

LIDL LUTON – 7081

MJM CONSULTING ENGINEERS

DESIGN PHILOSOPHY LUTON MODULAR WAREHOUSE UK

Revision A

		Checked	Approved
Revision A	First issue	MF	MND

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PRELIMINARY REMARKS

This structural design philosophy has been prepared by MJM Consulting Engineers Ltd for Lidl UK GmbH. It serves to provide guidance on the structural design aspects of the new Lidl Modular Regional Distribution Centre in Luton.

This design philosophy is to be read in conjunction with all other design information pertaining to the detailed design and construction of this Lidl (Modular) Regional Distribution Centre.

INTRODUCTION

The purpose of this structural design philosophy is to define the general methodology, criteria and data for the design of Lidl RDC warehouse at Luton. A full set of calculations must be submitted to MJM Consulting Engineers Ltd for review prior to construction of each element.

MAIN DESIGN CODES

- BS EN 1990:2002+A1:2005 – Eurocode – Basis of structural design.
NA to BS EN 1990:2002+A1:2005
- BS EN 1991-1-1:2002 – EUROCODE 1: ACTIONS ON STRUCTURES. GENERAL ACTIONS – DENSITIES, SELF-WEIGHT, IMPOSED LOADS FOR BUILDINGS.
NA to BS EN 1991-1-1:2002.
- BS EN 1991-1-3:2003+A1:2015 – EUROCODE 1: ACTIONS ON STRUCTURES. GENERAL ACTIONS – SNOW LOADS.
NA to BS EN 1991-1-3:2003.
- BS EN 1991-1-4:2005+A1:2010– EUROCODE 1: ACTIONS ON STRUCTURES. GENERAL ACTIONS – WIND ACTIONS.
NA to BS EN 1991-1-4:2005.
- BS EN 1991-1-5:2003 – EUROCODE 1: ACTIONS ON STRUCTURES. GENERAL ACTIONS – THERMAL ACTIONS.
NA to BS EN 1991-1-5:2003.
- BS EN 1991-1-6:2005 – EUROCODE 1: ACTIONS ON STRUCTURES. GENERAL ACTIONS – ACTIONS DURING EXECUTION.
NA to BS EN 1991-1-6:2005.
- BS EN 1991-1-7:2006+A1:2014– EUROCODE 1: ACTIONS ON STRUCTURES. GENERAL ACTIONS – ACCIDENTAL ACTIONS.
NA to BS EN 1991-1-7:2006.
- BS EN 1991-2:2003 - Eurocode 1: Actions on structures. Traffic loads on bridges (incorporating corrigenda December 2004 and February 2010).
NA to BS EN 1991-2:2003.
- BS EN 1992-1-1:2004+A1:2014 – EUROCODE 2: DESIGN OF CONCRETE STRUCTURES. GENERAL RULES AND RULES FOR BUILDINGS.
NA to BS EN 1992-1-1:2004+A1:2014.

- BS EN 1992-3:2006 – EUROCODE 2: DESIGN OF CONCRETE STRUCTURES. LIQUID RETAINING AND CONTAINMENT STRUCTURES.
NA to BS EN 1992-3:2006.
- BS EN 1993-1-1:2005+A1:2014 – EUROCODE 3: DESIGN OF STEEL STRUCTURES. GENERAL RULES AND RULES FOR BUILDINGS.
NA to BS EN 1993-1-1:2005.
- BS EN 1993-1-10:2005 – EUROCODE 3: DESIGN OF STEEL STRUCTURES. MATERIAL TOUGHNESS AND THROUGH-THICKNESS PROPERTIES.
NA to BS EN 1993-1-10:2005.
- BS EN 1994-1-1:2004 – EUROCODE 4: DESIGN OF COMPOSITE STEEL AND CONCRETE STRUCTURES. GENERAL RULES AND RULES FOR BUILDINGS.
NA to BS EN 1994-1-1:2004.
- BS EN 1997-1:2004+A1:2013 – EUROCODE 7: GEOTECHNICAL DESIGN. GENERAL RULES.
NA to BS EN 1997-1:2004+A1:2013.

PROJECT DESCRIPTION

It is proposed to construct a new Lidl distribution centre in Luton. The new distribution centre consists of a single storey warehouse with ambient and cold storage areas, a first floor warehouse area, two storey administration & canteen, plant room, a recycling area and docks on three side of the building. A bridge link from the car parking area to the administrative area and reception in the RDC building.

SITE LOCATION

The site is at Woodside Link, Chalton, Central Bedfordshire, East of England, LU4 9TX

STRUCTURE FORM

5.1 Superstructure - Steel frames

The warehouse is constructed using steel trusses varying in span. The overall width of the structure is approximately 200m. The typical bay dimension along the building is 8.2m or 8.0m giving an overall length of approximately 500m. The roof trusses support roof beams at max 5.1m centres that in turn support a profiled structural metal deck roof. UC columns provide support for the trusses and in turn transfer loads into the foundation.

Generally, all perimeter columns are founded at a level of -1.75m below FFL to suit dock levellers and internal columns are at a level of -0.45m below FFL. Internal columns are founded at -0.8mm below FFL at freezer and future freezer areas.

Upper floor areas forming the plant deck/Plant recess roof, break out area and administration/canteen are constructed using in-situ concrete supported on metal decking in turn supported on compositely designed steel beams.

The first floor warehouse area is constructed using in-situ concrete supported on precast units acting as a composite floor in turn supported on compositely designed secondary steel beams

which are supported by primary trusses. UC columns provide support for the trusses and in turn transfer loads into the foundations. Since the imposed load on the mezz floor is high and the span of the truss may be up to 25m, double trusses and double columns are present.

5.2 Substructure

Foundations are concrete pad or pile foundation as indicated on the tender foundation drawings. The RDC ground floor slab is ground bearing slab.

STABILITY PROVISIONS

Roof plan bracing and vertical bracing plus portal action from trusses shall be provided to stabilise the building in both the permanent and temporary condition. The concrete floors act as a diaphragm to transfer lateral loads at the floor levels to columns.

MOVEMENT JOINTS

The overall length of the building is approximately 500m which exceeds the maximum length without an expansion/contraction joint, therefore an expansion/contraction movement joint is indicated. However, the expansion and contraction between the two parts of the building should be checked to make sure the gap of the movement joint is big enough to accommodate the movement.

The overall length of the link bridge is approximately 37m. Slotted holes are required at the connection between the bridge trusses and the main building columns. to accommodate the expansion/contraction due to temperature.

DISPROPORTIONATE COLLAPSE

Building consequence classes – 2a (Industrial buildings not exceeding 3 storeys.)

MATERIAL

Steel – S355

Concrete – C30/37

Reinforcement – Reinforcement to be high yield bars with a minimum characteristic yield strength $f_y = 500 \text{ N/mm}^2$.

LOADS

10.1 Dead load and imposed load

(BS EN 1991, Eurocode 1, part 1-1 General actions – densities, self-weight and imposed loads)

Roof

Dead load (excluding steelwork)

Roof deck + insulation + membrane	0.22 kN/m ²
PV panel	0.30 kN/m ²
General services and sprinklers	0.30 kN/m ²

Local services	refer to the drawings of GB-P761 LTN-PSE-DR-WH-GF-TEN-S0005 & 0006
Ceiling	0.25 kN/m ²

Imposed load (Ref. to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0005 & 0006)

Roof imposed load (Category H)	0.60 kN/m ²
Ceiling imposed load (Category H)	0.25 kN/m ²
Allowance for water within gutters areas in accordance with SIPHONIC design (Typically 150mm deep)	

Warehouse Mezzanine floor

Dead load (excluding steelwork)

140mm concrete structural topping	3.50 kN/m ²
260mm precast unit	3.55 kN/m ²
General services and sprinklers	0.30 kN/m ²
Ceiling	0.25 kN/m ²

Imposed load (Ref. to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0003)

Mezz general imposed load * (Category E)	20.0 kN/m ²
Sorter (Category E) #	10.0 kN/m ²
Construction stage imposed load **	1.5 kN/m ²

*15kN point loads to allow for rack legs, conveyor feet.
Point loads from MEWP refer to Jungheinrich specs. of EFG 425, ESE120 and ERD 220.

Extra point loads ($G_k=20$ kN & $Q_k=80$ kN) to allow for the Sorter mezz columns. Location and details refer to GB-P761 LTN-PSE-DR-WH-GF-TEN-S0003.

** Only applied to construction stage

Office floor

Dead load (excluding steelwork)

150mm composite slab (dry concrete)	2.84 kN/m ²
150mm composite slab (Wet concrete)	2.96 kN/m ²
General services and sprinklers	0.25 kN/m ²
Ceiling	0.25 kN/m ²
Finishes	1.50 kN/m ²
Glass partitions	4.00 kN/m

Imposed load (Ref. to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0004)

Archive room (category E)	10.0 kN/m ²
Admin Mezz general (category B)	4.00 kN/m ² +1.00 kN/m ² (partition)
Canteen general (category C)	5.00 kN/m ²
Copier room (category B)	8.00 kN/m ²
Server room / Comms Room (category E)	10.00 kN/m ²
Workshop Mezz (category E)	10.00 kN/m ²

Warm up room roof/Tower pod (category B)	5.0 kN/m ²
Construction stage imposed load **	1.5 kN/m ²

** only applied to construction stage

Plantroom

Dead load (excluding steelwork)

200mm composite slab (dry concrete)	4.05 kN/m ²
200mm composite slab (Wet concrete)	4.21 kN/m ²
General services and sprinklers	0.25 kN/m ²
Ceiling	0.25 kN/m ²

Imposed load (Ref. to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0003)

Refrigeration (category E)	Worst of 30.0 kN/m ² or combination of 7.5 kN/m ² surround individual plant and individual plant weight as noted on M&E drawings
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Heating room, LV/HV switch room, Sprinkler valve station & Circulation (category E) *	7.5 kN/m ²
Plant room Gantry (Category E)	7.5 kN/m ²

* Additional Individual plant weight as noted on M&E drawings should be taken into account.

Refrigeration recess roof

Dead load (excluding steelwork)

200mm composite slab (dry concrete)	4.05 kN/m ²
200mm composite slab (Wet concrete)	4.21 kN/m ²
General services and sprinklers	0.25 kN/m ²
Ceiling	0.25 kN/m ²

Imposed load (Ref. to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0005)

Imposed load (category E)	Worst of 30kN/m ² or 1.5 kN/m ² around individual plant and individual plant weight as noted on M&E drawings
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Break out area

Dead load (excluding steelwork)

150mm composite slab (dry concrete)	2.84 kN/m ²
150mm composite slab (Wet concrete)	2.96 kN/m ²
General services and sprinklers	0.25 kN/m ²
Ceiling	0.25 kN/m ²

Finishes	0.50kN/m ²
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Imposed load (Ref. to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0004)

Imposed load (category E)	5.00 kN/m ² +1kN/m ² for water standing in the roof
Construction stage imposed load **	1.5 kN/m ²
** only applied to construction stage	

Link Bridge

Dead load (excluding steelwork)

75mm concrete structural topping	3.50 kN/m ²
150mm precast unit	3.55 kN/m ²
General services and sprinklers	0.30 kN/m ²
Ceiling	0.25 kN/m ²

Imposed load (Ref. to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0004)

Vertical imposed load	5.00 kN/m ²
Horizontal imposed load	10% of the total load corresponding to the uniformly distributed vertical load to BE EN 1991-2
Construction stage imposed load **	1.5 kN/m ²
** only applied to construction stage	

Ground floor

Dead load

Typical 250mm concrete slab	6.25 kN/m ²
Freeze area (250mm top slab+240 insulation+180 BTM slab)	11.0 kN/m ²

Imposed load (Ref. to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0001 & S0002)

Refer to the drawings of GB-P761 LTN-PSE-DR-WH-GF-TEN-S0001 & 0002

10.2 Wind load

(BS EN 1991, Eurocode 1, part 1-4 General actions – Wind actions)

Site location	Woodside Link, Chalton, Central Bedfordshire, East of England, LU4 9TX
Grid reference	TL039251
Basic map wind speed	21.5m/s
Site altitude	138
Distance to sea	120km

Wind directional factor should be taken into account to minimise the requirement of the secondary steelwork.

10.2.1 Wind load on building

Wind load

To BS EN 1991-1-3

10.2.2 Wind load on link bridge

Wind load

To BS EN 1991-1-3

10.3 Snow load

(BS EN 1991, Eurocode 1, part 1-3 General actions – Snow actions)

Characteristic ground snow load	0.572 kN/m ²
Snow load shape coefficient – roof pitch 0-15°	1
Drifted snow load abutting taller building	To BS EN 1991-1-3
Drifted snow load at parapets	To BS EN 1991-1-3

10.4 Impact load

All columns to be designed for an accidental impact load from forklift trucks of 300 kN at a height of 0.75m above ground floor slab.

The dock leveller retaining wall to be designed for an accidental impact load from HGV of 150kN per buffer to Table 4.1 of BS EN 1991-1-7. Please note that the HGVs do not always dock square so the HGV loading must not be split between the buffers

10.5 Thermal load

(BS EN 1991, Eurocode 1, part 1-5 General actions – Thermal actions)

Minimum shade air temperature (°C)	-18°C
Maximum shade air temperature (°C)	34°C

10.5.1 Building

Thermal temperature	To BS EN 1991-1-5
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10.5.2 Link bridge

Thermal temperature	To BS EN 1991-1-5
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LOAD CASES AND PARTIAL LOAD FACTORS FOR THE SUPERSTRUCTURE

11.1 RDC Main structure

Construction stage

Loadcase Title	Strength	Service	SLS Quasi
Self-weight – excluding slab	1.35	1	1
Slab wet	1.35	1	1
Construction imposed load	1.5	1	1

Dead + Imposed load

Loadcase Title	Strength	Service	SLS Quasi
Self-weight – excluding slab	1.35	1	1

Slab dry	1.35	1	1
Roof dead	1.35	1	1
Services	1.35	1	1
Ceiling	1.35	1	1
Walls	1.35	1	1
Finishes	1.35	1	1
Floor imposed (Cat B)	1.5	1	1
Floor imposed (Cat C)	1.5	1	1
Plant imposed (Cat E)	1.5	1	1
Ceiling imposed (Cat H)	1.5	1	1
Roof imposed (Cat H)	1.5	1	1

Dead + Floor imposed load (L) + Roof imposed load + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.35	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.35	1
Ceiling	1.35	1
Walls	1.35	1
Finishes	1.35	1
Floor imposed (Cat B)	1.5	1
Floor imposed (Cat C)	1.5	1
Plant imposed (Cat E)	1.5	1
Ceiling imposed (Cat H)	1.05	0.7
Roof imposed (Cat H)	1.05	0.7

** Four direction should be considered respectively

Dead + Floor imposed load + Roof imposed load (L)+ EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.35	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.35	1
Ceiling	1.35	1
Walls	1.35	1
Finishes	1.35	1
Floor imposed (Cat B)	1.05	0.7
Floor imposed (Cat C)	1.05	0.7
Plant imposed (Cat E)	1.5	1
Ceiling imposed (Cat H)	1.5	1
Roof imposed (Cat H)	1.5	1

*** Four direction should be considered respectively

Dead + Floor imposed load (L) + Snow + Wind*** + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.35	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.35	1
Ceiling	1.35	1
Walls	1.35	1
Finishes	1.35	1
Floor imposed (Cat B)	1.5	1
Floor imposed (Cat C)	1.5	1
Plant imposed (Cat E)	1.5	1
Ceiling imposed (Cat H)	1.5	1
Snow	0.75	0.5
Wind	0.75	0.5

*** Four direction should be considered respectively

Dead + Floor imposed load + Snow (L)+ Wind* + EHF *****

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.35	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.35	1
Ceiling	1.35	1
Walls	1.35	1
Finishes	1.35	1
Floor imposed (Cat B)	1.05	0.7
Floor imposed (Cat C)	1.05	0.7
Plant imposed (Cat E)	1.5	1
Ceiling imposed (Cat H)	1.05	0.7
Snow	1.5	1
Wind	0.75	0.5

*** Four direction should be considered respectively

Dead + Floor imposed load + Snow + Wind* (L) + EHF *****

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.35	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.35	1
Ceiling	1.35	1
Walls	1.35	1
Finishes	1.35	1
Floor imposed (Cat B)	1.05	0.7
Floor imposed (Cat C)	1.05	0.7
Plant imposed (Cat E)	1.5	1
Ceiling imposed (Cat H)	1.05	0.7
Snow	0.75	0.5
Wind	1.5	1

*** Four direction should be considered respectively

Dead + Wind* (L) + EHF *****

Loadcase Title	Strength	Service
Self-weight – excluding slab	1	1
Slab dry	1	1
Roof dead	1	1
Walls	1	1
Finishes	1	1
Wind	1.5	1

*** Four direction should be considered respectively

Dead + Floor imposed load (L) + Snow + Snow drift + EHF ***

Loadcase Title	Strength
Self-weight – excluding slab	1
Slab dry	1
Roof dead	1
Services	1
Ceiling	1
Walls	1
Finishes	1
Floor imposed (Cat B)	0.5
Floor imposed (Cat C)	0.7
Plant imposed (Cat E)	0.9
Ceiling imposed (Cat H)	0.7
Snow	0.2
Snow drift	1

*** Four direction should be considered respectively

Dead + Floor imposed load + Snow + Snow drift + Wind*** (L) + EHF ***

Loadcase Title	Strength
Self-weight – excluding slab	1
Slab dry	1
Roof dead	1
Services	1
Ceiling	1
Walls	1
Finishes	1
Floor imposed (Cat B)	0.3
Floor imposed (Cat C)	0.6
Plant imposed (Cat E)	0.8
Ceiling imposed (Cat H)	0.6
Snow	0.75
Wind	0.2
Snow drift	1

*** Four direction should be considered respectively

Dead + Floor imposed load (L) + Snow + Impact + EHF ***

Loadcase Title	Strength
Self-weight – excluding slab	1
Slab dry	1
Roof dead	1
Services	1
Ceiling	1
Walls	1
Finishes	1
Floor imposed (Cat B)	0.5
Floor imposed (Cat C)	0.7
Plant imposed (Cat E)	0.9
Ceiling imposed (Cat H)	0.7
Snow	0.2
Impact	1

*** Four direction should be considered respectively

Dead + Floor imposed load + Snow + impact + Wind*** (L) + EHF ***

Loadcase Title	Strength
Self-weight – excluding slab	1
Slab dry	1
Roof dead	1
Services	1
Ceiling	1
Walls	1
Finishes	1
Floor imposed (Cat B)	0.3
Floor imposed (Cat C)	0.6
Plant imposed (Cat E)	0.8
Ceiling imposed (Cat H)	0.6
Snow	0.75
Wind	0.2
Impact	1

*** Four direction should be considered respectively

Dead + Snow + Wind*** (L) + Thermal *** + EHF ***

Loadcase Title	Service
Self-weight – excluding slab	1
Roof dead	1
Services	1

Ceiling	1
Snow	0.5
Wind	1
Thermal	1

*** Four direction should be considered respectively

Dead + Snow (L) + Wind*** + Thermal *** + EHF ***

Loadcase Title	Service
Self-weight – excluding slab	1
Roof dead	1
Services	1
Ceiling	1
Snow	1
Wind	0.5
Thermal	1

*** Four direction should be considered respectively

11.2 Link bridge

Construction stage

Loadcase Title	Strength	Service	SLS Quasi
Self-weight – excluding slab	1.2	1	1
Slab wet	1.35	1	1
Construction imposed load	1.5	1	1

Dead + Imposed load

Loadcase Title	Strength	Service	SLS Quasi
Self-weight – excluding slab	1.2	1	1
Slab dry	1.35	1	1
Roof dead	1.35	1	1
Services	1.2	1	1
Ceiling	1.2	1	1
Imposed load	1.3	1	1
Roof imposed (Cat H)	1.5	1	1

Dead + Imposed load + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.2	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.2	1
Ceiling	1.2	1
Imposed load	1.3	1
Roof imposed (Cat H)	1.5	1

** Four direction should be considered respectively

Dead + Imposed load (L) + Wind*** + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.2	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.2	1
Ceiling	1.2	1
Imposed load	1.3	1
Roof imposed (Cat H)	1.5	1
Wind load	0.51	0.3

** Four direction should be considered respectively

Dead + Imposed load + Wind*** (L) + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.2	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.2	1
Ceiling	1.2	1
Imposed load	0.54	0.4
Roof imposed (Cat H)	1.05	0.7
Wind load	1.7	1

** Four direction should be considered respectively

Dead + Wind*** (L) + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.14	0.95
Slab dry	1.28	0.95
Roof dead	1.28	0.95
Services	1.14	0.95
Ceiling	1.14	0.95
Wind load	1.7	1

** Four direction should be considered respectively

Dead + Imposed load (L) + Thermal*** + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.2	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.2	1
Ceiling	1.2	1
Imposed load	1.35	1
Roof imposed (Cat H)	1.5	1
Thermal	0.93	0.6

** Four direction should be considered respectively

Dead + Imposed load + Thermal*** (L) + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.2	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.2	1
Ceiling	1.2	1
Imposed load	0.54	0.4
Roof imposed (Cat H)	1.05	0.7
Thermal	1.55	1

** Four direction should be considered respectively

Dead + Imposed load (L) + Wind*** + Thermal*** + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.2	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.2	1
Ceiling	1.2	1
Imposed load	1.3	1
Roof imposed (Cat H)	1.5	1
Wind load	0.51	0.3
Thermal	0.93	0.6

** Four direction should be considered respectively

Dead + Imposed load + Wind*** (L) + Thermal*** + EHF ***

Loadcase Title	Strength	Service
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Self-weight – excluding slab	1.2	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.2	1
Ceiling	1.2	1
Imposed load	0.54	0.4
Roof imposed (Cat H)	1.05	0.7
Wind load	1.7	1
Thermal	0.93	0.6

** Four direction should be considered respectively

Dead + Imposed load + Wind*** + Thermal*** (L) + EHF ***

Loadcase Title	Strength	Service
Self-weight – excluding slab	1.2	1
Slab dry	1.35	1
Roof dead	1.35	1
Services	1.2	1
Ceiling	1.2	1
Imposed load	0.54	0.4
Roof imposed (Cat H)	1.05	0.7
Wind load	0.57	0.3
Thermal	1.55	1

** Four direction should be considered respectively

DEFLECTION CRITERIA

Item	Relative to	Limit	
Main structure without intermediate floor	Ground level	Height/150	Imposed loads + wind loads
Main structure with intermediate floor	Floor level	Height/150	Imposed loads + wind loads
Roof beams/ Rafters/ trusses	Member ends	Span/360	Imposed load
		Span/200	Total load
Floor beams	Member ends	Span/360	Imposed load
		Span/250	Total load
Floor beams	Floor TOS	35mm+decking def.	Steel + Wet concrete
Metal decking	Member ends	Min Span/180 or 20mm	Wet concrete
		Min Span/360 or 20mm	Imposed load
		Min Span/250	Total load
Intermediate cladding posts	Member ends	Height/250	Wind loads
Door posts	Member ends	Height/250	Wind loads
Glazing restraint members	Member ends	Vertical – span/500	Dead loads
		Horizontal – span/360	Wind loads

VIBRATION LIMIT

14.1 Office/Canteen floor

Minimum natural frequency

4Hz

14.2 Link bridge

A verification of the comfort criteria should be performed to BS EN 1991-2: 2003 if the fundamental frequency of the deck is less than:

- 5Hz for vertical vibrations
- 2.5Hz for horizontal (lateral) and torsional vibration

FIRE STRATEGY

Please refer to MSA Fire Strategy.

GROUND WATER LEVEL

Refer to the site specific geotechnical/Geo-Environmental Site Investigation report for details.

FOUNDATION AND GROUND SLAB

Foundations and ground floor slabs shall be designed in response to the specific local ground conditions defined in the site specific geotechnical/Geo-Environmental Site Investigation report. The total settlement of foundations and ground slab shall not exceed 25mm. The differential settlement shall not exceed 1:500.

Foundation will be reinforced/mass concrete pads for the gridline upto 31 and pile foundation for the gridline 31 to 63 at minimum -0.45 below the FFL for internal column (typical) and -1.75 for the external column (typical). The top foundation level to the freezer area and future freezer area is - 0.8m below the FFL.

The loads onto ground floor slab (ref to drg. GB-P761 LTN-PSE-DR-WH-GF-TEN-S0001 & S0002) should be taken into account in the foundation design,

Foundations shall be designed to BS EN 1992-1-1 and BS EN 1997-1. The load combinations of STR and GEO stated in BS EN 1990 shall be considered along with Combination 1 and 2 stated in BS EN 1997-1.

The following check and design should be carried out in the foundation design

- Bearing pressure check
- Overturning
- Sliding
- Uplift
- Bending.
- Shear & punching shear
- Settlement

The tower raft foundation / ground floor slab shall be a reinforced slab designed to suit the loading provided by the cladrack tower specialist. The tower ground slab deformation requirements will be as per FEM 9831-1:

- Maximum rotation (mm):
 - 1/3000 in full length
 - 1/3000 in full width
- Maximum angular rotation:
 - 1/2000 radians

DOCK LEVELLER WALL

The dock leveller walls shall be made of precast concrete. Steel faced rubber buffer (B/H/T 250/750/100mm) projection positioned 150mm above dock to provide external impact protection in front of the dock leveller wall. The dock leveller walls should be designed to withstand an impact

load from a 40 tonne HGV travelling at 5mph speed with an allowance of not less than 150kN impact load per buffer as stated in Table 4.1 of BS EN 1991-1-7.

Unless impact protection is provided, impact on the rear of the buffer from MHE movements should also be considered in the design. The impact load should be derived from the MHE load capacity and operating speed.

In the refrigerated areas the loading dock walls are not supported by the ground floor slab and should be designed as cantilevers. The eccentricity of the buffer needs to be considered and the design checked for the impact load applied at the top edge of the buffer. Bending of the buffer and bearing on the concrete edge of the precast wall will also need to be considered.

APPENDIX – MHE SPECIFICATION

High performance trucks with low energy consumption

Tailored performance based on application with efficiency and Drive & Lift Plus models

Parameter steering (optional)

Safe sideways battery removal with SnapFit

Ergonomic and easily adjustable operators environment

Operator assistance systems to suit any application



EFG 425k/425/430k/430/S30

Electric four-wheel counterbalance trucks (2,500/3,000 kg)

Our Series 4 electric four-wheel fork lift trucks with capacities up to 3000 kg are ideal for a wide range of indoor and outdoor applications, particularly when using attachments. Our Pure Energy technology concept enables them to achieve the best possible energy and cost efficiency coupled with maximum performance.

By using the most advanced 3-phase AC technology in combination with our own manufactured electronic controller as well as the compact hydraulic unit, we have been able to significantly reduce energy consumption – while simultaneously increasing throughput. This is verified by measurements as per the VDI cycle: At full throughput, our new Series 4 EFG consumes up to 10% less energy than a comparable competitor model.

A choice of configuration packages with variable travel/lift speeds from the Efficiency and Drive & Lift Plus modules will complete your transport and stacking operations with maximum energy efficiency.

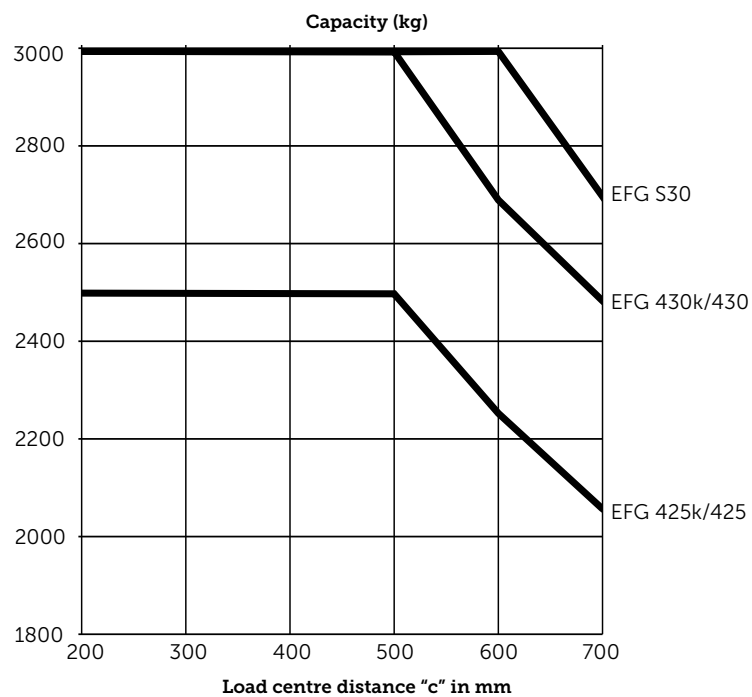
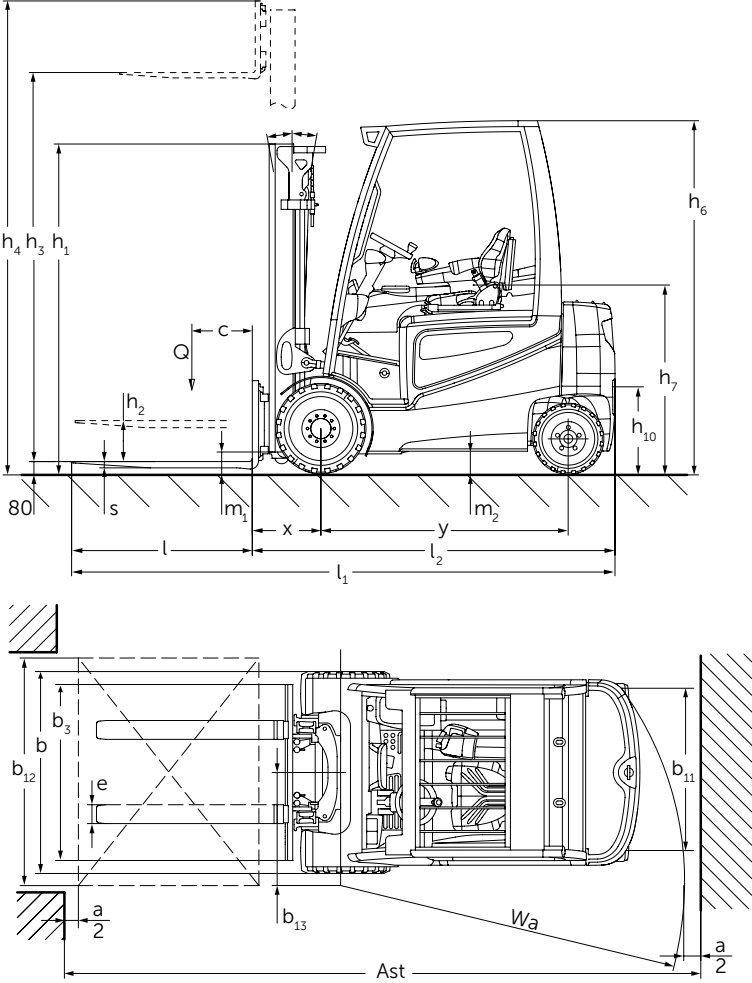
The infinitely adjustable steering column and armrest allow for adjustment to suit all operator sizes. The individual adjustment of the controls is very easy to carry out thanks to the single-point adjustment via two adjustable axes.

In addition, the new compact mast significantly extends the operator's field of vision, offering the best visibility available on the market. Important features contributing to the enhanced visibility include compact profile nesting and an optimised chain and hose guide as well as two viewing windows in the cross member.

The truck contour is closed on the operator's right side. This guarantees maximum rigidity and stability for the overall design and creates a number of storage options, e.g. for papers and a smartphone.

Mature concepts for demanding yet energy and cost-saving applications, make the Series 4 EFG trucks universally suitable for indoor and outdoor operation.

EFG 425k/425/430k/430/S30



EFG 425k/425/430k/430/S30

Standard mast designs EFG 425k/425/430k/430/S30								
	Lift h_3 (mm)	Lowered mast height h_1 (mm)		Free lift h_2 (mm)		Extended mast height h_4 (mm)		Mast tilt forward / back α/β (°)
		EFG 425k / 425	EFG 430k / 430 / S30	EFG 425k / 425	EFG 430k / 430 / S30	EFG 425k / 425	EFG 430k / 430 / S30	
Duplex ZT	2900	2125	2122	150	150	3502	3659	6/8
	3100	2225	2222	150	150	3702	3859	6/8
	3300	2325	2322	150	150	3902	4059	6/8
	3500	2425	2422	150	150	4102	4259	6/8
	3700	2525	2522	150	150	4302	4459	6/8
	4000	2675	2672	150	150	4602	4759	6/8
	4300	2875	2872	150	150	4902	5059	6/8
	4500	2975	2972	150	150	5102	5259	6/8
Duplex ZZ	3100	2190	2187	1609	1448	3680	3839	6/8
	3300	2290	2287	1709	1548	3880	4039	6/8
	3500	2390	2387	1809	1648	4080	4239	6/8
	3700	2490	2487	1909	1748	4280	4439	6/8
	4000	2640	2637	2059	1898	4580	4739	6/8
Triplex DZ	4400	2090	2087	1509	1348	4980	5139	6/8
	4700	2190	2187	1609	1448	5280	5439	6/5.5
	5000	2290	2287	1709	1548	5580	5739	6/5.5
	5500	2490	2487	1909	1748	6080	6239	6/5.5
	6000	2690	2687	2109	1948	6580	6739	6/5.5
	6500	2890	2887	2309	2148	7080	7239	6/3
	7000	3090	3087	2509	2348	7580	7739	6/3
	7500	3290	3287	2709	2548	8080	8239	6/3

Technical data in line with VDI 2198

Identification	1.1	Manufacturer (abbreviation)		Jungheinrich		
	1.2	Model		EFG 425k	EFG 425	EFG 430k
	1.3	Drive		Electric		
	1.4	Manual, pedestrian, stand-on, seated, order picker operation		seat		
	1.5	Load capacity/rated load	Q t	2.5	2.5	3
	1.6	Load centre distance	c mm	500		
	1.8	Load distance	x mm	425	425 ¹⁾	447
	1.9	Wheelbase	y mm	1,575	1,720	1,575
Weights	2.1.1	Net weight incl. battery (see row 6.5)	kg	4,770	4,680	5,260
	2.2	Axle load with load front/rear	kg	6,440 / 830	6,590 / 590	7,360 / 910
	2.3	Axle load without load front/rear	kg	2,450 / 2,320	2,720 / 1,960	2,530 / 2,730
Wheels / frame	3.1	Tyres		SE		
	3.2	Tyre size, front	mm	225 / 75-10	225 / 75-10	250 / 60-12
	3.3	Tyre size, rear	mm	180 / 70-8	180 / 70-8	200 / 50-10
	3.5	Wheels, number front/rear (x = driven wheels)		2X / 2		
	3.6	Tread width, front	b ₁₀ mm	990	990	950
	3.7	Tread width, rear	b ₁₁ mm	940		
Basic dimensions	4.1	Tilt of mast/fork carriage forward/backward	α/β °	6/8		
	4.2	Mast height (lowered)	h ₁ mm	2,225	2,225	2,222
	4.3	Free lift	h ₂ mm	150		
	4.4	Lift	h ₃ mm	3,100		
	4.5	Extended mast height	h ₄ mm	3,702	3,702	3,859
	4.7	Height of overhead guard	h ₆ mm	2,240		
	4.8	Seat height/stand height	h ₇ mm	1,190		
	4.12	Coupling height	h ₁₀ mm	385		
	4.12.1	2nd coupling height	mm	540		
	4.19.4	Total length including fork length	l ₁ mm	3,446	3,591	3,467
	4.20	Length to face of forks	l ₂ mm	2,296	2,441	2,317
	4.21	Overall width	b ₁ /b ₂ mm	1,198		
	4.22	Fork dimensions	s/e/l mm	40 / 120 / 1,150	40 / 120 / 1,150	45 / 125 / 1,150
	4.23	Fork carriage ISO 2328, class/type A, B		2A	2A	3A
	4.24	Fork carriage width	b ₃ mm	1,120		
	4.31	Floor clearance with load under mast	m ₁ mm	117		
	4.32	Ground clearance, centre of wheelbase	m ₂ mm	135		
	4.33	Aisle width for pallets 1000 x 1200 sideways	Ast mm	3,626	3,776	3,647
	4.34	Aisle width for pallets 800 x 1200 lengthways	Ast mm	3,826	3,976	3,847
Performance data	4.35	Turning radius	W _a mm	2,000	2,150	2,000
	4.36	Smallest pivot point distance	b ₁₃ mm	600		
	5.1	Travel speed, laden/unladen	km/h	19 / 20 ³⁾		
	5.2	Lift speed, laden/unladen	m/s	0.48 / 0.6 ³⁾	0.48 / 0.6 ³⁾	0.43 / 0.6 ³⁾
	5.3	Lowering speed, laden/unladen	m/s	0.58 / 0.58 ³⁾		
	5.5	Drawbar pull w. / w.o. load	N	5,100 / 5,600 ³⁾	4,900 / 5,500 ³⁾	5,000 / 5,800 ³⁾
	5.6	Max. drawbar pull, laden/unladen	N	16,000 / 16,300 ³⁾	16,000 / 16,300 ³⁾	15,700 / 16,000 ³⁾
	5.7	Gradeability laden/unladen	%	10 / 16 ³⁾	10 / 16 ³⁾	9 / 15 ³⁾
	5.8	Max. gradeability, laden/unladen	%	19 / 27 ³⁾	19 / 27 ³⁾	17 / 25 ³⁾
	5.9.1	Acceleration time w / w.o. load (to 10 m)	S	4.5 / 4 ³⁾		
Electrics	5.10	Service brake		mechanical		
	6.1	Drive motor, output S2 60 min.	kW	15.0 ³⁾		
	6.2	Lift motor, output at S3 15%	kW	22.0 ³⁾		
	6.3	Battery as per DIN 43531 / 35/36 A, B, C, no		A 43536		
	6.4	Battery voltage/nominal capacity K5	V/Ah	560 - 620 80	700 - 775 80	560 - 620 80
	6.5	Battery weight	kg	1,540	1,863	1,540
		Battery dimensions L/W/H	mm	1,028 / 711 / 784	1,028 / 855 / 784	1,028 / 711 / 784
	6.6	Energy consumption according to VDI cycle	kWh/h	6.4 ²⁾³⁾	6.4 ²⁾³⁾	8 ²⁾³⁾
	6.7	Throughput	t/h	196 ³⁾	196 ³⁾	225 ³⁾
	6.8	Energy consumption at max. throughput	kWh/h	7 ⁴⁾	7 ⁴⁾	7.2 ⁴⁾
Misc.	8.1	Type of drive control		Impuls/AC		
	8.2	Working pressure for attachments	bar	200		
	8.3	Oil flow for attachments	l/min	25		
	8.4	Sound pressure level at operator's ear as per EN 12053	dB (A)	70		
	8.5	Trailer coupling, model/type DIN		DIN 15170-H		

¹⁾ + 10 mm for DZ mast

²⁾ 60 VDI work cycles/h

³⁾ With Drive & Lift Plus options package

⁴⁾ With Efficiency options package

In accordance with VDI Guideline 2198 this specification sheet provides details of the standard truck only. Non-standard tyres, different masts, optional equipment, etc. may result in different values.

Technical data in line with VDI 2198

Identification	1.1	Manufacturer (abbreviation)		Jungheinrich	
	1.2	Model		EFG 430	EFG S30
	1.3	Drive		Electric	
	1.4	Manual, pedestrian, stand-on, seated, order picker operation		seat	
	1.5	Load capacity/rated load	Q t	3	
	1.6	Load centre distance	c mm	500	600
	1.8	Load distance	x mm	447	452
	1.9	Wheelbase	y mm	1,720	
Weights	2.1.1	Net weight incl. battery (see row 6.5)	kg	5,080	5,330
	2.2	Axle load with load front/rear	kg	7,450 / 630	7,620 / 710
	2.3	Axle load without load front/rear	kg	2,770 / 2,310	2,780 / 2,550
Wheels / frame	3.1	Tyres		SE	
	3.2	Tyre size, front	mm	250 / 60-12	315 / 45-12
	3.3	Tyre size, rear	mm	180 / 70-8	200 / 50-10
	3.5	Wheels, number front/rear (x = driven wheels)		2X / 2	
	3.6	Tread width, front	b ₁₀ mm	950	1,000
	3.7	Tread width, rear	b ₁₁ mm	940	
Basic dimensions	4.1	Tilt of mast/fork carriage forward/backward	α/β °	6/8	
	4.2	Mast height (lowered)	h ₁ mm	2,222	
	4.3	Free lift	h ₂ mm	150	
	4.4	Lift	h ₃ mm	3,100	
	4.5	Extended mast height	h ₄ mm	3,859	
	4.7	Height of overhead guard	h ₆ mm	2,240	
	4.8	Seat height/stand height	h ₇ mm	1,190	
	4.12	Coupling height	h ₁₀ mm	385	
	4.12.1	2nd coupling height	mm	540	
	4.19.4	Total length including fork length	l ₁ mm	3,612	3,617
	4.20	Length to face of forks	l ₂ mm	2,462	2,467
	4.21	Overall width	b ₁ /b ₂ mm	1,198	1,300
	4.22	Fork dimensions	s/e/l mm	45 / 125 / 1,150	50 / 125 / 1,150
	4.23	Fork carriage ISO 2328, class/type A, B		3A	
	4.24	Fork carriage width	b ₃ mm	1,120	
	4.31	Floor clearance with load under mast	m ₁ mm	117	
	4.32	Ground clearance, centre of wheelbase	m ₂ mm	135	
	4.33	Aisle width for pallets 1000 x 1200 sideways	Ast mm	3,797	3,802
	4.34	Aisle width for pallets 800 x 1200 lengthways	Ast mm	3,997	4,002
Performance data	4.35	Turning radius	W _a mm	2,150	
	4.36	Smallest pivot point distance	b ₁₃ mm	600	650
	5.1	Travel speed, laden/unladen	km/h	19 / 20 ²⁾	
	5.2	Lift speed, laden/unladen	m/s	0.43 / 0.6 ²⁾	
	5.3	Lowering speed, laden/unladen	m/s	0.58 / 0.58 ²⁾	
	5.5	Drawbar pull w. / w.o. load	N	5,000 / 5,800 ²⁾	
	5.6	Max. drawbar pull, laden/unladen	N	15,700 / 16,000 ²⁾	
	5.7	Gradeability laden/unladen	%	9 / 15 ²⁾	8 / 14 ²⁾
	5.8	Max. gradeability, laden/unladen	%	18 / 26 ²⁾	17 / 25 ²⁾
	5.9.1	Acceleration time w / w.o. load (to 10 m)	S	4.5 / 4 ²⁾	
Electrics	5.10	Service brake		mechanical	
	6.1	Drive motor, output S2 60 min.	kW	15.0 ²⁾	
	6.2	Lift motor, output at S3 15%	kW	22.0 ²⁾	
	6.3	Battery as per DIN 43531 / 35/36 A, B, C, no		A 43536	
	6.4	Battery voltage/nominal capacity K5	V/Ah	700 - 775 80	
	6.5	Battery weight	kg	1,863	
		Battery dimensions L/W/H	mm	1,028 / 855 / 784	
	6.6	Energy consumption according to VDI cycle	kWh/h	8 ¹⁾²⁾	8.1 ¹⁾²⁾
	6.7	Throughput	t/h	225 ²⁾	220 ²⁾
	6.8	Energy consumption at max. throughput	kWh/h	7.2 ³⁾	8.1 ³⁾
Misc.	8.1	Type of drive control		Impuls/AC	
	8.2	Working pressure for attachments	bar	200	
	8.3	Oil flow for attachments	l/min	25	
	8.4	Sound pressure level at operator's ear as per EN 12053	dB (A)	70	
	8.5	Trailer coupling, model/type DIN		DIN 15170-H	

¹⁾ 60 VDI work cycles/h

²⁾ With Drive & Lift Plus options package

³⁾ With Efficiency options package

In accordance with VDI Guideline 2198 this specification sheet provides details of the standard truck only. Non-standard tyres, different masts, optional equipment, etc. may result in different values.

EFG 425k/425/430k/430/S30



Benefit from the advantages



Sideways battery removal



duoPILOT



Ergonomic workstation



multiPILOT

Pure Energy

Our Pure Energy technology concept enables you to achieve the best possible energy efficiency coupled with maximum throughput:

- Most advanced 3-phase AC technology.
- Compact controller.
- Compact hydraulic unit.
- Needs-oriented control of the hydraulics / motors.

Options packages

The right truck for every customer application thanks to individually selectable packages:

- Efficiency package with Jungheinrich Curve Control.
- Drive & Lift Plus package with greater travel/lift speeds.

Parameter steering

Electric steering with dynamic response dependent on the travel program selected:

- Minimising of unwanted steering movements.
- Slim steering column creates more legroom.
- Improved energy efficiency.
- Optimised throughput.

Sideways battery exchange

- Universal battery exchange system for all 48 V and 80 V trucks.
- Simple, rapid and reliable exchange system.

Individually adjustable operating concept

- A choice of five parameterised travel programmes.
- Stepless single-point adjustment of the armrest and steering column in two axes.
- A choice of three different operating controls.
- Adjustable lever and controls.
- Single or double pedal operation.

Operator-orientated workplace

The ergonomics of the operator's workstation guarantee relaxed, fatigue-free work:

- Low, highlighted entry step with level footwell.
- Slim steering column for maximum knee and legroom.
- High-resolution, contrast-rich full-colour TFT display with self-explanatory symbols.
- Compact nested profile package with outstanding visibility.
- Unobstructed view thanks to special overhead guard design, optimised chain and hose configuration.
- Operator-oriented storage concept for intuitive working
- Large, adjustable armrest with different upholstery fabrics and spacious storage compartment
- USB port for external power supply
- Low vibrations as the cab floats on special mountings

Safety

High drive dynamics and performance levels also provide a high level of safety:

- Reduction in speed when cornering thanks to Jungheinrich Curve Control.
- No uncontrolled roll-back on ramps or inclines due to automatic wheel stop (optional).
- Excellent stability due to extremely low centre of gravity and high pivot steer axle.

A range of operator assistance systems (optional) provides additional safety for the operator, truck and load:

- Access Control: The access control system, which requires a sequence of safety checks before the truck is unlocked:
 1. Valid access code.
 2. Seat switch closed.
 3. Seatbelt secured.
- Drive Control: Speed control, which automatically reduces the speed of travel when cornering and from a defined lift height.
- Lift Control: Lift speed control, which automatically reduces the travel speed as well as the tilt speed of the mast beginning at a defined lift height. The tilt angle is shown on a separate display.

Jungheinrich UK Ltd.

Head Office:
Sherbourne House
Sherbourne Drive
Tilbrook
Milton Keynes MK7 8HX
Telephone 01908 363100
Fax 01908 363180

info@jungheinrich.co.uk
www.jungheinrich.co.uk

The German production facilities in Norderstedt, Moosburg and Landsberg are certified. **ISO 9001**
ISO 14001

Jungheinrich fork lift trucks meet European safety requirements.



 **JUNGHEINRICH**
Machines. Ideas. Solutions.

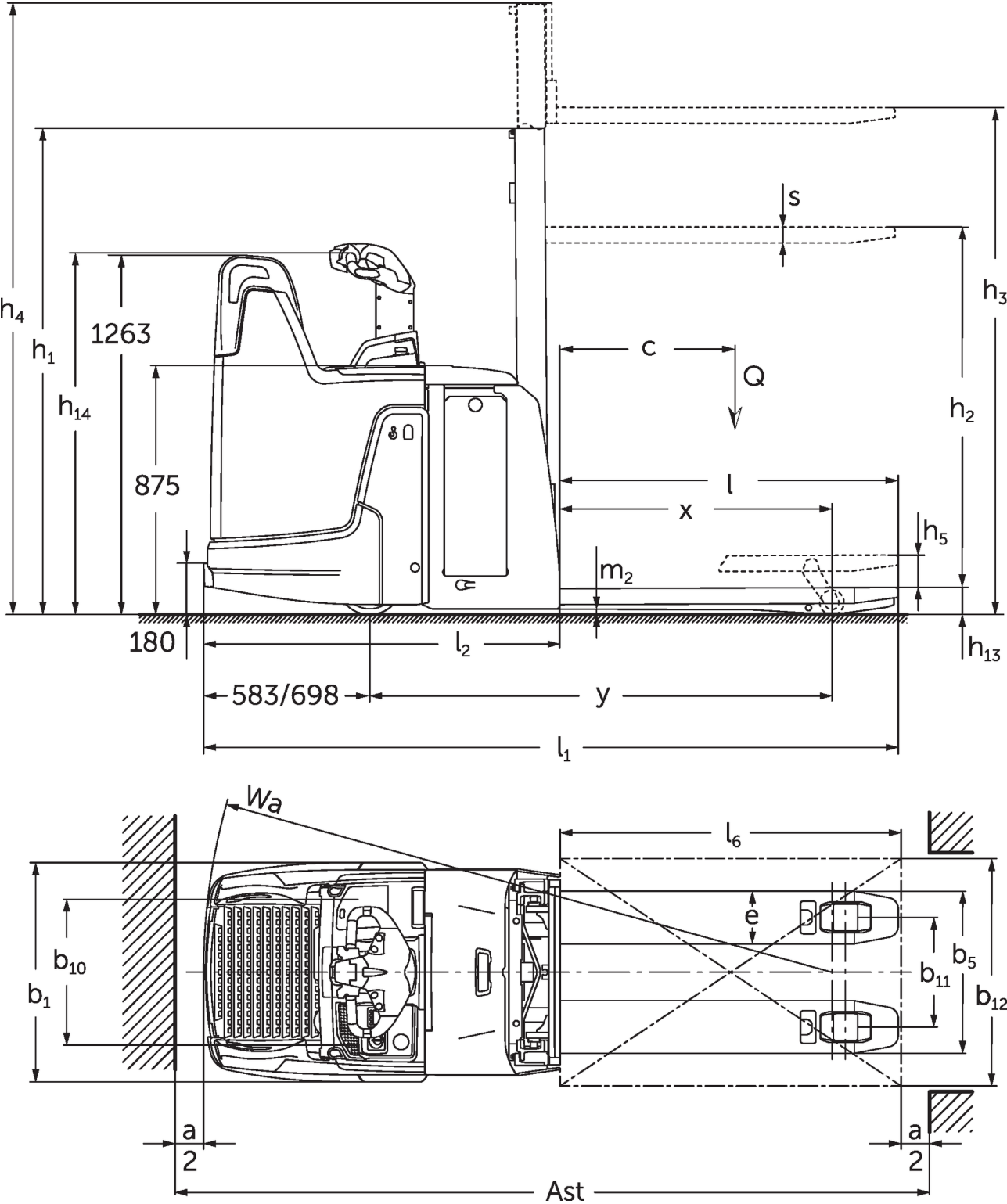


Electric pedestrian controlled truck

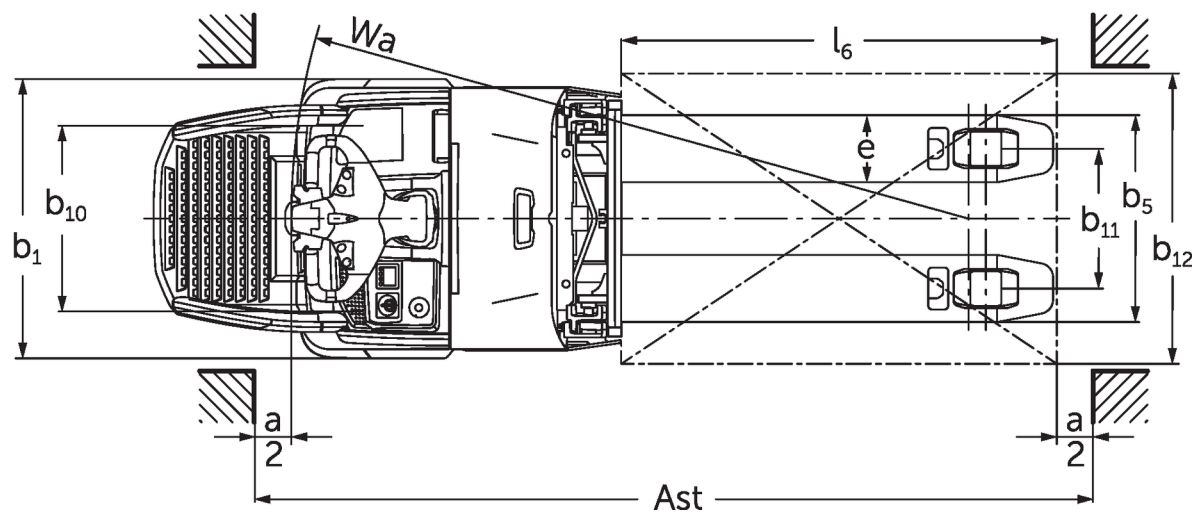
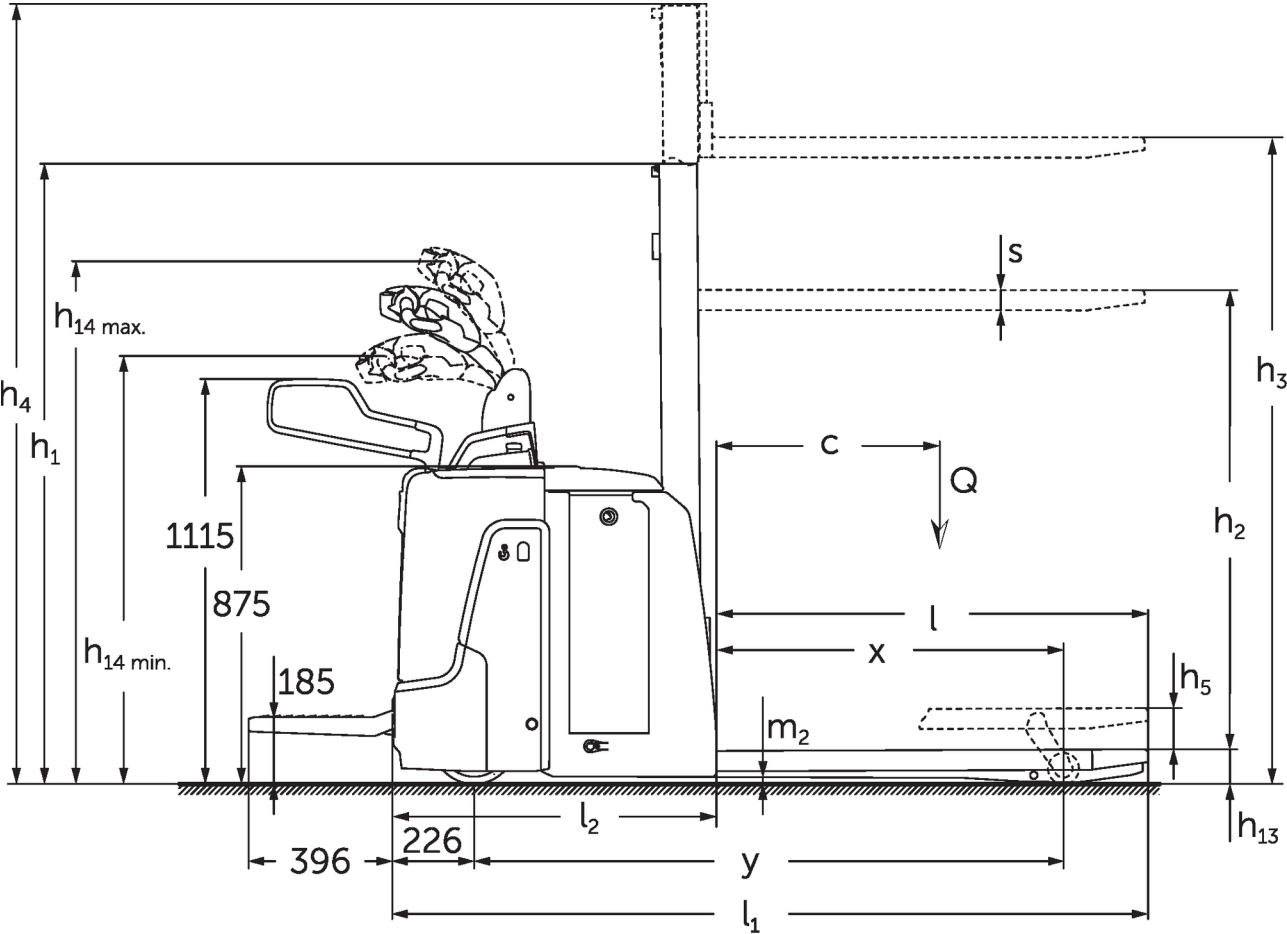
ERD 120 / 220

Lift height: 1500-2905 mm / Capacity: 2000 kg

ERD 120 / 220



ERD 120 / 220



ERD 120 / 220

ERD 120, ERD 220, ERD 220 drivePLUS	Lift (h3)	Retracted mast height (h1)	Free lift (h2)	Extended mast height (h4)
Duplex mast ZT	1660 mm	1306 mm	100 mm	2115 mm
	2010 mm	1481 mm	100 mm	2465 mm
	2100 mm	1526 mm	100 mm	2555 mm
	2560 mm	1756 mm	100 mm	3015 mm
	2900 mm	1926 mm	100 mm	3355 mm
Duplex mast ZZ	2500 mm	1706 mm	1250 mm	2956 mm
	2900 mm	1906 mm	1450 mm	3356 mm
Single mast E	1500 mm	1921 mm	1468 mm	1953 mm
	1660 mm	2081 mm	1628 mm	2113 mm
	2100 mm	2521 mm	2068 mm	2553 mm
Triplex mast DT	2050 mm	1213 mm	100 mm	2513 mm
	2350 mm	1313 mm	100 mm	2813 mm
	2500 mm	1363 mm	100 mm	2963 mm
	2905 mm	1498 mm	100 mm	3368 mm

VDI table

Stand-on: 02/2020

Characteristic	1.1	Manufacturer (abbreviated description)		Jungheinrich		
	1.2	Manufacturer's type designation		ERD 120	ERD 220	ERD 220 drivePLUS
	1.3	Drive		Electric		
	1.4	Operation		Stand-on/pedestrian		
	1.5	Capacity/load	Q kg	2.000		
	1.5.1	Rated capacity/load with mast lift	Q kg	1.000		
	1.5.2	Rated capacity/load with support arm lift	Q kg	2.000		
	1.6	Load centre distance	c mm	600		
	1.8	Load distance, centre of drive axle to fork	x mm	956		
	1.9	Wheelbase	y mm	1.624		
Weights	2.1.1	Service weight (incl. battery)	kg	1.010		
	2.2	Axle load laden front/rear	kg	1.830 / 1.185		
	2.3	Axle load unladen front/rear	kg	260 / 750		
Wheels/suspension system	3.1	Tyres		Vulkollan		
	3.2	Tyre size, front		ø 230 x 65	ø 230 x 77	
	3.3	Tyre size, rear		ø 85 x 95 / ø 85 x 75		
	3.4	Additional wheels		ø 140 x 50		
	3.5	Wheels, number front/back (x=driven)		1x + 2 / 2 oder 4		
	3.6	Tread width, front	b ₁₀ mm	512		
	3.7	Tread width, rear	b ₁₁ mm	385		
Basic dimensions	4.2	Retracted mast height (h1)	h ₁ mm	1.306		
	4.3	Free lift (h2)	h ₂ mm	100		
	4.4	Lift (h3)	h ₃ mm	1.660		
	4.5	Extended mast height (h4)	h ₄ mm	2.115		
	4.6	Initial lift	h ₅ mm	110		
	4.9	Height of tiller handle in drive position min./max.	mm	1.230 / 1.410		
	4.15	Height, lowered	h ₁₃ mm	90		
	4.19	Overall length	l ₁ mm	2.084		
	4.20	Length including fork shank	l ₂ mm	894		
	4.21	Overall width	b ₁ / b ₂ mm	770		
	4.22	Fork dimensions	s/e/ l mm	56 / 185 / 1.190		
	4.25	Width across forks (dimension 1), WaF	b ₅ mm	570		
	4.32	Ground clearance centre of wheelbase	m ₂ mm	19		
	4.34	Aisle width (pallet 1000x1200 sideways)	Ast mm	2.300		
	4.34.1	Aisle width (pallet 800x1200 length)	Ast mm	2.310		
	4.35	Turning radius	W _a mm	1.866		
Performance data	5.1	Travel speed laden/unladen	km/h	8.2 / 9	9.5 / 12.5	9.5 / 14
	5.2	Lift speed laden/unladen	m/s	0.17 / 0.32		
	5.3	Lowering speed laden/unladen	m/s	0.45 / 0.35		
	5.7	Gradeability laden/unladen	%	8 / 16		10 / 20
	5.10	Service brake		generative		

E-motor/Electronics	6.1	Drive motor, performance S2 60 min	kW	2	2.8	3.2
	6.2	Lift motor, performance with S3	kW	2.2		
	6.3	Battery according to DIN 43531/35/36		DIN 43535 B		
	6.4	Battery voltage / nominal capacity	V / Ah	24 / 250		
	6.5	Battery weight	kg	235		
	6.6.1	Energy consumption according to EN cycle	kWh/h	0.68	0.62	0.71
	6.6.2	CO2 equivalent as per EN 16796	kg/h	0,37	0,34	0,38
	6.7	Throughput	t/h	84	108	
	6.8.1	Energy consumption with max. throughput	kWh/h	0.83	1.44	1.48
Miscellaneous	8.1	Type of drive control		AC speedCONTROL		
	10.7	Sound level as per EN12053, operator's ear	dB (A)	71	68	67
- In accordance with VDI Guideline 2198 this data sheet provides details of the standard truck only. Non-standard tyres, different masts, optional equipment, etc. may result in different values.						

1) All data based on: Stand-on platform: Folding (folded up); battery compartment: M-LBE; mast: ZT1660; fork length: 1190 mm; initial lift: raised 2) Batteries available up to a capacity of 465 Ah. 3) In double-deck applications: Mast lift max. 1 t / overall load max. 2 t 4) Values for folding stand-on platform. With fixed stand-on platform: 1256 mm (1296 mm with L battery compartment high-LBE) or 1204 / 1284 mm with height-adjustable tiller 5) Values for proportional hydraulics. With black/white hydraulics (standard): 0.26 / 0.27 m/s 6) Value for M-LBE battery compartment. M-VBE, L-LBE & L high-LBE: +72 mm; L-VBE: +117 mm 7) Value for fork length 1190 mm. Fork length 1150 mm: -40 mm 8) Value for initial lift raised. Lowered initial lift: +48 mm 9) Value for folding platform folded up. Folding platform folded down: +396 mm; compact, fixed platform: +357 mm; extended, fixed platform: +472 mm; L platform: +477 mm 10) Value for proportional hydraulics. With black/white hydraulics (standard): 1.9 kW 11) Value for ZT mast. Single stage mast: +1 mm; DT mast: +10 mm; ZZ mast: +29 mm

The German production facilities in
Norderstedt, Moosburg and Landsberg
are certified.

ISO 9001
ISO 14001

Jungheinrich fork lift trucks meet
European safety requirements.



 **JUNGHEINRICH**

Sideways travel improves performance in applications with regular direction change

Ideal for loading and unloading of HGVs and for longer transport distances

Electric steering

High speed and acceleration improving productivity



ESE 120/220/320

Electric stand-on / sideways-seated pallet truck (2,000 kg)

ESE 120/220/320 pallet trucks are ideal for horizontal transport over medium to long distances. With their sideways operator position, they offer excellent visibility and relaxed working conditions. This is a great advantage, especially where frequent changes of direction are required.

The width of the ESE 120 stand-on truck is only 760 mm, which is narrower than a Euro pallet. This allows for easy pallet positioning inside an HGV as well as for rapid loading and unloading. The fold-up seat offers additional comfort when travelling over longer distances. The low entry height assists frequent entry and exit.

The ESE 220 with 820 mm truck width and the ESE 320 with 930 mm width are side-seat trucks which offer your operators a high degree of comfort and are therefore ideal for long-distance transport. The adjustable foot-well height ensures a

relaxed working position for all operators.

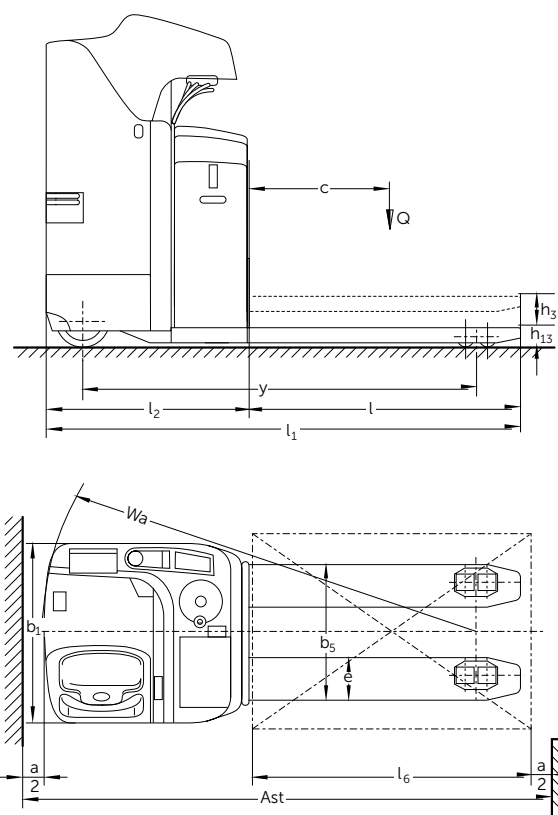
All trucks are fitted with powerful 24 V drive motors for rapid acceleration and high top speeds. In addition they offer the advantages of a sturdy design: The frame and load sections are designed for capacities up to 2000 kg.

Other advantages:

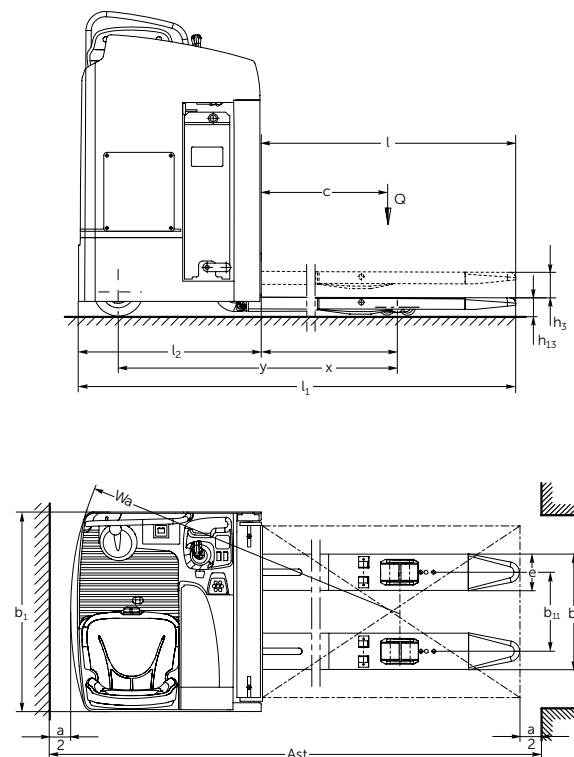
- Rapid travel speeds and acceleration.
- Extremely durable frame for exceptionally high operational demands.
- Display with steering position display and travel program selection (optional for ESE 220 and 320).
- Electric steering for easy manoeuvring with a few turns of the steering wheel.
- Excellent energy management for low operating costs.

ESE 120/220/320

ESE 120



ESE 220/ 320



Technical data in line with VDI 2198

Identification	1.1	Manufacturer (abbreviation)		Jungheinrich			
	1.2	Model		ESE 120	ESE 120	ESE 220	ESE 320
					Rapid drive		
	1.3	Drive		Electric			
	1.4	Manual, pedestrian, stand-on, seated, order picker operation		stand-on	stand-on	seat	seat
	1.5	Load capacity/rated load	Q t	2			
	1.6	Load centre distance	c mm	600			
	1.8	Load distance	x mm	964 ⁴⁾	964 ⁴⁾	868	868
	1.9	Wheelbase	y mm	1,595 ²⁾	1,731 ⁴⁾	1,535 ⁴⁾	1,541 ³⁾
Weights	2.1.1	Net weight incl. battery (see row 6.5)	kg	857	990	1,062	1,074
	2.2	Axle load with load front/rear	kg	1,840 / 1,017	1,900 / 1,090	1,896 / 1,142	1,902 / 1,182
	2.3	Axle load without load front/rear	kg	215 / 642	240 / 750	258 / 808	264 / 816
Wheels / frame	3.1	Tyres		Polyurethane			
	3.2	Tyre size, front	mm	Ø 230 x 78			
	3.3	Tyre size, rear	mm	Ø 85 x 85			
	3.4	Additional wheels (dimensions)	mm	Ø 140 x 54			
	3.5	Wheels, number front/rear (x = driven wheels)		2+1x/4	1+1x/4	2-1x/4	2-1x/4
	3.6	Tread width, front	b ₁₀ mm	475	475	544	645
	3.7	Tread width, rear	b ₁₁ mm	340 / 370 / 490	340 / 370 / 490	385	385
Basic dimensions	4.4	Lift	h ₃ mm	125			
	4.8	Seat height/stand height	h ₇ mm	0	0	1,020	1,020
	4.8.1	Standing height	h ₇ mm	245	245	0	0
	4.15	Height, lowered	h ₁₃ mm	90			
	4.19	Overall length	l ₁ mm	2,024	2,096	2,009	2,009
	4.20	Length to face of forks	l ₂ mm	874	946	859	859
	4.21	Overall width	b ₁ /b ₂ mm	760	760	820	930
	4.22	Fork dimensions	s/e/l mm	55 / 170 / 1,150	55 / 170 / 1,150	60 / 185 / 1,150	60 / 185 / 1,150
	4.25	Width across forks	b ₅ mm	510 / 540 / 660	510 / 540 / 660	540	540
	4.32	Ground clearance, centre of wheelbase	m ₂ mm	30	30	25	25
	4.34	Aisle width for pallets 800 x 1200 lengthways	Ast mm	2,274 ¹⁾	2,346 ¹⁾	2,197 ¹⁾	2,215 ¹⁾
	4.35	Turning radius	W _a mm	1,838	1,910	1,665	1,683
Performance data	5.1	Travel speed, laden/unladen	km/h	8.5 / 10.5	9.5 / 12.5	10 / 12.5	10 / 12.5
	5.2	Lift speed, laden/unladen	m/s	0.04 / 0.05	0.04 / 0.05	0.06 / 0.07	0.06 / 0.07
	5.3	Lowering speed, laden/unladen	m/s	0.065 / 0.045	0.065 / 0.045	0.06 / 0.05	0.06 / 0.05
	5.8	Max. gradeability, laden/unladen	%	6 / 12	6 / 12	8 / 13	8 / 13
	5.10	Service brake		electric			
Electrics	6.1	Drive motor, output S2 60 min.	kW	2.0	2.5	2.8	2.8
	6.2	Lift motor, output at S3 15%	kW	2.0	2.0	1.5	1.5
	6.3	Battery as per DIN 43531 / 35/36 A, B, C, no	B	B	B	no	no
	6.4	Battery voltage/nominal capacity K5	V/Ah	24 / 375	24 / 500	24 / 465	24 / 465
	6.5	Battery weight	kg	297	370	380	380
Misc.	8.1	Type of drive control		SpeedControl	SpeedControl	AC Speed-Control	AC Speed-Control

¹⁾ Diagonal in accordance with VDI: + 188 mm

²⁾ Load section lowered: +65 mm

³⁾ Load section lowered: + 95 mm

⁴⁾ Load section lowered: 90 mm

Benefit from the advantages



ESE 120: Controls for speed regulation and lift function



ESE 120 stand-on truck with easily accessible controls and fold-up seat



All drive and lift functions controlled by the multi-functional joystick on the ESE 220/320



Comfortable seating position with height-adjustable footplate

Innovative 3-phase AC technology

Better performance combined with reduced operating costs. Make use of these advantages (for ESE 220/320):

- High level of efficiency with excellent energy management.
- Powerful acceleration.
- Rapid change in direction of travel.
- No carbon brushes, maintenance-free drive motor.

Productivity-enhancing ergonomics

The arrangement of the operator workstation, sideways to the direction of travel, ensures optimum visibility and reduces potential neck complaints due to frequent changes in direction. A safety switch in the footwell ensures maximum safety.

ESE 120

- Fold-up seat acts as a backrest when the operator is standing.
- Footrest for better support when sitting.

ESE 220/320

- Comfortable seat with adjustment for body weight.
- Padded armrest.
- Padded knee area.

Comfortable and safe operation

Safe speed regulation with SpeedControl. SpeedControl ensures maximum safety and effortless control of speed in all situations.

- Roll-back protection on gradients with automatically activated brake.
- Constant travel speed on gradients/descents.
- Energy recovery with regenerative braking.
- Particularly smooth stepless operation.

Easy operation and good all-round visibility

The central position of the operator within the enclosed truck contours means they are well protected and have optimum all-round visibility. The easy-to-operate electric steering and the easily accessible controls provide additional comfort:

ESE 120:

- Speed regulation by drive switch.
- Lift function button can be operated without changing grip.
- Stable drive handle provides a secure grip when standing.

ESE 220/320:

- Drive and lift control via multifunction lever.

Powerful battery

ESE 120

- Short battery compartment: 3 PZS 375 Ah.
- Long battery compartment: 4 PZS 500 Ah.

ESE 220/320

- Lateral battery exchange.
- 3 PZS 465 Ah.
- Lateral battery exchange.

Robustness and ease of servicing

- Easy access to the controller and electronics.
- Robust, enclosed frame.

Additional equipment

- Different load wheels (depending on the application).
- Cold store version.
- Code lock.
- Steering wheel on the left (ESE 120).
- Load guard.
- Unloading and steering position display (optional on the ESE 220/320).

Jungheinrich UK Ltd.

Head Office:
Sherbourne House
Sherbourne Drive
Tilbrook
Milton Keynes MK7 8HX
Telephone 01908 363100
Fax 01908 363180

info@jungheinrich.co.uk
www.jungheinrich.co.uk

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