



passenger goods/car
lift

MIH/MDH model

TECHNICAL SPECIFICATIONS



ETI-405
V.03
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CONTENTS		PAGE
1.	BASIC DESCRIPTION	4
1.1	Usage	4
1.2	Regulations	4
1.3	Characteristics	5
2.	DETAILED DESCRIPTION	6
2.1	Driving type	6
2.2	Guiding	8
2.3	Sling	8
2.4	Shaft characteristics	8
2.5	Cabin	8
2.6	Car operating panel.	10
2.7	Car doors	11
2.8	Landing doors	11
2.9	Landing operating panels	11
2.10	Control system	12
3.	CONTROL SYSTEM OPTIONS	13
4.	DRAWINGS	15
4.1	Raised view (MIH model)	15
4.2	Raised and front view (MDH model)	16
4.3	Door arrangement (4 panels, MIH model)	17
4.4	Door arrangement (6 panels)	18
4.5	Lift reactions in the shaft	19

1. Basic description

1.1. Usage

Vertical transport of goods and passengers, very useful for Industry and Service sectors. Some examples of the usages:

- ✓ Transport of palletized goods for industrial purposes.
- ✓ Trolley lift in shopping centers.
- ✓ Stretcher-lift in hospitals.
- ✓ Car-lift in residential buildings or public car parks.
- ✓ Transport of loaded forklift truck.



Figure 1. Transport of palletized goods usage.



Figure 2. Car-lift usage.

Both of the models are different technical answers for the same usages. Differences are briefly summarized next:

- **MDH:** It is a direct acting lift, without any ram guiding, any speed governor, no safety gear or lifting chains. Therefore, its assembly is much simpler. We supply it in a run range up to 4 m. **Model MIH will not be supplied within that range.**
- **MIH:** Indirect acting lift, differential relation 2:1, is supplied for runs between 3.7 and 20 m approximately.

1.2. Regulations

Designed and manufactured in accordance with requirements of **Lifts Directive 95/16/CE**, throughout the accomplishment of **Harmonized Norm EN 81-2** and the **Directive of Electromagnetic Compatibility 89/336/CEE**.

1.3. Characteristics

Load	<p>Up to 5,000 kg, minimum nominal load according to cabin dimensions following chart 1.1.A within Norm EN 81-2. Suitability for those 5.000 kg load capacity depends on cabin dimensions and travel. Therefore, this load will not be able to be lifted under certain circumstances.</p> <table border="1" data-bbox="497 481 1244 813"> <thead> <tr> <th>Load nominal Q (Kg)</th> <th>Upper maximum AxB (m²)</th> <th>Q*</th> <th>P</th> </tr> </thead> <tbody> <tr> <td>1,000</td> <td>3.6</td> <td>1,625</td> <td>1,650</td> </tr> <tr> <td>1,500</td> <td>4.8</td> <td>2,375</td> <td>1,850</td> </tr> <tr> <td>2,000</td> <td>6.6</td> <td>3,500</td> <td>2,200</td> </tr> <tr> <td>2,500</td> <td>8.6</td> <td>4,750</td> <td>2,500</td> </tr> <tr> <td>3,000</td> <td>10.6</td> <td>6,000</td> <td>2,900</td> </tr> <tr> <td>3,500</td> <td>12.6</td> <td>7,250</td> <td>3,200</td> </tr> <tr> <td>4,000</td> <td>14.6</td> <td>8,500</td> <td>3,500</td> </tr> <tr> <td>4,500</td> <td>16.6</td> <td>9,750</td> <td>3,800</td> </tr> </tbody> </table> <p>The maximum load admitted in the boarding, during the load and down operations, it won't overcome 80% of the maximum specified load.</p>	Load nominal Q (Kg)	Upper maximum AxB (m ²)	Q*	P	1,000	3.6	1,625	1,650	1,500	4.8	2,375	1,850	2,000	6.6	3,500	2,200	2,500	8.6	4,750	2,500	3,000	10.6	6,000	2,900	3,500	12.6	7,250	3,200	4,000	14.6	8,500	3,500	4,500	16.6	9,750	3,800
	Load nominal Q (Kg)	Upper maximum AxB (m ²)	Q*	P																																	
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3,500	12.6	7,250	3,200																																		
4,000	14.6	8,500	3,500																																		
4,500	16.6	9,750	3,800																																		
Speed	0.2 m/s, 0.3 m/s, 0.4 m/s, 0.5 m/s and 0.6 m/s (depending on cabin dimensions and nominal load).																																				
Stops	Up to 8 stops.																																				
Travel distance	<ul style="list-style-type: none"> • MDH (direct acting lift): For travels up to 4 m approximately, depending on pit depth and headroom height. This model is supplied for this travel range when suitable. For longer run distances, MIH is supplied. • MIH (indirect acting lift): Between 3.7 and 20 m. Check for longer travel distances. 																																				
Power supply	400 V ± 5% 3-phases, 50/60 Hz. Ask us for other voltage possibilities. Y-D starting always included within the basic standard equipment.																																				
Fixations	The fixation of the elevator to the shaft will be made through fixations that don't specify of welding, since it is designed with screwed unions.																																				
Anchorajes	The supplied anchorages are for massive concrete walls.																																				

2. Detailed description

2.1. Driving type

Description

- **MDH:** Hydraulic, direct action, by means of two opposite cylinders.
- **MIH:** Hydraulic, indirect action (differential ratio 2:1), by means of two opposite cylinders and four high performance lifting chains with a plate combination of 6x6, depending on the load to be lifted.

Load to be lifted (kg)	Diameter	Breaking load (kN)
From 1,000 to 2,500	1"	210
From 3,000 to 4,000	1¼"	310



Figure 3: Cylinders in inner room (MIH).

Cylinders

Single cylinders with lower hydraulic buffers, with interconnected stop valves for the simultaneous closing of both valves in case of performance. Oil inlet located in the lower part of the cylinders. **They can be supplied in two parts (with joint).**



Figure 4. Cylinders in inner room (MDH).

Hydraulic power unit

Hydraulic unit with motor soaked in oil, screw pump (low noise), valve block with all safety measures specified in EN 81-2, identification and instructions plates included in the unit.

Three available dimensions, depending on pump flow and oil capacity required by the cylinders:

- 500x800x950 (height)
- 500x1,000x1,200 (height)
- 500x1,200x1,400 (height)

Pipes

- **Rigid:** pipes according to DIN 2391, steel St-37.4 (NBK). The standard supply includes 6 m of main pipe, a diverting joint for the pit and 3 m of cylinder connection pipes. The necessary elbows are not included in the standard supply.

- **Flexible:** hydraulic hoses with double metallic mesh. Same composition as the previous one. Fixations for the flexible pipes are included.

Available options

- An **Oil Cooler** is necessary in case of more than 20 starts/hour of continuous operation. Its sizing depends on the kind of usage given to the unit (moderate or intensive) and the load to be lifted. In the case of an overuse, the power unit can support a higher number of starts per hour. Electric control unit, interconnection hydraulic hoses and cooling unit are supplied.



Figure 6. Re-Levelling with Auxiliar Motor

- **Emergency Motor-Pump Group:** Supplementary hydraulic system, intended for lifts MIH ó MDH used for car lifting. The objective of this supplementary system is to operate in case of breakdown of the main thrust unit. Unit speed when using this system is 0.1 m/s approx. This system is made of a motor-pump and a valve block of single speed. This is placed in the power unit itself. It does not work as an independent levelling system.



Figure 8. Double switched power unit.

- **Oil tank heater:** Resistor with control thermostat, for heating the oil in the oil tank. It is an adequate option when the hydraulic unit suffers extreme low temperatures. Oil temperature should be higher than 15 °C.



Figure 5. Air cooler and controller

- **Re-Levelling with Auxiliar Motor:** This is an additional hydraulic system, intended for goods lifts loaded with forklift trucks. It increases the precision of the levelling and make it quicker. This feature is only available for MIH. The leveling is performed in a much more precise stop interval (± 15 mm of the stop level). This is achieved by means of a direct additional motor-pump assembly without valve block and not controlled by the Y-D starting system in the main motor. This motor-pump is to be located in the power unit itself.



Figure 7. Emergency motor-pump group.

- **Double switched power unit:** Supplementary hydraulic unit intended for lifts MIH or MDH used for car lifting. It is based on fitting two interconnected hydraulic units. They can operate either together or keeping one for emergencies.

2.2. Guide rails assembly

By means of two ISO 7465 calibrated guiding rails, depending on load:

Load to be lifted (kg)	Guide	Dimensions (mm)
From 1,000 to 2,000	T90/B	90 x 75 x 16
From 2,500 to 3,500	T125/B	125 x 82 x 16
From 4,000 to 5,000	T127/3B	127 x 89 x 16

Guides are prepared to be fitted by guide clamps to the guide brackets.

2.3. Sling

Formed by two frames hanging on one cylinder each. Car floor leans on four structural lower beams, (two central plus two below the boardings). Central beams are fixed directly to the sling frames and so are the braces supporting the boarding beams. The slings run through the guide rails by using Sliding shoes. A safety gear acting by over speed governor are used in case of MIH (indirect acting lift). The over speed governor is prepared for reset and remote activation.

2.4. Shaft characteristics

All necessary materials are supplied for installing the elevator (guide brackets) to massive concrete walls. The guide brackets must be fit to the wall in two possible ways:

- Anchorages for structural concrete (minimum H-250), type HILTI M16 (supplied)
- Also can be fitted to a shaft metallic structure, by welding the fittings.

Refer to page 19 to calculate reactions in shaft.

2.5. Cabin

Consists on easy-to-assemble modules, made of steel sheets.

Walls and roof

Modules finished in baked-enamel (epoxy-polyester) paint.

Finishing options:

- Standard: Light grey RAL 7032; rough texture (embossed).
- Stainless Steel sheet
- Color non standard
- Galvanized sheet



Figure 9: Cabin steel finishing.

Dimensions

Dimension	Symbol	Measure		
		Minimum	Maximum	
Width (mm)	A	Minimum	1,500	
		Maximum	$2,800 \leq A \leq 2,850$	For Q $\leq 5,000$ Kg
			$2,850 \leq A \leq 2,900$	For Q $\leq 4,500$ Kg
			$2,900 \leq A \leq 3,000$	For Q $\leq 4,000$ Kg
			$3,000 \leq A \leq 3,150$	For Q $\leq 3,500$ Kg
			$3,150 \leq A \leq 3,250$	For Q $\leq 3,000$ Kg
$3,250 \leq A \leq 3,450$	For Q $\leq 2,500$ Kg			
Depth (mm)	B	Minimum	1,600	
		Maximum	6,000	
Height (mm)	H	Standard	2,200	
		Maximum	2,850	

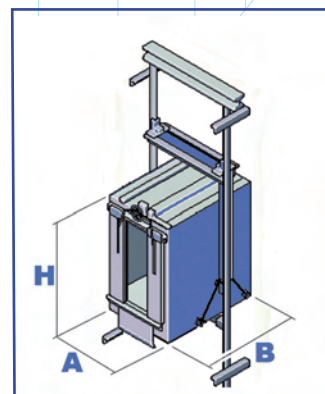


Figure 10: Cabin dimensions diagram.

Drawings in pages 15 to 18.

Entrances

1 or 2 cabin entrances (refer to pages 16 to 18).

Protections

Side protections. **Options:**

- Stainless grooved steel sheets.
- Wooden protections.



Figure 11: Cabin wooden protections

Floor

Steel grooved sheets 4 mm thick, standard primer finish. **Two finishing options:**

- Stainless grooved steel sheets.
- Spotted black gum cover.

Lighting

Two roof light units with prismatic diffuser ready to get embedded.

Two fluorescent lines in each unit (2 x 18 W), installed power 72 W.

Optional automatic switch off, for energy saving.



Figure 12: Cabin lighting

Other options

- **Emergency trap door:** Rescue on ceiling on the cabin room intended for passengers rescuing. Its measures are: 350 x 500 mm and would have a mechanical locking activated by electric control. It can be opened from the inside by means of a triangle-shaped key. It accomplishes with EN 81-2 requirements.
- **Usable Door Measures=Cabin Measures (Height and/or Floor Opening Clearance):** This is a constructive solution for avoiding bumping the entrances when downloading the cabin. There are three different possibilities:
 - Door opening clearance equal to cabin width.
 - Door height equal to the cabin one.
 - Both previous possibilities together.
- **Off Centre Car Doors:** Cabin prepared for shipments asymmetric with respect to the cabin central axle. There would be to indicate the diversion of the doors and in which direction they are to be corrected.
- **Car Doors with Different Clear Opening at Both Entrances:** Double entrance cabin (180° entrances) in which both doors have different clear opening.
- **Different Clearance Between Cabin and Shaft Walls to Both Sides:** Guide brackets for cabin and cylinder guide brackets are supplied specially for different DH measurements at both sides. Clearance DH is the distance between the shaft wall and the outer wall of the cabin. Refer to attached drawings.
- **Pit Ladder:** Ladder with enough length in order to allow secure access to the pit.

2.6. Car operating panel

Detailed description



Figura 13: Cabin button panel.



Figure14: Stamped plate in panel.

- ✓ Made of stainless steel.
- ✓ Anti-vandal push buttons.
- ✓ Opening door, emergency and sound alarm pushbuttons.
- ✓ Emergency light incorporated.
- ✓ Position indicator with 7 segment display.
- ✓ Cabin light and Emergency cabin light, overload sound signal and and microphone for the inter-communicator.
- ✓ Double button panel in the case of double cabin shipment or long cabin distance B.
- ✓ **Key push buttons; (option under previous order).**
- ✓ **Plate for engraving logotypes, names, CE mark, etc...** Stamping service is available, but it is necessary sending data to Hidral.

Two way intercom

There is option for supplying a **two way intercom** placed in the car operating panel (accomplish-ing EN 81-2). There is option for remote programming of the emergency telephone as other operation features. A shared phone line can be used. Alarm push buttons are supplied. They are located on the roof and under de cabin frame, for rescues in case of someone getting trapped in the shaft.

There is chance for supplying a supplementary intercommunicator for communications with the machine room.

There is also chance for supplying a two way intercom for accomplishing the harmonized regulation EN 81-28. In case of ordering this option, bear in mind that it is required that the emergency call switching board is equipped with the necessary features to get calls from this special intercom.

In addition to the previous, in the standard equipment is included a sound siren that gets activated when pressing the emergency button in the cabin button panel.

2.7. Car doors

We supply doors type Selcom of 4 and 6 panels. The car door type 8 panels, with central opening will be supplied made by Fermator. Cabin can be adapted to doors type Fermator of 4 and 6 panels.

Types	Automatic telescopic , 4, 6 and 8 (8 panel type only by Fermator). Central opening with no spy hole. Doors with electronic control and with regulation of opening and closing speed and regulation of acceleration ramps.
Finishing	Epoxy paint. Stainless steel (optional, check our prices).
Dimensions	Standard clearance height: 2,000 mm Maximum height: 2,800 mm Standard dimension: Maximum clear opening (3,000 mm maximum) = Cabin with (A) – 100 mm. Check previous available options referred to “ Usable Door Measure = Cabin Measure (Width Clearance and/or Height) ”.
Sills	A standard door tracking sill made of a hollow aluminum frame, suitable for car wheels or light load shipment, is supplied. <ul style="list-style-type: none"> • A strengthened aluminium sill can be supplied optionally, suitable for rubber tyres with $\varnothing > 300$ mm, appropriate for a maximum load of 800 kg per wheel. • A strengthened steel tracking sill can be supplied optionally (even stainless steel tracking sill). This option is recommended for load shipment by means of forklift trucks (wheels $\varnothing < 300$) and loads between 800 and 2,000 kg per wheel (depending on the kind of step supporting).

2.8. Landing doors

Same description as for the cabin doors. We supply doors type Selcom with 4 and 6 panels. There is a central opening door with 8 panels type Fermator.

2.9. Landing operating panels

Detailed description

- ✓ Stainless steel.
- ✓ Anti-vandal pushing button.
- ✓ Presence light (green) and engaged light (red).
- ✓ It is a wall mounted push button panel.
- ✓ Key push button (option under ordering).
- ✓ Check for optional engraving (logotype, name, etc...).

Optional remote controls.

They perform a landing call. There are two options for remote controls:

- The one that allows calling the cabin to just one floor (ground floor normally).
- The one that allows calling the cabin to every available floor. Every user would have access to just two of them.



Figure 15: Key pushing button.



Figure 16: Landing button panel lights.

2.10. Control

Description

- ✓ Simple universal hydraulic control by means of push-buttons.
- ✓ Maneuver controls into metallic closet controlled by means of a PLC (programmable logic controller).
- ✓ Magnetic switches are used to stop the lift at landings and to lower the speed before stopping.
- ✓ Relevelling with doors opened is available.
- ✓ Automatic call to ground floor after 10 minutes in case the lift has not been in use during this period of time.
- ✓ Automatic run to ground floor after 10 minutes.
- ✓ Prepared for coupling to pre-fitted pluggable electric installation.
- ✓ Landing level Indication and Malfunction Indication shown on the PLC by means of light indication codes.
- ✓ Easy maintenance and repair.

Electric installation

Installation can be supplied under two options:

- To be wired up wire by wire, supplying enough length of cable.
- **Pre-fitted pluggable installation.**

Power

The following chart shows the maximum needed power supplied with the lift, depending on load and speed criteria. It shows the maximum possible value, as they can vary depending on cabin dimensions and the travel length. These are values to 400 V, 50 Hz and 3-phases.

	1,500 kg	2,000 kg	2,500 kg	3,000 kg	3,500 kg	4,000 kg	4,500 kg	5,000 kg
0.2 m/s	12 kW/27A	16 kW/35A	16 kW/35A	16 kW/35A	20 kW/42A	24 kW/42A	24 kW/50A	24 kW/50A
0.3 m/s	16 kW/35A	20 kW/42A	20 kW/42A	24 kW/50A	29 kW/60A	29 kW/50A	33 kW/70A	40 kW/81A
0.4 m/s	20 kW/42A	20 kW/42A	24 kW/50A	29 kW/60A	40 kW/81A	40 kW/81A	-	-
0.5 m/s	24 kW/50A	29 kW/60A	33 kW/70A	40 kW/81A	-	-	-	-

The shown power is given by the motor within its axle (useful power). The motor consumption power is higher and is reflected through the indicated intensity of nominal consumption. Check power for 0.6 m/s speed.

Additional protection

- ✓ Against inversion or lack of phases.
- ✓ Against motor overheating by means of thermostors.
- ✓ Against oil overheating (70 °C).
- ✓ Maximun running time between floors.
- ✓ Control blockages due to contactor (power switch) failures or by the activating of the Top limit switch.
- ✓ Overload device.
- ✓ Landing door unlocking zone indication for rescuing operations.
- ✓ Automatic recovery if power supply fails.
- ✓ Electric anti-creep device according EN 81-2.
- ✓ Proteccions against free fall and descent with excessive speed and creeping of the car. Instant safety gear, over speed governor and rupture valve.
- ✓ Protections against lifting chain breaking, placed at chain terminals.
- ✓ Temperature relay in machine room –option under request-.
- ✓ Acoustic alarm.

3. Control system options

Standard fire alarm control option

The controller is prepared for exclusive use of fire-fighters in case of fire emergency. This maneuver is designed under the conceptions of normative EN 81-72. This option includes:

- One of the landing operating panel button panels will have a key for exclusive emergency use. This key can be substituted by an entry in the control panel suitable for a signal coming from a unit of automatic detection of fire. When any of these devices gets activated, the cabin will run to the floor designed for evacuation, remaining there with doors open.
- Priority key in the car operating panel. When activated, the movement of the unit is restricted, only the person who is dealing with the car operating panel would have control, even when the condition described in the previous paragraph is still in effect.

Duplex control

This option is available for coordinating two lifts working in parallel. This operation guarantees that the nearest lift attends the call.

Up and down collective control

Lifts are supplied with a selective maneuver for ascends and descends. Such option incorporates call register and memory for incoming calls from cabin and floor, in order to deal with them in a sequenced way. **Not recommended for car-lifting use.**

Priority key in Cop

Car operating pane is supplied with a priority key. When activated, the lift is exclusively controlled by the car operating panel. It would not attend floor calls.

Gong when arrives at floor level

This option includes acoustic signal at floor levels to warn the arrival of the cabin. It is an indicator of cabin presence.

Direction indicator arrows in car operating panel

Two indicator lights are supplied with every car operating panel. They show both senses of movement. One of both arrows will light on depending on the movement direction.

Selective boarding control

It is only available for cabins with two shipment entrances (180°). This option allows the user to decide which door would get opened when arriving to a floor with two available entrances, for private car parks, etc. In the car operating panel there will be doubled pushing button (key) for every floor with doubled door. Every pushing button would identify one of the floor entrances.

Traffic light system

This system indicates the state of the lift in order to know if you can get into the cabin as soon as it arrives to your floor by means of an external signal (traffic light is compounded by a traffic light device with a red and a green light, placed in the chosen floor, normally in the ground floor. Meaning of the lights:

Green light:

- When the cabin is at the service floor, unloaded and with the doors closed.
- When cabin is moving towards the floor where the traffic lights are, with no load on it.
- When cabin is unloaded, placed in the floor where traffic lights are and with doors opened.

Red light: All the rest of situations.

Additional traffic lights can be ordered for every floor, not only for the ground floor.



Figure 17: Traffic light.

Car parking helping system

This system is used for vehicle alignment into the cabin in order to avoid hitting the cabin and door panels. For centering the vehicle, photocells at shipment entrances and two light indicators with direction arrows (<--, -->) in the car operating panel are used. Whilst one of the photocells is operative, with a car standing in the way, the arrow indicates the correct sense in which the car is to move in order to clear the photocell.



Figure 18: Cabin button panel

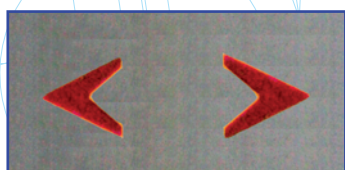


Figure 19: Vehicle alignment indicators

Automatic door opening in case of electric breakdown

Electric device in the cabin doors actuators designed for automatic door opening in the ground floor, in the case of a power failure.

Extractor fan

Smoke extractor for the cabin. It starts when cabin is moving in between floors. By using the smoke extractor, a CO₂ detection device becomes unnecessary, as cabin keeps well ventilated.

Machine room temperature relay control

This is an electronic relay, installed into the maneuver control panel that controls temperature into the machine room. In the case of temperatures under -5 °C or above 40 °C, the relay blocks acceptance of lift calls. This accomplishes section 0.3.15 of EN 81-2.

Positional display in landing

This positional device show the floor where the cabin is. It is supplied with the unit and shows the same value as the cabin positional device.

Light barrier

These optical barriers avoid door closing when an obstacle is detected. We supply barriers type MEM-CO. One barrier per cabin door is supplied.

Shaft lighting

Shaft system which gives sufficient level of lighting. A switch is included in the machine room and another one is supplied to be installed into the pit; in addition a double line of lights are to be installed at one side of the lift shaft.

Supply without electric material

There is given neither the electric control panel, neither the pre-mounted installation, neither the operating panels.

The hole in the operating panels cloth will be the standard of our design (consult us).

4. Drawings

4.1. Raised view of MIH model with central opening doors of 4 or 6 panels

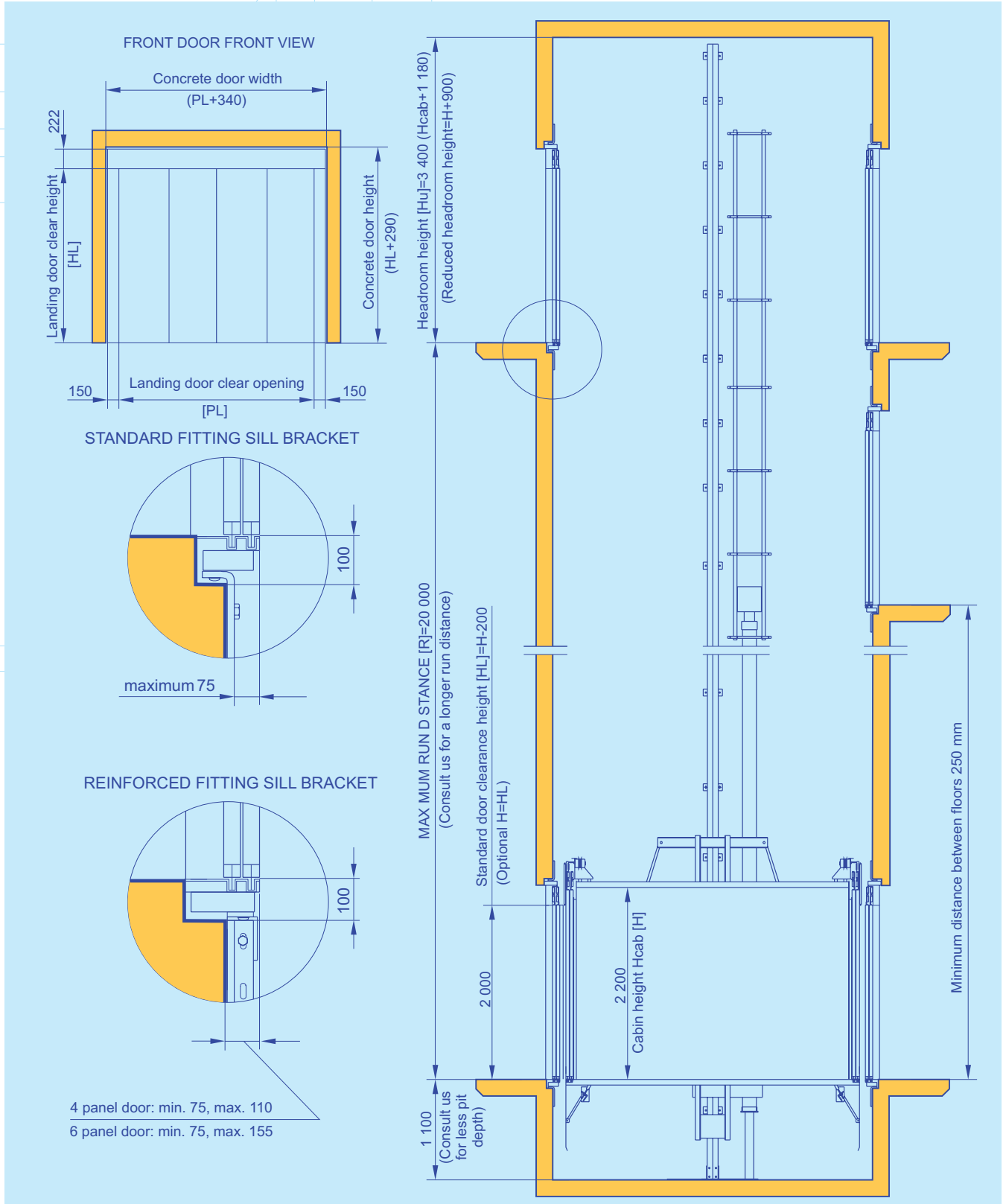


Figure 20: Example of standard measure, Cabin Height = 2,200 mm. Supplied doors type SELCOM.

4.2. Raised view and front view of Model MDH with doors of 4 or 6 central opening panels

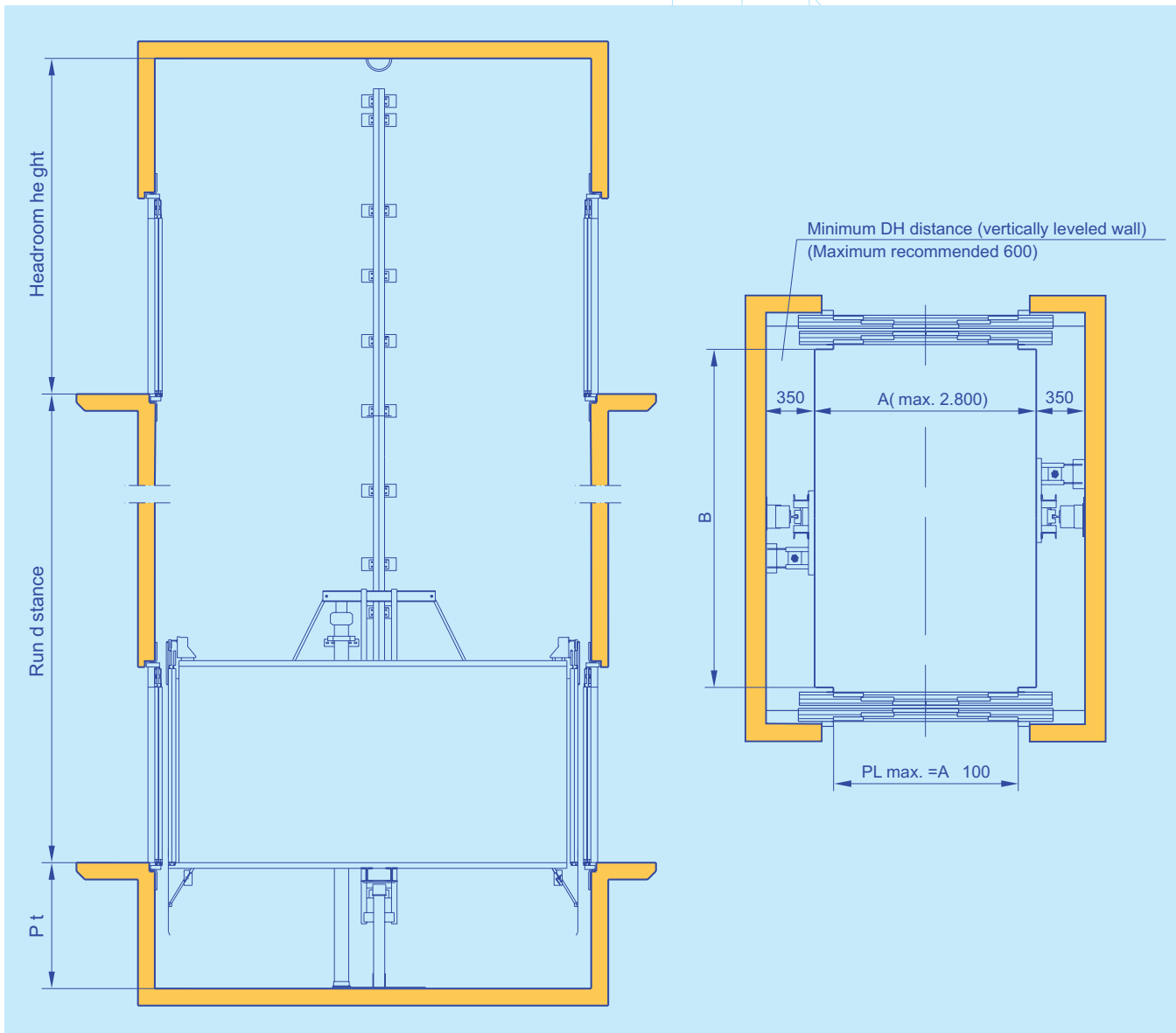


Figure 21: This model is a direct acting lift, only valid in the travel range described below. For this travel range we supply this model, but not MIH model (indirect acting lift). This model is simpler than the MIH one as it has no drive chains, pulley headstocks, speed restrictors, nor cylinder guides. We supply doors type SELCOM.

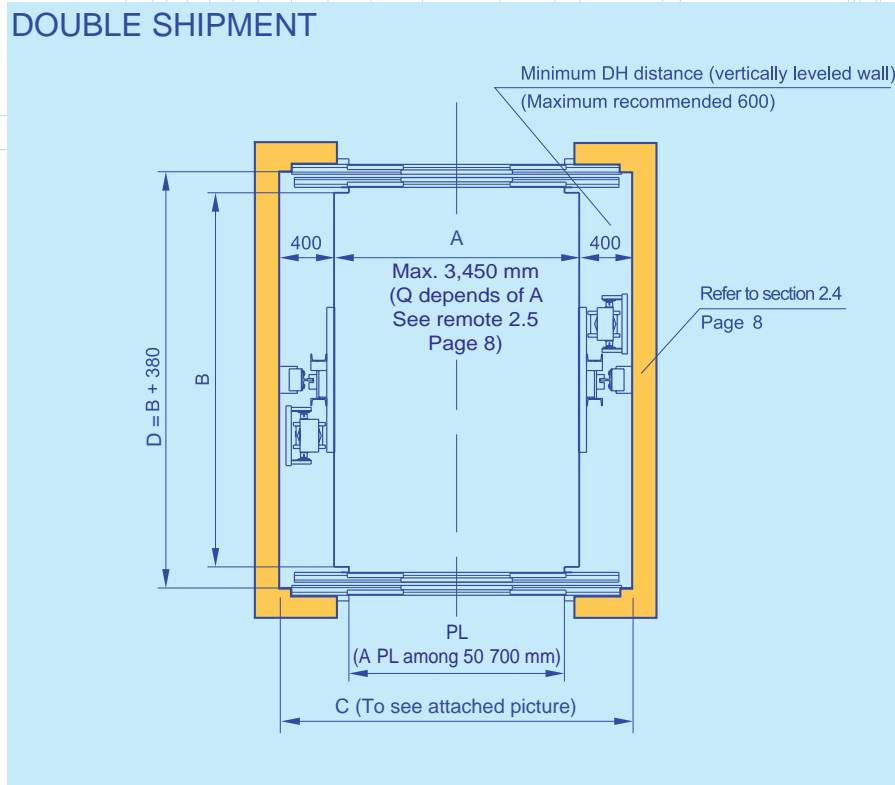
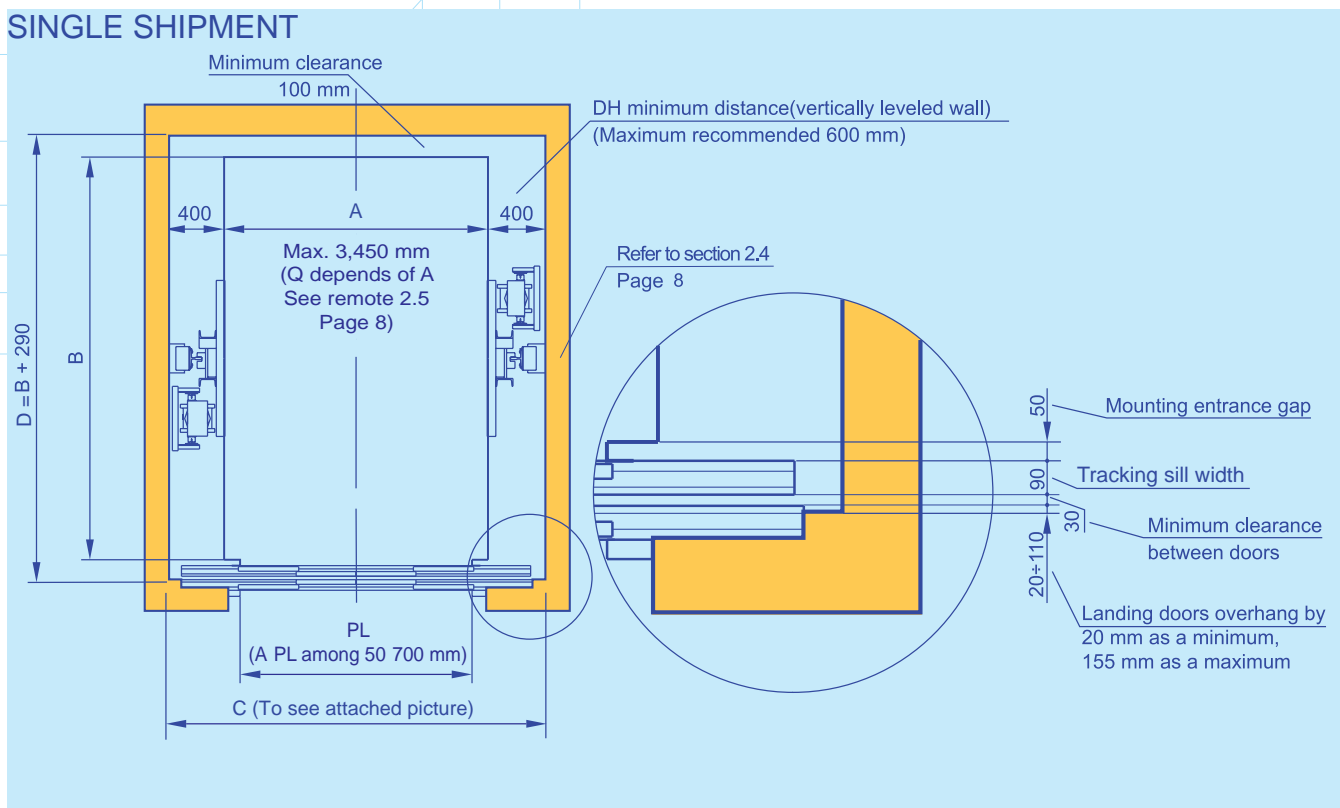
The travel for this lift has to be designed depending on the pit and the headroom height; for this, we have two different formulae according to the given headroom height:

Pit	Headroom height ⁽¹⁾	Travel
1,100 mm ≤ Pit ≤ 1,800 mm	Headroom height ≤ 3,650 mm	Travel ≤ Pit + Headroom height - 1,000 mm
	Headroom height > 3,650 mm	Travel ≤ Pit + 2,650 mm

(1) Accomplishing Headroom height EN 81-2 = Cabin height + 1,120 mm. In the case of shorter Headroom height we offer an option of reduced Headroom height = Cabin Height + 900 mm, but additional measures are to be taken in order to compensate this situation.

Note: For further data, refer to next pages.

4.3. Arrangement with telescopic central opening doors of 4 panel (MIH model)



C = It must be the maximum figure from both expressions below:

- a) $A+800$ or
 - b) $1,5 PL+150$ *
- *(except for $PL=1.200, 1.500, 1.800$ or 2.400 that must be $1,5 PL+180$)

PL = Width clear opening
Optional $A=PL$

Nominal load Q (kg)	Maximum area ⁽¹⁾ A x B (m ²)
1,000	3.60
1,500	4.80
2,000	6.60
2,500	8.60
3,000	10.60
3,500	12.60
4,000	14.60
4,500	16.64 ⁽¹⁾
5,000	12.00 ⁽¹⁾

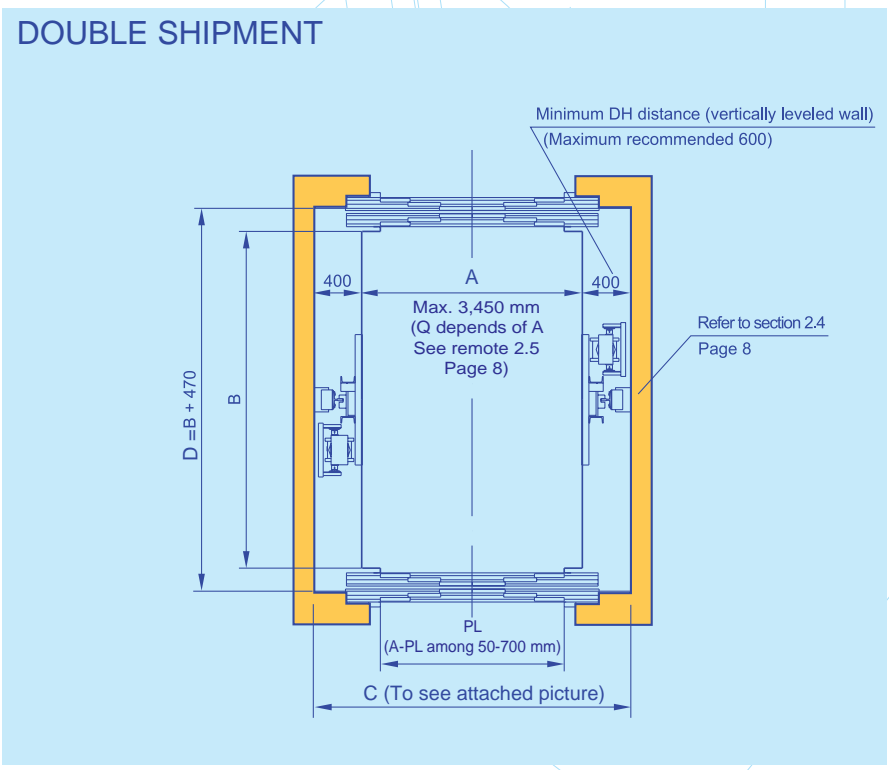
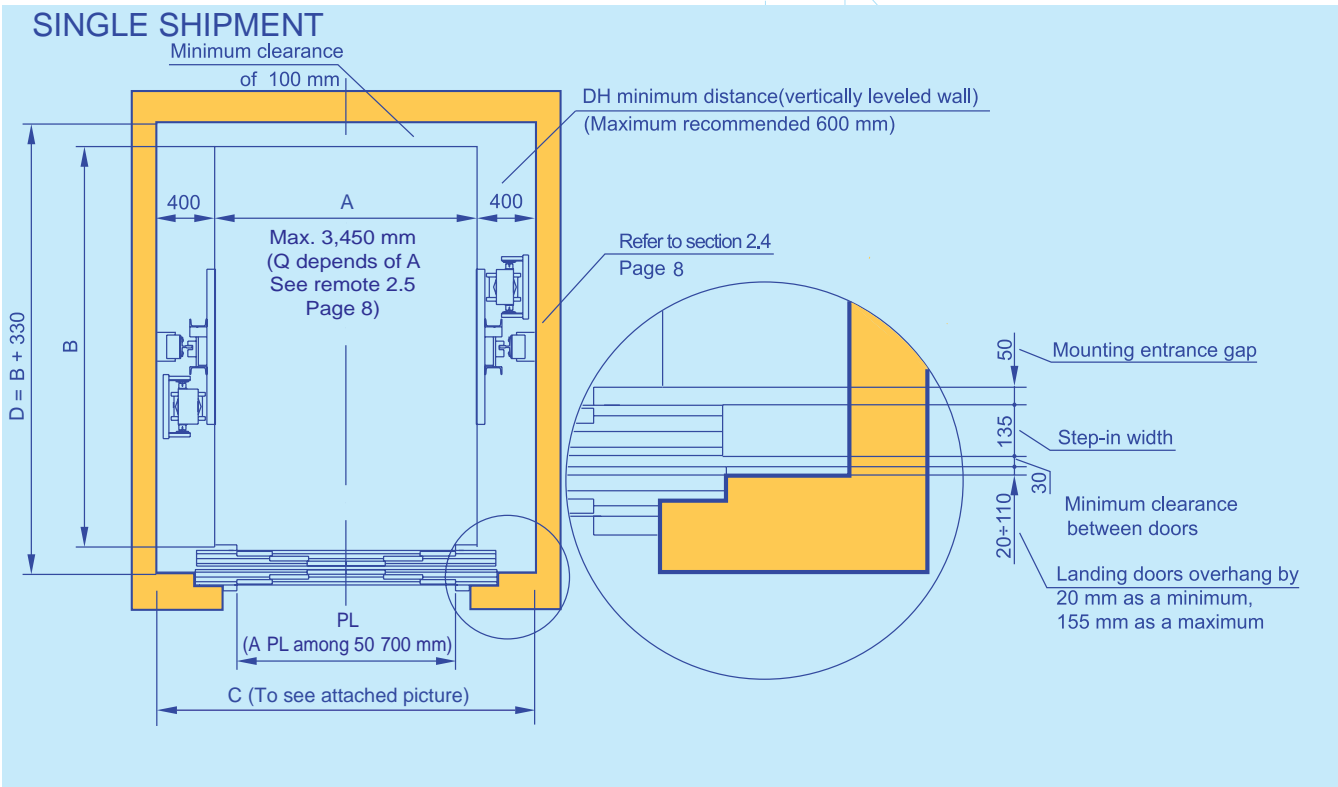
⁽¹⁾ Following chart 1.1. A of normative EN 81-2

⁽¹⁾ Limitation by product design for $R \leq 6,800$ mm. For more travel distance, is necessary to reduce the area for lowering the unloaded cabin weight (P).

[Recommended cabin $H=2,200$ mm].

Figure 22: Minimum dimensions of lift shaft (ground plan). Central automatic actuator of 4 panels in cabin. Automatic doors of 4 panels for central opening in landings.

4.4. Arrangement with telescopic central opening doors of 6 pa-



C = It must be the maximum figure from both expressions below:
 a) $A+800$ or
 b) $4/3 PL+150 *$
 *(except for $PL=1,500, 1,600, 1,800, 2,300, 2,600$ or $2,700$ that must be $4/3PL+200$)

PL = Width clear opening
 Optional $A=PL$

Nominal load Q (kg)	Maximum area ⁽¹⁾ A x B (m ²)
1,000	3.60
1,500	4.80
2,000	6.60
2,500	8.60
3,000	10.60
3,500	12.60
4,000	14.60
4,500	16.64 ⁽¹⁾
5,000	12.00 ⁽¹⁾

⁽¹⁾ Following chart 1.1. A of normative EN 81-2
⁽¹⁾ Limitation by product design for $R \leq 6,800$ mm. For more travel distance, is necessary to reduce the area for lowering the unloaded cabin weight (P).
 [Recommended cabin $H=2,200$ mm].

Figure 23: Minimum dimensions of shaft (floor plan). Central automatic actuator of 6 panels in cabin. Automatic doors of 6 panels for central opening in landings.

4.5. Lift reactions in the shaft

$$R_x (N) = 10 \times \frac{Q \times B / 8}{2 \times L} \times 3$$

$$R_y (N) = 10 \times \frac{Q \times A / 8}{L} \times 3$$

$$R_z (N) = 10 \times \frac{P + Q_m}{2} \times 2$$

$$\text{MIH: } R_c (N) = 10 \times (P + Q_m) \times 2$$

$$\text{MDH: } R_c (N) = 10 \times (P + Q_m)$$

$$R_g (N) = 10 \times \frac{P + Q_m}{2} \times 3$$

$$R_a (N) = 10 \times \frac{P + Q_m}{2} \times 4$$

Nominal load Q (Kg)	S (m ²)	Q* (Kg)	P (Kg)
1,000	3.6	1,625	1,650
1,500	4.8	2,375	1,850
2,000	6.6	3,500	2,200
2,500	8.6	4,750	2,500
3,000	10.6	6,000	2,900
3,500	12.6	7,250	3,200
4,000	14.6	8,500	3,500
4,500	16.6	9,750	3,800

- A and B (mm): Cabin dimensions.
- Q (kg): Nominal load.
- S (m²): Cabin surface.
- P (kg): Unloaded cabin weight; see chart.
- Q* (kg): Load according to EN 81-2 chart 1.1; see chart.
- Q_m (kg): Máx. (Q, Q*).
- R_y (N): Reactions at cabin guides supports.
- R_z (N): Reactions at cylinder head, MIH model.
- R_c (N): Reactions at cylinder base.
- R_g (N): Reactions at guide base.
- R_a (N): Reactions at damper base.

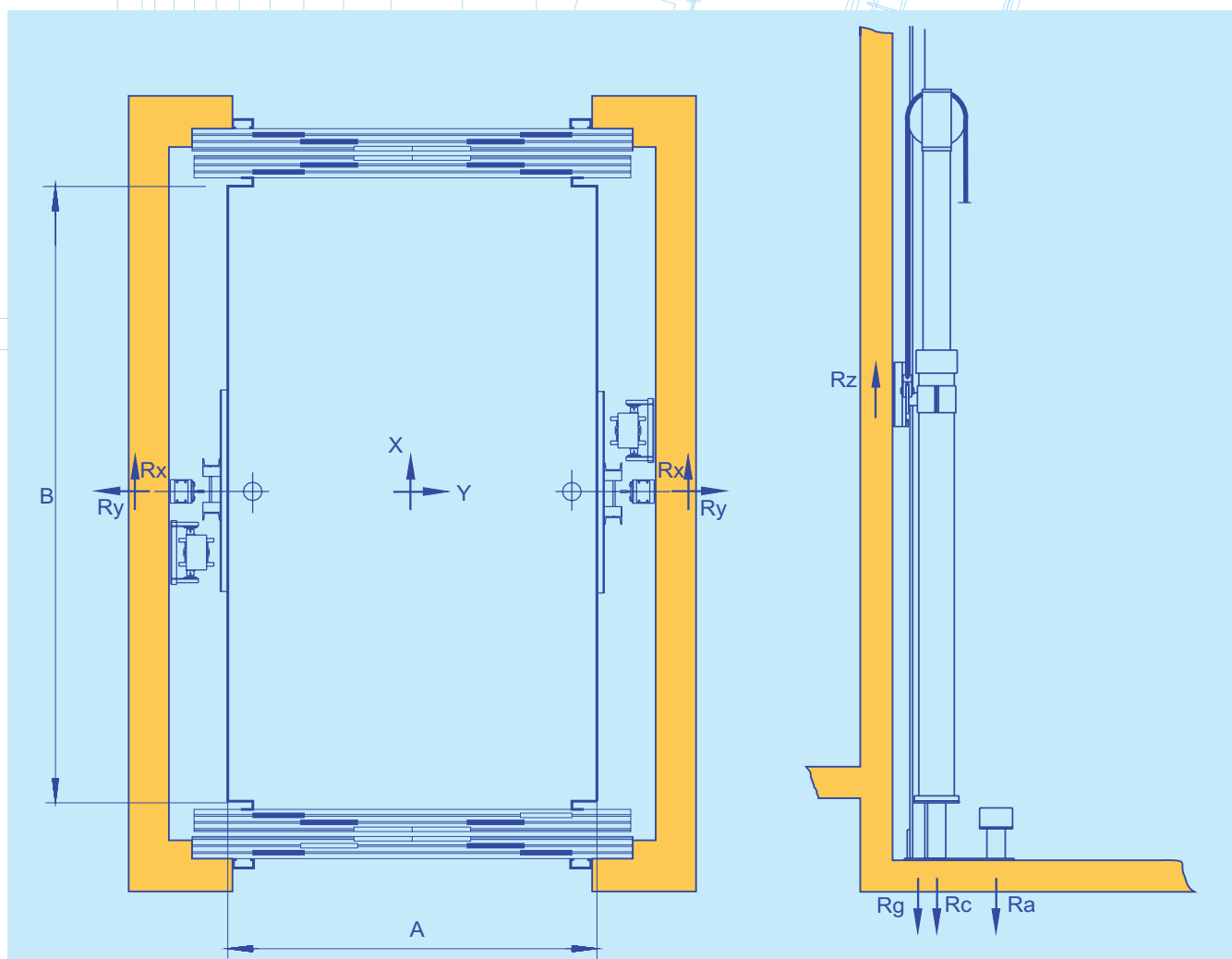


Figure 24: Lift shaft reactions



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