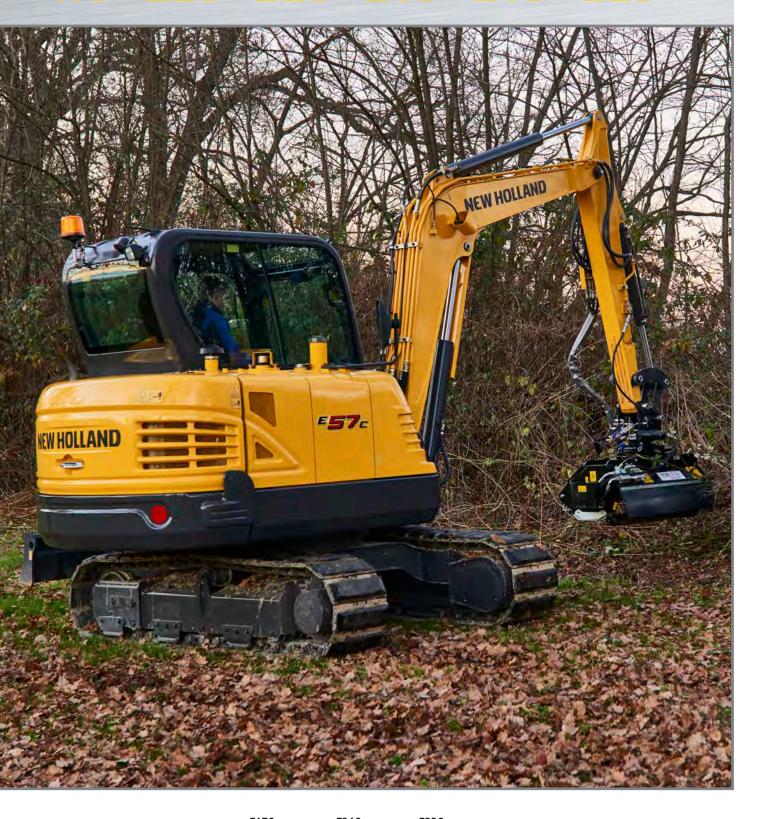
## E17c E25c E33c E37c E57c E60c



	E17C	E26C	E33C
ENGINE POWER HP	16.8	24.8	24.4
OPERATING WEIGHT KG (CAB/CANOPY)	-/1770	2650/2500	-/3150
DIGGING DEPTH MM (SHORT/LONG)	2200/-	2420/2645	3035/3335
	E37C	E57C	E60C
ENGINE POWER HP	24.4	66.9	64.7
OPERATING WEIGHT KG (CAB/CANOPY)	3760/3620	5580/-	5980/-
DIGGING DEPTH MM (SHORT/LONG)	3135/3440	-/4060	-/3990



# MORE POWER. MORE PRODUCTIVITY.



# MOREVALUE.



## THE RANGE

### THE RIGHT TOOL FOR THE JOB.

New Holland mini crawler excavators have a capacity range from 1.7 to 6.0 tonnes. With a choice of canopy, cab and SR short radius zero tail swing versions to choose from, there is the right model ideally suited to landscaping, amenity work, agriculture, horticulture, nurseries, vineyards, estate management and general contracting. Varied applications include track, irrigation and drainage scheme construction and maintenance through to fence, temporary building and crop support erection.

Need more? With the Object Handling Kit installed, all models can be used to raise heavy suspended loads using a lifting eye on the bucket linkage. All this versatility from New Holland Construction dealers

#### Small in size. Big on performance. Huge in versatility.

Compact dimensions enable New Holland mini-excavators to access difficult work areas. Compact dimensions are matched to high performance. Designed for day-long working, each model has class leading excavation performance with the versatility to power a wide range of attachments.



Models	Cab / Canopy	Power (Hp)	Operating Weight* (Cab / Canopy) (kg)	Design	Rear overhang (mm)	Blade width (mm)	Max digging depth(Short arm / Long arm) (mm)	Max dump height (Short arm / Long arm) (mm)
E17C	-/•	16.8	- / 1770	SR	0	990 - 1300	2200 / 2350	2570 / 2670
E26C	•/0	24.8	2650 / 2500	SR	0	1500	2420 / 2645	2930 / 3030
E33C	-/•	24.4	- / 3150	SR	0	1550	3035 / 3335	3275 / 3455
E37C	0/0	24.4	3760 / 3620	SR	0	1740	3135 / 3440	3425 / 3615
E57C	• / -	66.9	5580 / -	Conventional	690	1920	3820 / 4060	4050 / 4180
E60C	• / -	64.7	5980 / -	Medium SR	80	1980	3570 / 3990	3930 / 4100

ullet Standard O Optional – Not available  $\ ^*$  weight with full fuel tank, operator & bucket



## **OPERATOR PLATFORM AND CAB**

#### **DESIGNED AROUND YOU.**

Slim frame pillars ensure excellent all-round visibility, with a good view of the boom and dipper. When working in a confined area or between valuable crops such as in a vineyard, nursery or an orchard, a New Holland mini-excavator can be operated with absolute precision for minimal disruption.

New Holland E17C, E26C and E33C mini-excavators are fitted with a canopy only, while the E37C are offered with a choice of canopy or full cab. The E57C and E60C are cab only. All variants are ROPS roll-over (Excluding E17C), TOPS tip-over and FOPS falling-object compliant to ISO standards. Low noise and vibration levels ensure extended work periods can be undertaken in comfort with no compromise in operator safety.

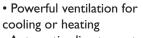


Adjustable suspension seat









 Automatic climate control as standard on E57C and E60C



• Integrated cup holders are fitted to the E26C and above



• E26C and above have a lockable cubby under the seat



Adjustable wrist rests



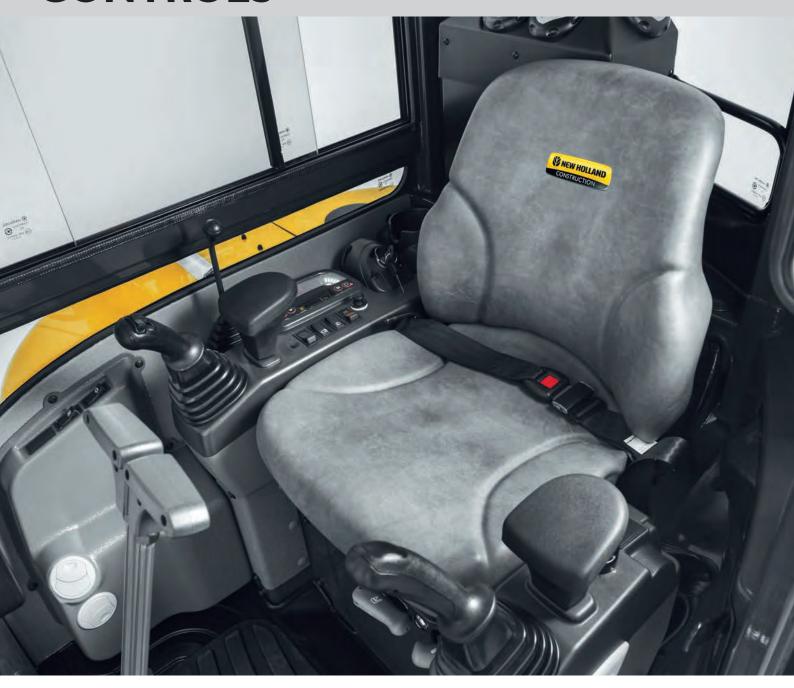
• Front screen opens or can be raised clear



 $\bullet$  Standard hands free feature available on E57C and E60C

• Control your mobile phone and radio via Bluetooth

## **CONTROLS**



## MORE POWER, MORE PRODUCTIVITY, MORE VALUE.

A comfortable operator is a safe and productive operator. All models have excellent ergonomics, with all key controls positioned for easy access. The shape of the joysticks enables the operator to choose their preferred method of working the key excavator functions, allowing both gripped and palm down operating positions. The armrests adjust to deliver the required level of support and the foot pedals on the more compact models fold to increase floor space. Getting in and out the machine is eased by the left side-console tilting out of the way, locking the hydraulics at the same time to prevent accidental operation.

- All controls are within easy reach
- Joysticks positioned for ease of use
- Safety lock prevents exit while hydraulic controls are live



- Standard digital side console on E17C, E26C, E33C and E37C
- Sealed against dust and moisture
- Integrated code anti-theft system
- Hour meter, engine speed and warning lights
- Fuel level and coolant temperature gauges



- $\bullet$  Standard digital 14.5cm colour LCD touch screen display on E57C and E60C
- Displays engine speed and coolant temperature
- Hydraulic oil temperature
- Fuel level
- Maintenance information to include fault codes and diagnostics
- Input for rear view camera



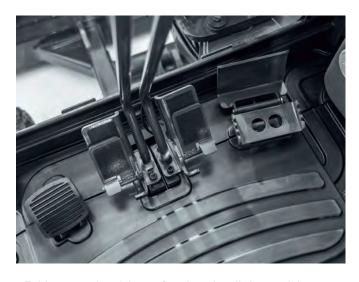
• E17C to E37C joystick features full proportional control

Optional integral buttons for auxiliary hydraulics



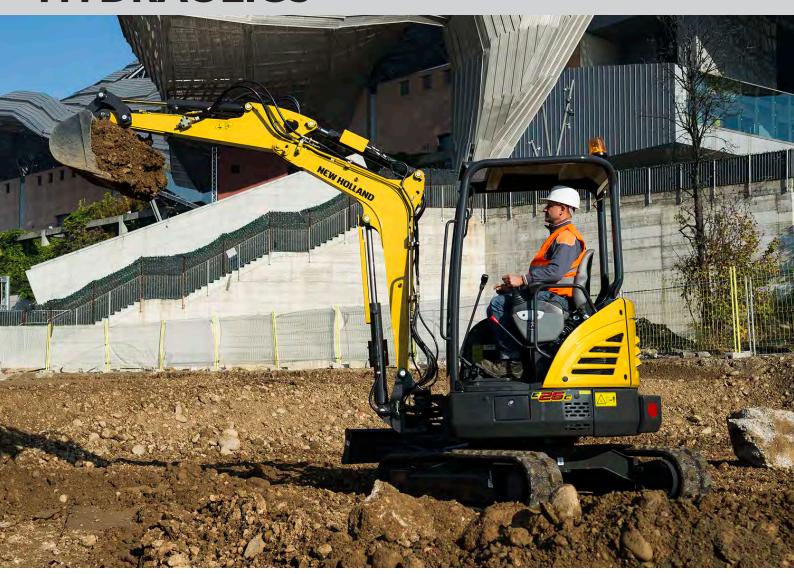
• E57C and E60C joystick features full proportional control

•Optional additional auxiliary controls on left joystick



 $\bullet$  Fold-up travel pedals are fitted to the all the models except  ${\sf EI7C}$ 

## **HYDRAULICS**



### SMOOTH CONTROL, POWERFUL PERFORMANCE.

The efficient conversion of engine power into hydraulic muscle lies behind the efficiency of New Holland mini-excavators. bAll models have three separate pumps to deliver optimised performance when travelling between sites or using the dozer blade, when working with the excavator and when driving hydraulic attachments. For demanding auxiliary attachments, a fourth pump option is available for the E57C and E60C.

To ensure smooth operation, valves control the flow of oil as the rams are fully extended and retracted, automatically providing a cushion effect to smooth the operation of all key functions. In work this reduces shock loads transferred to the machine and operator, reducing fatigue. This feature is further enhanced by the inclusion of an accumulator within the hydraulic circuit.

To further boost performance, the top two models have hydraulic flow summation. This advanced system delivers the enhanced proportional control typically restricted to large excavators.

#### **Cushioned rams for:**

- Smoother operation
- Greater operator comfort
- Reduced machine wear

#### Hydraulic accumulator delivers:

- Cushioned shock loads
- Oil leak compensation
- Vibration damping
- Emergency hydraulic function

#### Separate oil pumps deliver:

- Cooler running
- Greater efficiency
- Faster hydraulic response
- · Dedicated flow to meet demand
- Fourth pump option E57C and E60

With SAE bucket breakout forces up to 37765 Kn and dig depth up to 3.81 m, C Series excavators put big digging power in restricted areas. They offer top-of-class ground clearance and excellent dozer blade lift height for maneuvering and working in rough conditions. The E17C features a variable undercarriage that retracts for entry through tight egresses and then extends for stability.

#### Long and short arm choice

Specify your C series mini-excavator with the arm length to best suit your requirements.

Models	Short arm lenght (mm)	Long arm lenght (mm)
E17C	960	-
E26C	960	1350
E33C	1300	1600
E37C	1300	1600
E57C	-	1900
E60C	-	1900

#### Ample boom swing angles

- Efficient parallel digging: good for working along side obstacles
- Less time: no need to reposition the machine, get the job done faster
- Better visibility: larger left swing angle to the side of the door

Models	Left swing (degrees)	Right swing (degrees)
E17C	70	54
E26C	75	50
E33C	75	50
E37C	75	50
E57C	80	50
E60C	70	50

#### Auxiliary hydraulic power and versatility

- Power for grabs and clamshell buckets
- Reversible flow for soil augers
- High capacity constant flow for flails and cutterbars
- Power for hydraulic breakers and hammers

#### **Clever features**

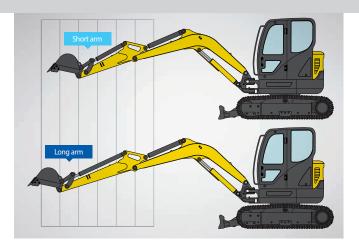
- Hydraulic flow summation system
- Boom hold
- Swing parking brake
- Excellent hydraulic hose protection
- Cylinder protection covers on boom, dipper and dozer

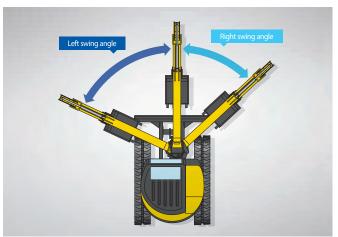
#### Transport and security

All C Series models were made to be moved. Thoughtfully placed tie down holes are provided for safe transportation. The ESL (Engine Start Limit) System requires a passcode to start the engine to deter theft. You can also set the time permitted between engine starts.

#### Boom pivot pins secured by plate and bolt

- Reduced lateral movement
- Long service life
- Reliable performance in tough conditions
- Lower whole life operating costs









# **UNDERCARRIAGE**



## **EXCELLENT STABILITY, MAXIMUM TRACTION.**

Built for versatility, New Holland mini-excavators have powerful traction matched to a low centre of gravity for stability across difficult terrain. The dozer blade, which is lowered for stability when excavating, features excellent geometry for levelling and grading. Dependent upon model, there are four choices of track design, with the E17C also featuring hydraulic variable track width.

On steep inclines, the two-speed drive can be set to automatically default into low range to maintain forward speed with no input from the operator.



#### **Automatic shifting**

New Holland's Auto Shift traveling system automatically downshifts when load increases to enhance travel torque on slopes and in difficult conditions, then shifts back up to secure a faster travel speed after the load decreases. The Auto Idle system improves fuel efficiency by automatically decreasing engine RPM when you re not using the operating levers.



- E17C travel motor hoses run inside the track frame for protection
- Excellent ground clearance, up to 170mm on E17C
- Double-flange rollers feature as standard to minimise the risk of de-tracking



- E17C track width adjusts from 980mm to 1300mm
- This function is hydraulically controlled from the operator seat



- Dozer blade extenders are standard on variable track width E17C model
- Simple pin lock system





Wide tracks offering		EI7C	E26C	E33C	E37C	E57C	E60C
Track width							
1 - Rubber tracks	(mm)	230	250	300	300	400	400
2 - Steel tracks	(mm)	-	-	-	-	450	450

# **ENGINE**



## EFFICIENT, POWERFUL, DEPENDABLE.

New Holland mini-excavators are compliant with Tier 4B emission regulations and employ different after treatment technologies to achieve this. Each model has a power unit selected to match the excavators size and capacity. This ensures optimised performance and fuel economy. To further enhance economy, the E37C, E57C and E60C are fitted with Auto-idle.

Models	Power (hp)	Emission Level	Tier 4 Technology
E17C	16.8	Tier 4B	Mechanical - No ATS
E26C	24.8	Tier 4B	Mechanical - No ATS
E33C	24.4	Tier 4B	Mechanical + CEGR
E37C	24.4	Tier 4B	Mechanical + CEGR
E57C	66.9	Tier 4B	Electronic + CEGR + DPF
E60C	64.7	Tier 4B	Electronic + CEGR + DPF

#### Auto-idle (E33C, E37C, E57C and E60C)

When the hydraulics or traction motors are not demanding oil, the engine speed is reduced to idle with no input required from the operator. This feature can be turned on or off via a simple switch on the main console.

- Reduced fuel consumption
- · Low engine noise when not working
- Reduced wear

# SERVICE AND BEYOND THE PRODUCT

### **SERVICING, NO SWEAT!**

New Holland mini-excavators are compliant with Tier 4B emission regulations and employ different after treatment technologies to achieve this. Each model has a power unit selected to match the excavators size and capacity. This ensures optimised performance and fuel economy. To further enhance economy, the E37C, E57C and E60C are fitted with Auto-idle.

• Sight glass levels allow hydraulic oil levels to be checked quickly and with no need to lift the engine hood.

#### Long service intervals

- Main pivots. Lubricate every 250 hours
- Polymer shims. Long life. Maintenance free
- Exteneded life hydraulic filters. I,000 hour change interval
- Long-life hydraulic oil. 2,000 hour change interval



Centralised grease points.

• Forward tilting cab eases maintenance access is available on E60C model.

• A remote electric refuelling pump is available on E57C and E60C models.



When the unexpected occurs, you need to know your equipment is protected. At New Holland we understand the importance of your machinery being in good working order when it counts. Service Plus is designed to help keep your equipment working well beyond the manufacturer's base warranty period while taking away the concerns of the cost and inconvenience of mechanical failure.

## WHAT ARE THE ADVANTAGES OF SERVICE PLUS? PEACE OF MIND

Provides protection for the full Manufacturer's Base Warranty Period.

#### **FLEXIBLE OPTIONS**

Plans can be customised or extended to meet individual needs.

#### **DEPENDABLE SERVICE**

Eligible repairs completed by an authorised New Holland Dealership and their trained service technician's using genuine OEM parts & lubricants.

#### TRANSFERABLE PROTECTION

New Equipment Plans may be transferred to a new owner at no charge

#### • STANDARD PROTECTION PLAN 12 Months / Unlimited Hours

Additional years/hours can be purchased. Please contact your local New Holland dealer for further information.

#### **NEW HOLLAND SERVICES.**



#### Finance tailored to your business

CNH Industrial Capital, the financial services company of New Holland, is well established and respected within the agricultural sector. Advice and finance packages tailored to your specific needs are available. With CNH Industrial Capital, you have the peace of mind that comes from dealing with a financing company that specialises in agriculture.

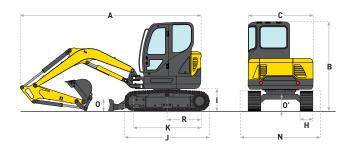


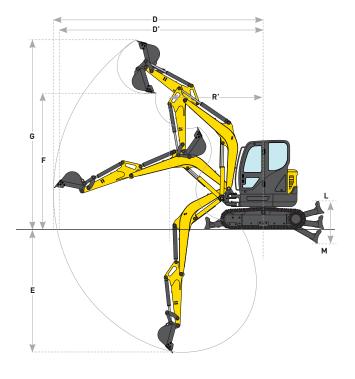
#### Trained to give you the best support

Your dedicated New Holland dealer technicians receive regular training updates. These are carried out both through on-line courses as well as intensive classroom sessions. This advanced approach ensures your dealer will always have the skills needed to look after the latest and most advanced New Holland products.

# E17C/E26C/E33C/E37C

## **DIMENSIONS**





		EI	7C	E2	6C	E3	3C	E3	7C	E5	7C	E6	0C
Digging performances													
Arm		Short	Long										
Dipperstick	mm	960	-	1120	1350	1300	1600	1300	1600	-	1900	-	1900
Dipperstick Breakout force (ISO)	kN	8.5	-	14.6	12.8	19.5	16.9	19.5	16.9	-	28.7	-	22.4
Bucket Breakout force (ISO)	kN	15.5	-	21.1	21.1	30.7	30.9	30.7	30.9	-	42.4	-	40.9
D - Max reach	mm	3900	-	4480	4680	5180	5470	5315	5605	-	6400	-	6480
D' - Max reach at ground level	mm	3800	-	4340	4540	5060	5355	5200	5495	-	6270	-	6350
E - Max digging depth	mm	2200	-	2420	2645	3035	3335	3135	3440	-	4060	-	3990
F - Max dump height	mm	2570	-	2930	3030	3275	3455	3425	3615	-	4180	-	4100
G - Max digging height	mm	3580	-	4150	4235	4650	4840	4810	5010	-	5920	-	5850

		EI7C	E26C	E33C	E37C	E57C	E60C
R - Rear end swing radius	mm	645	775	775	870	1650	1080
R' - Min front slew radius	mm	1570	1970	2290	2330	2350	2420
H - Track width	mm	230	250	300	300	380	380
I - Ground clearance of rear end	mm	440	510	540	540	690	660
J - Overall Length of Crawler	mm	1590	1910	2130	2130	2530	2530
K - Center distance of tumblers	mm	1230	1490	1700	1700	1990	1990
L - Blade max lifting	mm	285	330	400	375	390	200
M - Blade max lowering	mm	225	380	435	390	590	700
N - Blade width	mm	990 / 1300	1500	1550	1740	1920	1980
O - Blade height	mm	250	300	330	370	350	350
O' - Ground clearance of undercarriage	mm	170	290	290	290	380	380

# /E57C/E60C

## **SPECIFICATIONS**

		EI7C	E26C	E33C	E37C	E57C	E60C
Engines		Kubota	Kubota	Yanmar	Yanmar	Yanmar	Yanmar
Туре		D902	D1305	3TNV88F	3TNV88F	4TNV98C	4TNV98C
N° of cylinders		3	3	3	3	4	4
Displacement	(cm3)	898	1261	1642	1642	3319	3319
Compliant with engine emissions regulations Tier / Stage	4B / 3A	4B / 3A	4B / 3A	4B / 3A	4B / 3B	4B / 3B	
Rated gross horse power	[kW/ hp(CV)]	12.5 / 16.8	18.5 / 24.8	18.2 / 24.4	18.2 / 24.4	49.9 / 66.9	48.3 / 64.7
@ rated speed	(rpm)	2300	2400	2200	2200	2150	2050
Max torque	(Nm)	54	81	94	89	235	235
@ rated speed	(rpm)	1900	1600	1200	1200	1550	1560
Diesel tank capacity	(Litres)	20	30	30	40	120	82
Hydraulic system***							
Variable displacement axial piston pumps		•	•	•	•	•	•
Maximum flow	(lpm)	2 x 18.8	2 x 27.6	2 x 37.4	2 x 37.4	2 x 57.8	2 × 55
Maximum pressure	(bar)	210	220	230	230	220	220
Gear pump delivery flow	(lpm)	11.3	19.6	23.1	23.1	38.4	36.6
Gear pump delivery pressure	(bar)	170	175	205	205	220	220
Transmission							
Туре		two speed	two speed	two speed	two speed	two speed	two speed
Travel Speed - Low (1st)	(km/h)	2.1	2.4	2.4	2.3	2.1	2.0
Travel Speed - High (2nd)	(km/h)	4.3	4.5	4.2	4.4	4.1	3.9
Slewing							
Slewing speed	(rpm)	9.5	9.1	9.0	9.5	9.1	8.8
Boom slewing angle - left / right	(degrees)	70 / 5 <del>4</del>	75 / 50	75 / 50	75 / 50	80 / 50	70 / 50
Transport feature*							
Weight - Cab version	(kg)	_	-	-	3660	5410	5850
Weight - Canopy version	(kg)	1680	2410	3050	3520	_	_
A - Max length - short / long arm	(mm)	3480 / 3510	4030 / 4100	4640 / 4665	4790 / 4815	5900 / 5990	5600 / 5720
B - Max height	(mm)	2320	2500	2500	2500	2550	2550
C - Max width	(mm)	990 - 1300	1500	1550	17 <del>4</del> 0	1920	1980
Operating weight**							
Cab version	(kg)	_	2650	_	3760	5580	5980
Canopy version	(kg)	1770	2500	3150	3620	_	_

<sup>\*</sup> Weight is with full fuel tank, without operator, without bucket

<sup>\*\*</sup> includes operator, full fuel tank and one bucket

<sup>\*\*\*</sup> Specifications are representative of pump capacity only, not actual hydraulic flow at auxiliary fittings.

# E17C/E26C/E33C/E37C

### LIFTING CAPACITIES

Lift point Arm		LIFT-POINT RADIUS							
	1.5	m	2.0	m	3.0 m				
height (m)	AIIII	Į.	-	ļ	<del>=</del>		<b>#</b>		

Lift	LIFT-POINT RADIUS						
point		1.5 m		2.0 m		3.0 m	
		Ιμ	<b>*</b>	l <sub>l</sub> l	<b>+</b>	<b> </b>  -	<b>₩</b>
(111)		i		i		i	

#### **CX17C CANOPY**

1.0	ka	Blade up			430	430	230	230
m	kg	Blade down			*620	460	*400	250
0.0	lea	Blade up	*600	*600	390	390	210	220
m	kg	Blade down	*600	*600	*820	420	*450	230
-1.0	l.a.	Blade up	630	630	390	390		
m	kg	Blade down	1060	680	*720	420		

CX3	CX33C CANOPY											
1.0	ka	Blade up	400	290	1320	910	660	480				
m	kg	Blade down	*730	290	2090*	920	*1000	480				
0.0	lea	Blade up	380	270	1210	810	610	430				
m	kg	Blade down	*380	270	*1800	820	*1260	430				
-1.0	Lon	Blade up	370	260	1200	810	590	410				

260

\*2420

810

\*1290

410

\*820

Lift point	Arm	LIFT-POINT RADIUS						
		1.5 m		2.0 m		3.0 m		
height (m)	AIIII	ĮΝ	<b>#</b>	Į.	-	Į	<b>#</b>	

Lift point	Arm	LIFT-POINT RADIUS						
		2.0	m	3.0	m	4.0	) m	
height (m)		Į.	<b>#</b>	Į.	<b>#</b>		-	

#### CX26C CANOPY

-									
ı	1.0	ka	Blade up			760	620	400	340
	m	kg	Blade down			*1690	670	*900	360
	0.0	l.a.	Blade up	*840	*840	710	570	380	310
	m	kg	Blade down	*840	*840	*1700	620	*1100	340
	-1.0	ka	Blade up	1240	950	710	570	370	310
ı	m	kg	Blade down	*1920	1040	*1910	620	*1030	330

#### **CX37C CANOPY**

1.0	lea	Blade up			810	690	520	450
m	kg	Blade down			*970	750	*690	490
0.0	lea	Blade up	*1320	1190	760	640	500	430
m	kg	Blade down	*1320	1320	*1160	700	*700	470
-1.0	ka	Blade up	1470	1200	750	630	490	420
m	kg	Blade down	*2060	1330	*1140	690	*750	460

All models are equipped with long arm, no bucket, std counterweight, rubber tracks

ISO 10567: Lifting capacity does not exceed 75% of tipping load or 87% of full hydraulic capacity.

#### CX37C CAB

1.0	ka	Blade up			860	730	550	480
m	kg	Blade down			*970	800	*690	520
0.0	ka	Blade up	*1320	1270	810	690	530	460
m	kg	Blade down	*1320	*1320	*1160	750	*770	500
-1.0	ka	Blade up	1570	1280	800	680	530	450
m	kg	Blade down	*2060	1410	*1140	740	*750	490

<sup>\*</sup> Indicates load limited by hydraulic capacity

# /E57C/E60C

Lift point	Arm	LIFT-POINT RADIUS						
		2.0 m		3.0 m		4.0 m		
height (m)	AIIII	Į.		P	<del>-</del>	Į.	=======================================	

# CX57C CAB - LONG ARM, NO BUCKET, STD COUNTERWEIGHT, RUBBERTRACK (400 MM)

1.0	ka	Blade up			1650	1290	1070	850
m	kg	Blade down			2450*	1430	1700*	940
0.0	l.a.	Blade up	1500*	1500*	1570	1210	1030	810
m	kg	Blade down	1500*	1500*	2830*	1350	1900*	900
-1.0	lea	Blade up	2740*	2260	1550	1190	1010	790
m	kg	Blade down	2740*	2570	2840*	1330	1940*	880

#### CX57C CAB - LONG ARM, NO BUCKET, ADDITIONAL COUNTERWEIGHT (+100 KG), RUBBERTRACK (400 MM)

1.0		Blade up			1750	1360	1130	910
m	kg	Blade down			2450*	1510	1700*	1000
0.0	l.a	Blade up	1500*	1500*	1660	1290	1090	870
m	kg	Blade down	1500*	1500*	2830*	1430	1900*	960
-1.0	lea	Blade up	2740*	2400	1640	1260	1070	850
m	kg	Blade down	2740*	2720	2840*	1410	1940*	940

ISO 10567: Lifting capacity does not exceed 75% of tipping load or 87% of full hydraulic capacity.

Lift point	Arm	LIFT-POINT RADIUS					
		2.0 m		3.0 m		4.0 m	
height (m)	AIIII	Ψ	<b>#</b>	Į.	-	Į.	-

# CX60C CAB - LONG ARM, NO BUCKET, STD COUNTERWEIGHT, RUBBERTRACK (400 MM)

1.0	ka	Blade up			1410	1170	900	760
m	kg	Blade down			2640*	1300	1770*	850
0.0	l.a.	Blade up	1360*	1360*	1320	1090	860	720
m	kg	Blade down	1360*	1360*	3050*	1220	1990*	800
-1.0	lea	Blade up	2470*	2110	1300	1070	840	700
m	kg	Blade down	2470*	2410	3020*	1200	2010*	780

#### CX60C CAB - LONG ARM, NO BUCKET, ADDITIONAL COUNTERWEIGHT (+200 KG), RUBBERTRACK (400 MM)

1.0	lea	Blade up			1560	1300	1010	860
m	kg	Blade down			2640*	1440	1770*	940
0.0	lea	Blade up	1360*	1360*	1480	1220	960	810
m	kg	Blade down	1360*	1360*	3050*	1360	1990*	900
-1.0	Len	Blade up	2470*	2360	1450	1200	940	790
m	kg	Blade down	2470*	2470*	3020*	1340	2010*	880

<sup>\*</sup> Indicates load limited by hydraulic capacity

## PARTS AND SERVICE

The New Holland dealer network is, in itself, the best guarantee of continued productivity for the machines it delivers to its customers. New Holland service technicians are fully equipped to resolve all maintenance and repair issues, with each and every service point providing the high standards they are obliged to observe under New Holland's stringent quality guidelines. The New Holland global parts network ensures fast reliable, replacement parts for less downtime increased productivity and of course, profitable operation for its customers.

#### AT YOUR OWN DEALERSHIP

The information contained in this brochure is intended to be of general nature only. The NEW HOLLAND CONSTRUCTION MACHINERY S.p.A. company may at any time and from time to time, for technical or other necessary reasons, modify any of the details or specifications of the product described in this brochure. Illustrations do not necessarily show products in standard conditions. The dimensions, weights and capacities shown herein, as well as any conversion data used, are approximate only and are subject to variations within normal manufacturing techniques.







