loader is designed for loading/unloading of all types of containers and pallets used today up to the size of 96 inches x 20 feet (2.440 x 6.096 mm). It can be used for handling of all main deck freight doors as well as the lower deck freight doors of all wide body aircraft from DC 8 to B747 nose loading and combi version.

Having a maximum loading width of 128 inches the loaders main platform can handle two (2) 10-feet ULDF's length-or crosswise or one (1) 20-feet ULD.

Referring to its function the loader can be operated by one person only and guarantees safe performance under all climatic conditions with outside temperatures from - 25 degrees C to + 60 degrees C with a relative humidity of the air up to 95 %. All parts and components are designed to withstand rough handling operation without causing any damage in function.

The loader's low loading height of 508 mm allows a perfect connection to all normal vehicles such as Transporters and Dollies having a standard height of 20 inches.

The main/rear platform of the loader can be loaded/unloaded sidewards (option) and/or from the rear. A 10-feet side loading can be carried out either at the front part or rear part of the main platform (depending on the loader execution) or a 20 feet side loading over the whole length of the main platform.

The loader stands free from the aircraft; the roll and pitch movements of the aircraft and/or height differences to the aircraft sill height can be controlled by a manually operated follow-up system.

The loader is driven without load; first after extending the stabilizers the loader can be loaded.

2. TECHNICAL CONSTRUCTION

2.1. *General Description*

The unit serves to load/unload pallets/containers while parked at the aircraft.

The loader is equipped with two separate vertically operating platforms whereby the front platform serves as a loading bridge in front of the aircraft's door, the main platform accepts the freight from either dollies or transporters and lifts the freight up to the front platform's level.

The front platform can be adjusted to aircraft's roll and pitch movements by lateral tilting of the front platform +/- 2 degrees.

Being in operational condition (lifting and loading procedure) the loader is suupported by six vertically operating double acting stabilizers. The loader is driven and operated from the front platform whereby the loader can be driven with lifted front platform.

During the handling operation the unit is not connected to the aircraaft, manually operated hinged adapters at the front platform's front side compensate different cargo door sizes.

The drive system is powered by a diesel engine and a hydro-static motor directly flanged to the front axle. All handling movements are hydraulically powered by hydraulic cylinders or hydro-motors.

2.2. *Axle and chassis*

The loader is driven by a diesel engine and hydro-static motor flanged to the driving axle; all movement of loading are done by hydraulic cylinders or hydro-motors.

2.3. *Drive system*

The loader is powerd by an air-cooled five cylinder diesel engine manufactured by Messrs. KLÖCKNER-HUMBOLDT-DEUTZ. The engine is installed at the chassis' front part on elastic bearings. A swivelling power-controlled axial piston provides the required hydraulic oil flow.

The front wheels are powered by a constant hydro-motor flanged to the planetary gear unit of the front axle.

Oil measuring stick, hydraulic oil filling orifice as well as diesel filter are easily accessible. The exhauster is located on the left-hand side, the exhaust muffler is elastically mounted to the chassis' frame. The diesel fuel tank has a capacity of 100 litres.

2.4. *Steering/brake system*

The fully hydraulic steering unit, Fabricate Danfoss, consists of two double-acting hydraulic cylinders flanged on to the steering axle and one steering unit. In case of a failure of the steering system it is possible to steer the loader manually with a steering force of approx. 50 kp. A gear pump flanged to the diesel engine supplies the steering and brake system with hydraulic oil pressure.

The brake system is designed as a dual-circuit fully hydraulic brake system acting at the front wheels. Two pressure reservoirs are mounted to the brake system and provide sufficient emergency braking efficient if requested. Both circuits are secured with non-return valves so that in case of a break-down of one circuit the second circuit will remain fully functional. In case of a loss of pressure at the pressure reservoirs the operator will be warned by a visual emergency indicator.

The parking brake is connected to the operating brake and is operated by a hydraulically acting hand brake valve. Please note that above-mentioned parking brake system should only be used for short-time parking. For long-time parking the stabilizers have to be extended. (For optional multiple disc brake as emergency long-time and parking brake please review chapter 7 „Options"). The brake pads are asbestos-free.

2.5. *Operation*

The driver's stand is located on front platform's level on the right-hand side and provides an excellent view in order to manoevre the loader with a maximum safety. In front and behind the driver's stand the floor of the front platform is covered by anti-ski protection. The driver's seat is vertically adjustable. The front platform with the driver's stand can be reached via a ladder when the front platform is lowered. All control and operating elements are clearly arranged and marked with pictograms acc. to IATA regulations. The switches are protected according to IP 65.

The driver's stand is equipped with the following instruments (for additional instruments please review chapter 7):

- Engine start/stop switch, key type
- Lever switch for lifting/driving procedure
- Lever switch for driving direction
- Fuel gauge
- Emergency stop (mushroom type)
- Working hourmeter

Switch for
- Lifting/lowering front platform
- Vehicle lights
- Indicators

Control and warning light s for:
- Loading function alternator
- Engine oil pressure
- Low brake pressure
- High engine temperature
- Parking brake
- Stabilizers fully extended

The control panel is connected to the driver's stand through a cable with a lenght of approx. 2 m and includes the switches for the following functions (loaders standard configuration):

Front platform:	lifting/lowering transfer system forward/backward tilting of front platform +/- 2 degrees lateral transfer system
Main platform:	lifting/lowering transfer system forward/backward lateral transfer system

Emergency stop: all switches have an automatic reset in zero position (deadman's principle).

The central switch board is located at chassis front part right-hand side. For emergency operation, i. e. „ lowering of platforms" and „retracting of stabilizers", a hand pump is located at chassis right hand side. A. m. functions can be operated by the hand pump and the corresponding valves. The hydraulic circuit of the platform transfer systems can be switched into pressureless condition by using the corresponding hand valves in order to move pallets and containers manually in case of an engine drop down.

For maintenance and repair works all functions can be controlled by hand from the relays located at the central switch board.

2.6*Lifting- and stabilizing systems*

The lifting systems of both platforms consist of torsion-free scissors systems made out of welded box-profiles and powerd by single-acting hydraulic cylinders.

The scissors system of the main platform is powered by four plunger cylinders. There are two vertically acting telescopic cylinders for the lifting of the main platform out of its collapsed position. The front platform's scissors system is powered by two plunger cylinders whereby the cylinders are mounted to the chassis and acting onto the cross-bars of the scissors system. All cylinders are positioned spherically in greasable bearings, the pistons are hard-chromium plated.

The lifting cylinders are equipped with pilot-controlled non-return valves as well as lowering brake valves.

During loading /unloading procedure the loader is supported by six double-acting hydraulic cylinders mounted to the chassis' frame. The cylinders are secured by pilot-controlled non-return valves in their extended position. The stabilizing cylinder plates are mounted spherically. Their pistons are hard-chrome plated. The stabilizers extend and retract automatically. They are operating by a controlled hydraulic pressure in that way that the loader is savely supported even being positioned on uneven ground.

2.7 *Loading platforms*

The longitudinal transfer of pallets/containers on both platforms is provided by zinc-plated steel rollers positioned at the center of the platforms and powered by one hydro-motor each platform via chains. Additional support is provided by non-powered zinc-plated rollers located beside the main transfer systems.

Lateral guiding is provided by steel-made 100 mm high guiding rails which can be manually moved from 125 to 60 inches.

Longitudinal positioning is provided by two each cravity-operated stops at front and rear end of the main platform as well as the rear end of the front platform which extend automatically, if the main platform is lifted and both platforms leave the same height and retract automatically (main platform front, front platform rear), if the main platform reaches its lowest height and if both platforms reach the same level.

The front platform in the front part is equipped with manually foldable adapters. These adapters are equipped with non-powered rollers and provide the possibility to handle all cargo door sizes of different aircraft. In front of the driver's stand at right-hand side the front platform is equipped with two foldable adapters which serve as standing place for the operator while operating aircraft's own transfer system and the loader.

In the down-folded position the adapters have a tilt of 50 degrees. Both length-sides of the front platform are equipped with hand rails.

Lateral guiding is provided by steel guiding rails which can be manually moved from 125 to 60 inches as well as manually swivelled at front platform's front part. The front platform is covered by steel plates and painted with anti-skid cover. The driver's stand is located on the right-hand side outside of the 125 inches guiding width. Both platforms are forced-guided by two guides as well as two rollers which means that even in case of tilting compensation of the front platform there is always a defined distance between both platforms.

For compensation of aircraft's roll and pitch movements the front platform can be tilted by +/- 2 degrees.

2.8 *Covering of the aggregate area*

The front part of the chassis is equipped with a manually removable covering sheet fixed with quick-locks. Having removed the covering, all components necessary for maintenance (oil measuring stick, motor oil filling orifice, engine filter, fuel injection pump, batteries etc.) are easily accessible.

The central switch board including all fuses and relays is located at chassis' front part on the right-hand side. The fuel tank is located on the chassis' left-hand side behind the front axle. Steel-made mud guards for the front wheels can be supplied as optional extra.

2.9 *Hydraulic systems*

For operation and driving procedure the hydraulic oil pressure is supplied by a swivelling power-controlled axle piston pump. The drive system is designed as an open circuit. Hydraulic oil pressure for the steering/brake system is provided by a gear pump with a constant oil flow.

The hydro-constant motor in axial piston is flanged to the drive axle and is powered with hydraulic oil pressure from the main pump via a control valve for the driving direction. In case of no user

engaged, the main pump supplies the hydraulic oil flow in a pressureless circuit back to the hydraulic tank.

All hydraulic valves are centralized in block design, at the chassis or under the platforms. All way-valves are of spool-valved design and have direct current magnets switching in oil. The magnets are eqipped with manual emergency controls and have cube-shaped plugs with check lamps. Except the lifting of the main platform and driving of the loader all handling procedures are with engine-idling speed.

The hydraulic tank is of welded design and equipped with a filling orifice with a ventilation filter as well as visual volume indicator and a drain screw. Two recoil filters located on the tank have a paper filter cartridge with 10 micron filtering, a visual dirt indicator and a bypass control. A hand pump mounted to the chassis on the right-hand side can be used with the corresponding valves to retract the stabilizers and to lower both platforms in case of an emergency operation. All hydraulically powered movements are electrically interlocked so that misoperation is impossible.

For service and repair works the hydraulic system is provided with several hydraulic measuring points. The hydraulic pressure reservoirs, intergrated into the brake system, are designed as diaphragm pressure reservoirs.

All hydraulic pipe connections are made as jointed flanged screw connections acc. to DIN 2353. The hydraulic pipes with bigger diameters are connected with special screwings. The installation of the hydraulic tube is carried out in such a way that all screwings can be tightened with standard tools without having to remove others. All hydraulic hoses are high pressure hoses with steel wire windings acc. to DIN 20023 respective SAE 100 R 9, and are wrapped with protective plastic spiral at areas of possible friction.

2.10 *Electrical systems*

All electric controls are centralized in the central switch board, protection IP 55. The operating current is 24 V (D.C.) and is supplied by two batteries of 12 V, 110 AH, each. The complete electrical system is separated into several separated circuits and secured by standard vehicle fuses acc. to DIN 75281. For activating of the hydraulic valves, plug-type relays with a rating of 4 A are used. The relays can additionally be activated by hand which means that all functions of the loader can also be controlled at floor level from the central switch board. For engine start-stop as well as vehicle lights relays with a rating of 30 A are used. All electrical wiring are water-proof and coded. All limit switches are tight integral casted non-contact proximity switches. All controls at the driver's stand and the operation panel are protected acc. to IP 65.

The lights include:

2 front lights (without high beam)
2 rear lights
4 indicator lights
2 brake lights

3. *Performance, technical data*

Dimensions

Length	12.480 mm
Width	4.325 mm
Height incl. hand rails	2.930 mm
Ground clearance, driving operation	100 mm
Wheelbase	6.553 mm
Width of track, drive axle	2.283 mm
Width of track, rear axle	3.390 mm
Turning radius (most forward edge of front platform with adapter folded down) approx.	12.500 mm
Vehicle own weight (equipped with all poss. options)	30.000 kgs

Loading area

Maximum loading width, front and main platform	3.230 mm
Loading length, front platform	5.060 mm
Loading length, main platform	6.900 mm
Loading length, lateral transfer (10 feet) at front part of main platform	3.150 mm

Lifting heights

Front platform from/to	2.050/5.600 mm
Main platform from/to	508/5.600 mm
Tilting of platform	+/- 2 degrees

Lifting capacity

Front and main platform, max. load	20.000 kgs
Max. admissive surface load	1.000 kgs/sqm
Lateral transfer drive 10 ft.	7.000 kg

Performance data

Lifting time, main platform with max. load (corresponds to a medium lifting speed of 0.11 m/sec.)	45 sec.

Lowering time, main platform with max. load	45 sec.
Lifting time, front platform with operational rpm	30 sec.
Lowering time, front platform	60 sec.
Maximum driving speed	16 km/sec.
Driving speed with lifted front platform and towing speed	6 km/h
Gradability	5 %
Transfer speed longitudinal a nd lateral (adjustable)	18 m/min
Maximum braking efficiency, full speed	25 %
Maximum braking efficiency, one circuit	15 %

Engine*

Air-cooled 5-cylinder Deutz diesel engine with direct injection

type	F5L912
Power acc. to DIN 6270 B2	62 KW
Idling rpm	1.050 rpm
Operating rpm	2.150 rpm
Starter	4 KW 24 V
Genrator	28 V 27 A
Connection box	SAE4

* for further engine types please review chapter 7

Oil filter
Exhauster system with noise protector
Fuel filter

Starting of engine without pre-glowing
Fuel tank 100 ltr.
Electrical fuel indicator at driver's stand
Auxiliary gear pump directly flanged to the engine
Automatic rpm increase by hydraulic cylinder

Drive axle

Planetary steering drive axle type LT51PL75
Manuafactured by Messrs. Kessler with double acting
steering sylinders, Duplex drum brakes
hydraulically powered servo brake, mineral oil resistant
type 410 x 180 DE Perrot

Brake system

Hydraulically operated dual-circuit servo
brake system, manufactured by Messrs. Rexroth

Brake pressure	97 bar
Engagement/disengagement pressure	125/150 bar
Pressure of reservoir	75 bar
Reservoir capacity	1,0 ltr

Steering

Fully hydraulic steering system with Danfoss
Orbitrol steering unit acting on the steering cylinders at the front axle
Safety block with double shock valve

Operating pressure	140 bar
Oil supply from constant pump	max. 18 l/min

Emergency steering effect in case of engine drop down

Tyres/rims

Front axle:

Pneumatic tyre	Michelin 445/65R 22, 5PR20

Rear axle:

Solid-rubber tyrers	18x9x12 1/8 ZST GL GST

Hydraulic system

Hydraulic pressure drive system max.	320 bar
Hydraulic pressure lifting system max.	290 bar
Hydraulic pressure transfer system	160 bar
Control pressure	50 bar
Hydraulic tank capacity	380 ltr.

Filter

Filter at return line mounted onto the hydraulic tank with automatic bypass and visual dirt indicator

Filter densitiy	10 microns
Hydraulic oil flow max.	350 ltr./min.

Ventilation filter mounted onto the hydraulic tank

Return filter I, capacity	300 ltr.
density	10 microns
Return filter II, capacity	80 ltr./min.
density	10 microns
High pressure filter, capacity	10 microns

Main pump

Power controller swivelling axle piston pump,
manufactured by Messrs. Hydromatic

Hydraulic oil flow	250 ltr./min.

Auxiliary pump

Constant pump, gear type, manufactured by Messrs. Rexroth
Hydraulic oil flow 36 + 18 ltr./min.

Drive motor

Hydro-constant motor manufactured by Messrs. Hydromatic

Hydro-motor for transfer systems:

Hydro-constant motor manufactured by Messrs. Danfoss

Hydraulic valves

Direct-acting way valves operated by magnets which are switched in oil, valves can be operated by hand and are equipped with light indicators.
Connections acc. to DIN 24340.

Hydraulic oil

Mineral oil respctive HD- engine oil acc. to API - classification CC

Electrical system

Operation and control voltage	24 V DC
Batteries	2 x 12 143
Alternator	28 V 18
Starter	4 KW 24 V
Fuses	15/10/5 A
Protection circuit	25 A
Bulbs for:	
Front lights	24 V 70 W
Indicators and brake lights	24 V 21 W
Rear lights	24 V 10 W
Control lights	24 V 2 W
Proximity switches	10 - 30 V

For further lights please review chapter 2.10

Components for PC-transfer systems

Transfer rollers	diameter:	152 mm
non-powered rollers	diameter:	63,5 mm

All rollers are made out of steel and are zinc-plated as well as equipped with closed bearings with life-time lubrication.

Chains of transfer system

Heavy duty single chain acc. to DIN 8187 size 3/4 x 7/16 inches.

Friction drives at main platform (option)

Friction wheels (retractable) Vulcolan tyres	diameter:	250 mm
Powered side-rollers	diameter:	127 mm

4. *Safety features*

Electric

If drive system is engaged, it is not possible to extend the stabilizers.

If stabilizers are not fully extended, it is not possible to activate the transfer systems of the platforms or to lift the main platform.

If the stabilizers are extended, the drive system is blocked.

If the brake pressure is too low, the drive system is blocked.

If the front platform is lifted or lowered during driving procedure, the drive system will automatically be inactivated.

If the front platform is lifted, the loader will automatically be decelerated to 6 km/h.

The main platform follows automatically the level of the front platform if this changes its level during the load transfer.

The main platform stops automatically on the same level of the front platform during lifting operation.

All control switches (except lever for drive/lifting procedure and selction lever for driving directions) are in „deadman“ design.

If an emergency push button is activated all movements are automatically interrupted and the engine stops.

If the V-belt is broken, the motor cuts off automatically (option extra).

If the batteries are flat, the loader can be started with an external power socket (optional extra).

Hydraulics

All lifting cylinders are equipped with pilot-controlled non-return valves as well as lowering brake valves both mounted directly to the cylinders.

All stabilizing cylinders are equipped with pilot-controlled non-return valves.

Each hydraulic circuit is equipped with its own pressure release system.

The steering system is supplied with hydraulic oil separately from other hydraulic circuits.

The brake system consists of two circuits as well as pressure reservoirs for emergency braking.

In case of a loss of brake pressure a multiple disc auxiliary brake stops the unit. (option extra).

In case of diesel engine failure all emergency operation can be carried out by using the hand-pump and the corresponding valves.

The loader is provided with an emergency steering system (also operating during pulling of the vehicle).

Mechanics

All walkable areas at the platforms are covered with steel sheets as well as painted with anti-skid cover.

All moving parts are designed in such way that all shearing areas are either protected or colour-marked.

The stops between the platforms extend automatically if both platforms have a different height of more than 60 mm.

All handrails have foot- and knee-protection and the front platform is equipped with extendable parts.

The front platform can be reached in any lifted height by an extendable ladder.

5. *Painting, labelling and marking*

Upon completion the whole loader is painted by sea-water resistant primer.

The single-colour final painting (acc. to customer's requirements) consists of two-component acryl lacquer.

Gaps, corners, hollow space are closed with elastic sealing.

All walking areas are painted with anti-skid cover.

All guiding rails are painted black.

All stops, maintenance rods, drag shoes, lever for hand pump, grease points as well as valves for emergency operation are painted red, the fuel tank is painted green.

All electrical components and wirings are acc. to DIN 40719.

All limit switches as well as magnets are coded at their plugs.

All hydraulic valves as well as measuring points are marked corresponding to the hydraulic schematic.

All marking and labelling is provided with German and English language.

The loader is equipped at its drivers's stand with a vehicle identification plate, the chassis is provided in its front part with the chassis number.

6. *Rules, guidelines, documentation*

The criteria for design, technical layout were carried out acc. to the following:

The general rules of mechanical engineering.

The road regulations of the Federal Republic of Germany (StVO) for brake system, lighting, steering as well as layout of the driver's stand.

The rules of the VDMA (The German engineering institute).

The law concerning the technical workmanship of materials.

The „Deutsche Industrienorm" DIN 18800.

The „Unfallverhütungsvorschrift Deutsche Luftfahrt" (accident prevention law for aviation), and as far as it is possible from the point of view of design the VBG 78.

All parts and components used are mainly German from manufacturers with highest reputation and excellent after-sales services world-wide.

With each unit one complete set of technical documentation will be delivered either in German or English consisting of following:

Adjustment protocol as well as brake test protocol
Function description
Operating instructions
Maintenance instructions
Schematic of hydraulic and brake system
Electric schematics
Adjustment instructions
Trouble shooting instructions
Illustrated parts lists
Sub-suppliers information

7. *Options against extra charge*

7.1 Drive/chassis/brakes

7.1.1. Air-cooled six-cylinder Klöckner-Humboldt-Deutz-diesel engine type F6L912W
7.1.2. Multiple disc brake as emergency brake
7.1.3 Central lubrication system
7.1.4 Towing coupling front and rear
7.1.5. Mud guards for front wheels
7.1.6 Aluminium protection for hydraulic emergency system
7.1.7 Rubber buffer at chassis' front part
7.1.8 Protection at chassis under main platform
7.1.9 Wheel jack
7.1.10 Fire extinguisher

7.2 Front platform

Lateral transfer system

7.3. Main platform

7.3.1 Lateral transfer system for 10 ft. ULDs
7.3.2 Side loading for 20 ft. ULDs one side (incl. option 7.3.1)
7.3.3 Side loading for 20 ft. ULDs both sides (incl. option 7.3.1)
7.3.4 Turning device for one LD container at rear part of main platform (only in conjuction of option 7.3.1 - 7.3.3)
7.3.5 Powered endroller

7.3.6 Platform walkable (including covered platform with anti-skid painting and handrail, removable in case of option 7.3.2 and 7.3.3)

7.4 *Operation, instruments, lights*

7.4.1 Electro hydraulical emergency system
7.4.2 External power socket
7.4.3 Battery main switch
7.4.4 Additional emergency stops
7.4.5 Additional engine start
7.4.6 Reversing light
7.4.7 Position lights at front platform
7.4.8 Working flood light at front platform
7.4.9 Rotating beacon at front platform

7.4.10 Additional position indicators at front platform
7.4.11 Lighting of driver's stand
7.4.12 Lighting of operation panel

7.5 *General Equipment*

7.5.1. Automatic deceleration in case of driving with lifted front platform
7.5.2 Automatic following system of main platform to front platform
7.5.3 Intermittent horn during reversing
7.5.4 Two rear mirrors at front platform
7.5.5 Hydraulically suspended driver's seat
7.5.6 Cover hood for the driver's stand
7.5.7 Winter Kit down to - 40 degrees
7.5.8 Multi-colour painting acc. to customer's requirements
7.5.9 Special labelling and marking acc. to customer's specification
7.5.10 Extra copies of documentation

SUBJECT TO TECHNICAL ALTERATIONS.