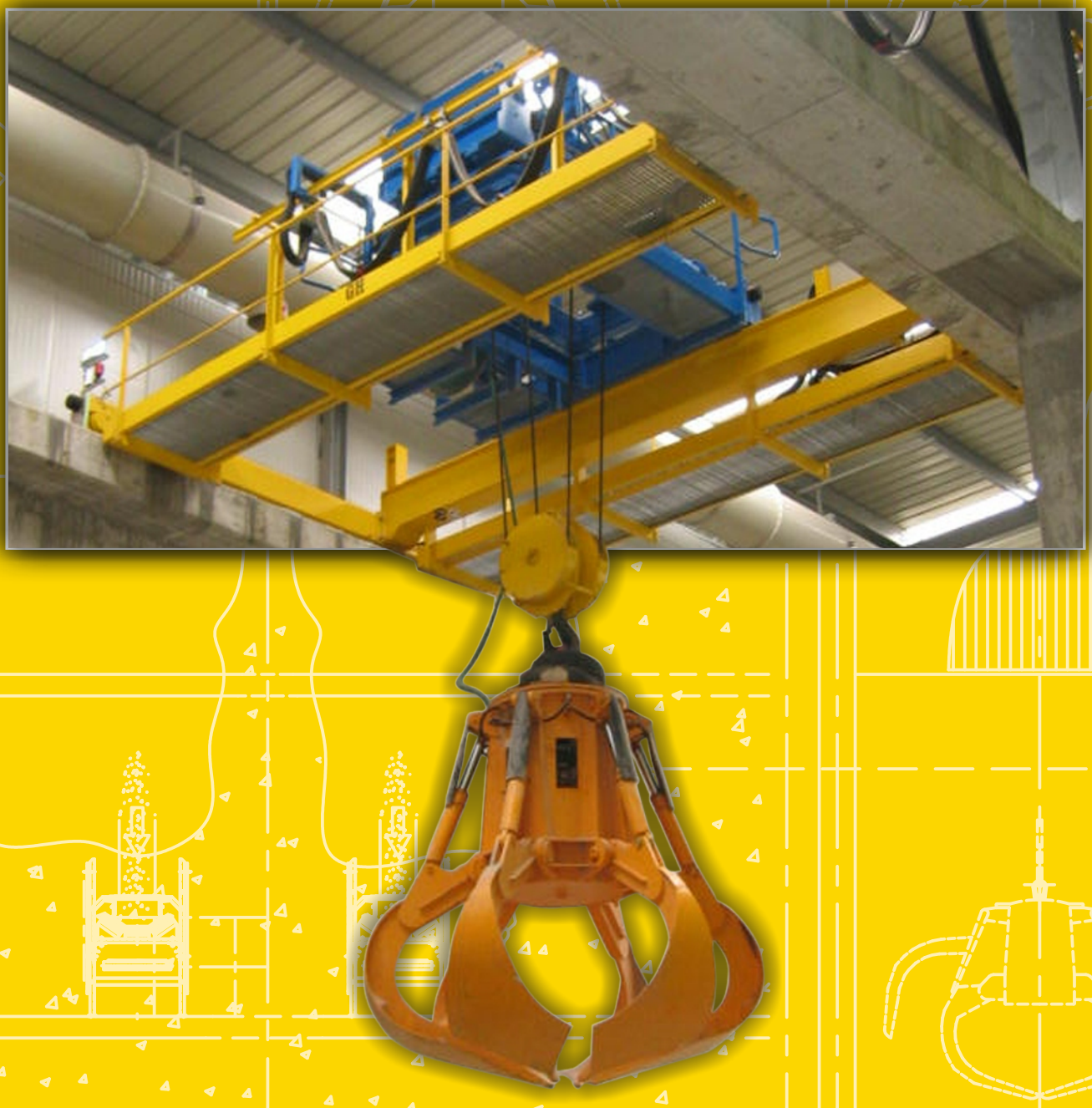
·GH·

CRANES & COMPONENTS



WASTE TREATMENT PLANT CRANES (WTC)

WITH ELECTRO HYDRAULIC OR MECHANICAL GRAB

PONTE ROLANTE SUWNICE GRUAS CRANES PONT-ROULANT PONTE ROLANTE SUWNICE

Type of cranes according to the seizing element operation mode

Electro hydraulically driven cranes

The orange peel grab or the grab are driven by an electro - hydraulic unit, consisting on an electric motor, a pump and hydraulic valves, which supply oil under pressure through duly protected hoses, to the cylinders operating the teeth or shells. All this units are integrated on the orange peel grab or grab body.

The orange peel grab or grab's electric supply is carried out through a spring reel or motorized cable reel, depending on the lifting/lowering travel and speeds.

Nowadays, most of the waste treatment plant cranes (WTC) are equipped with this type of grabs.

Mechanically driven cranes

The mechanically driven orange peel grabs and grabs are generally provided with four-ropes: They are based on two closing ropes and two suspension ropes.

This is why it is necessary to have a special lifting system available with two drums. Both drums must make movements, completely determined by a differential combiner, sometimes in the same direction and sometimes in the opposite direction. Its operation is carried out as follows:

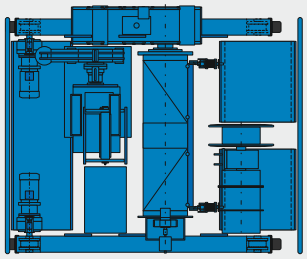
1. **When seizing the load,** with the orange peel grab or grab being open, this is positioned on the material to be seized, with the closing rope loose. Pulling from the closing rope, the bottom beam is approached to the upper one, and therefore closing the teeth or blades. In order to make the orange peel grab or the grab enter into the material, on its own weight, the holding rope must be loosened sufficiently during the closing course or a little earlier.

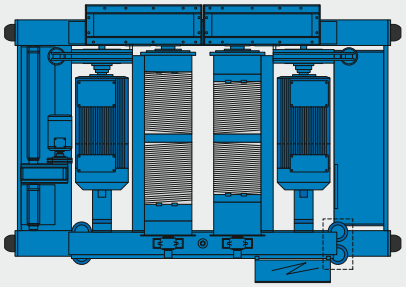
2. **Lifting and lowering of the closed orange peel grab or grab.** When the teeth or blades are already closed, if the closing rope is still pulled the grab goes up. So, in order to avoid that the holding rope remains too loose it must be wound in a simultaneous way as the closing and lifting.

3. **When opening the orange peel grab,** the holding rope is fixed and the closing rope is released, therefore the bottom beam goes down and the teeth or blades separate themselves.

4. **Lifting and lowering of the open orange peel grab and grab.** Then the upper beam hangs and, consequently, also the suspension rope. When you have to lower the orange peel grab or grab, the closing rope and the suspension rope must be unwound evenly and simultaneously.

Differences between hook blocks with a different driving system.





ELECTROHYDRAULIC DRIVE

- Higher control of the working performance.
- Less weight of the crab and consequently of the crane, for the same capacity.
- Less cost of the crane as a consequence of the above mentioned.
- More simple electric control gear, and consequently cheaper.
- Less lateral losses.
- Higher worn in case of waste fire in the pit.
- Possibility of coupling worn due to bumps during the operation.
- More sensible elements due to the type of the pressurization filter and the oil filter application.
- Maintenance requirement for holding eye.
- Better filling rate, due to a better nailing into the waste mass.
- Shorter orange peel grab's replacement times.
- Less height level.

MECHANICAL DRIVE

- As a general rule, higher opening and closing speed.
- Less maintenance of the proper orange peel grab or grab.
- Requires a frequent closing rope replacement in the hook block.
- Since the orange peel grab works quite inclined over the irregular surface it can affect the rope systems.

Working cycle definition

Starting basic data

Capacity of installation (t/h)
Orange peel grab / grab volume (m3)
Material density (t/m3)
Useful working time per hour (minutes) = (60' - waste homogenizing time in the pit.)

⇒ Number of manoeuvres per hour (cycles/hour)
Time **AVAILABLE** per cycle (seconds/cycle)

Average travel and traverse ranges

- Average of lifting and lowering (m) = H1 + H2 + 2/3 x pit H
  H1 = Height between the pit's upper part and the hopper's upper part.
  H2 = distance between the closed and lifted orange peel grab and the hopper upper part.
  It is advisable that H2 >= 1 m.
  Pit H = Pit height
- Traverse average range of crab (m) = ½ x S
  S = EOT crane span
- Travelling average range of EOT crane (m) = 2/3 x I
  I = Longest distance between the hopper axle and the pit end (in case there are more than one hoppers and the distance between them is bigger than I, 2/3 of this new distance will be considered)

Speeds

Some speeds will be determined for each movement. The duration of the complete cycle will be verified with them.

To calculate the duration of each movement, the acceleration and deceleration times must be taken into account. For this purpose, the recommendations shown in the attached table should be taken as a base. We propose to choose, as a general rule, the values assigned to the current applications.

FEM (European Federation of Materials Handling and Storage)
PROPOSAL ABOUT THE DURATION OF THE ACCELERATIONS (SECONDS)

SPEEDS TO REACH (m/min)	TYPE OF APPLICATIONS		
	SLOW	CURRENT	HARD
9,6	2,5		
15	3,2		
24	4,1	2,5	
37,8	5,2	3,2	
60	6,6	4	3
96	8,3	5	3,7
120	9,1	5,6	4,2
150		6,3	4,8
189		7,1	5,4
240		8	6

Description of the cycle duration

- Orange peel grab or grab closure seconds
- Load lifting seconds
- Long travel movement seconds
- Cross travel movement seconds
- Orange peel grab or grab opening seconds
- Cross travel movement seconds
- Long travel movement seconds
- Orange peel grab or grab lowering with no load seconds

Total REQUIRED time per cycle

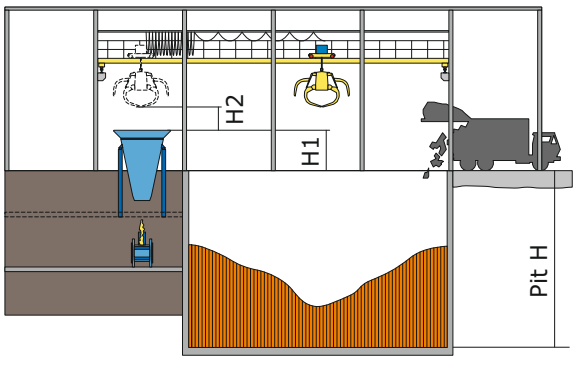
- Generally, it is convenient to carry out these movements in a semiautomatic way, i.e., the orange peel grab or grab opening and closing movements, as well as the positioning of the crane at the exact place to seize the load, should be made manually and the rest of motions automatically.

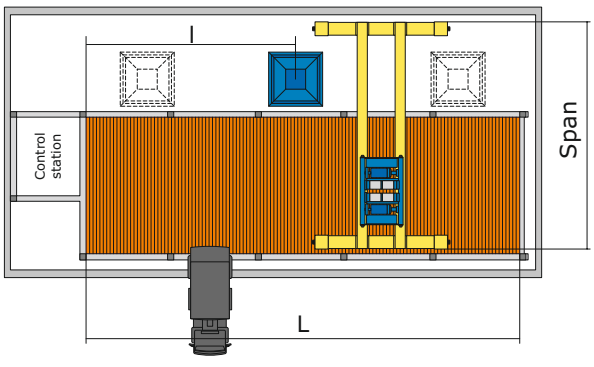
- In a semiautomatic operating mode, it is usual to carry out the crab traverse and the crane travelling simultaneously when the cycle requires to be shortened.

Verification

REQUIRED time per cycle < **AVAILABLE** time per cycle
(In case the available time is less than the required, it is necessary to act on the orange peel grab and grab capacity parameters and the speeds of the different movements).

Representative drawing





It is important to define the orange peel grab resting area, the EOT crane parking area, the length to pick up the rope-holder carriages and that the installations have an access for crane maintenance.

Selection tables

Cranes with an electro hydraulic grab

Type of Gear Box	Capacity tn.	Orange Peel Grab or Grab m^3	Working group*	Span (m)	Hook height of Lift (m)	Lifting Speed (m/min)	Cross travel Speed (m/min)	Long travel movement speed (m/min)
GHF	3,2	2 - 2,5	M7 - M8	5 - 30	10 - 30	16 - 40	20 - 40	40 - 80
	4	2,5	M7 - M8	5 - 30	10 - 30	16 - 40	20 - 40	40 - 80
	5	3 - 3,5	M7 - M8	5 - 30	10 - 30	16 - 40	20 - 40	40 - 80
	6,3	4 - 4,5	M7 - M8	5 - 30	10 - 30	16 - 40	20 - 40	40 - 80
GHG	8	5 - 6	M7 - M8	5 - 30	10 - 30	16 - 60	20 - 40	40 - 80
	10	8 - 9	M7 - M8	5 - 30	10 - 30	16 - 60	20 - 40	40 - 80
	12	8 - 9	M7 - M8	5 - 30	10 - 30	16 - 40	20 - 40	40 - 80
GHI	13,5	10	M7 - M8	5 - 30	10 - 30	16 - 50	20 - 40	40 - 80
	15	10 - 12	M7 - M8	5 - 30	10 - 30	16 - 40	20 - 40	40 - 80

* Our experience shows that, for this type of installations, it is advisable to use high working groups as M7 or M8.

Some references

Cap. tn.	Company
3,2	DRAGADOS OBRAS Y PROYECTOS - MELILLA
4	U.T.E. PLANTA R.S.U. PINTO - MADRID
5	MASIAS RECYCLING - CHINA
6,3	ANDRITZ - SWITZERLAND
8	U.T.E. CBC MIRAMUNDO - CADIZ
10	U.T.E. ECOPARC - BARCELONA
12	U.T.E. MEIRAMA - LA CORUÑA
13,5	VERTRESA - MADRID
15	U.T.E. MONTCADA - BARCELONA

Cranes with mechanical grab

Type of Gear Box	Capacity tn.	Orange Peel Grab or Grab m^3	Working group*	Span (m)	Hook height of Lift (m)	Lifting Speed (m/min)	Cross travel Speed (m/min)	Long travel movement speed (m/min)
GHG	12	5 - 6,3	M7 - M8	20 - 30	10 - 30	40 - 48	40 - 60	40 - 80
	13	6,3 - 8	M7 - M8	20 - 30	10 - 30	40 - 48	40 - 60	40 - 80
GHI	15	8 - 10	M7 - M8	20 - 30	10 - 30	40 - 80	40 - 60	40 - 80
GHJ	18	10	M7 - M8	20 - 30	10 - 30	40 - 80	40 - 60	40 - 80
	20	12,5	M7 - M8	20 - 30	10 - 30	40 - 80	40 - 60	40 - 80
	25	12,5 - 16	M7 - M8	20 - 30	10 - 30	40 - 80	40 - 60	40 - 80

* Our experience shows that, for this type of installations, it is advisable to use high working groups as M7 or M8.

Some references

Cap. tn.	Company
10	VIROEX - USURBIL
12	TIRME S.A. - MALLORCA
13	GONIO S.L. - CUBA
15	TIRME S.A. - MALLORCA
18	TIRME S.A. - MALLORCA
20	VIROEX S.L. - CUBA
25	TIRME S.A. - MALLORCA

These data are guidance. In any case, it is advisable to consult GH. For different configurations or dimensions, consult GH's head offices.

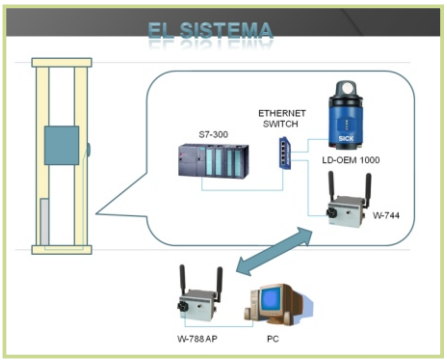
Electric wiring systems standardized by GH for waste treatment plants cranes

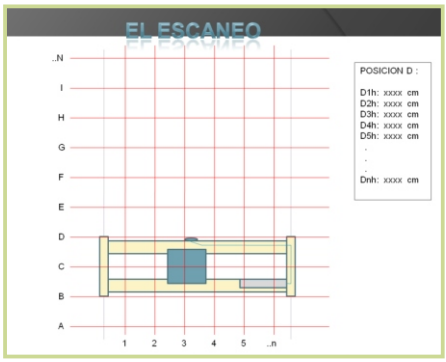
Wiring systems diagram

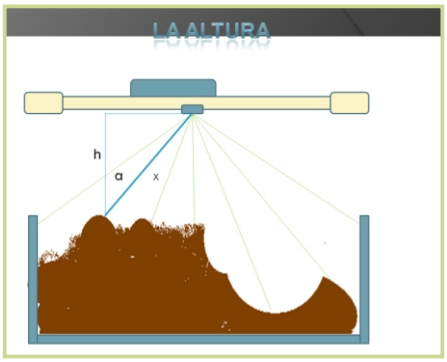
WTC (Waste Treatment plant Cranes) EOT CRANE

- ELECTRIC CABINETS IN ELECTRICAL ROOM (CCM)
  - CCM Wiring System
- ELECTRIC CABINETS IN EOT CRANE
  - GH-BUS System
  - GH-WE System

Waste management automated systems







Steps to follow for a WTC project definition

The first thing to know is the location of the electric cabinets. For that issue, there are two possibilities, the decision is up to the customer and must be defined by them.

1.- Electric cabinets in a conditioned electrical room (CCR).

In that way, the only thing we have to do, is to focus the project, with all the power, manoeuvre and control cables from the electric cabinet up to the overhead travelling crane and to the cabin. (see page 6).

The protection of the electrical cabinets is better against dust, humidity, etc. and maintenance is easier. But this supposes a higher installation cost because of the fixed and mobile run of electric wiring.

2.- Electric cabinets on the overhead travelling crane.

There are two alternatives from which, the model best meeting the client's requirements, must be selected:

- In places where the travel distance of the EOT crane and other characteristics are optional.
- Regarding to the electric project development, the possibilities are more extended and opened to the working demands from the side of the client's specifications, for the systems developed in GH-WE and GH-BUS.
- Economically, the most attractive alternative for the installation in site is the GH-WE system, since it is directly fed from a shielded cable. The installation is faster and easier than the one with the cable-holder carriages (see page 8).
- The disadvantage of this system is its coverage, which at present, is limited to 100m, on the 2.4 Ghz -100mW band. Shortly, since the 5 Ghz-1W installations will be allowed, we will be able to increase its coverage considerably, in its unavailability, the slowing development of the antenna and Wifi equipment.
- The GH-BUS system (see page 7) allows us to increase the travel distances. For this, amplifiers are installed, which guarantees the communication up to 300 m.

Installation systems (CCR/Crane Control Room)

Electrical cabinet in a separate electrical room

- Fixed power and control wiring system installation, from the switchboard (CCR) up to the end of the bay at the rail height of the overhead travelling crane, through a conduit on trays or grids.
- Fixed control wiring system installation from the electric cabinet up to the control station, through a conduit on trays or grids.
- Fixed installation of the cables of emergency stops from the electric cabinet up to the hoppers, through a conduit on trays or grids.
- Mobile power and control wiring installation from the bay end at the rail height, up to the overhead travelling crane, through cable-holder carriages.
- Profibus field bus, with absolute encoders.
- Under course weight display panel, accumulated weight by shift, EOT crane anomalies.
- Communication with Scada on Ethernet or Profinet.
- Control commutation between crane's PLCs wiring on Profinet net.
- Differential selector for mechanical grab.
- Redundant anti-collision through absolute encoders.
- Cabin area limitation through absolute encoders.

CCR wiring system

CCR Electric cabinet

- Accessibility for maintenance.
- Protection against dust and humidity.
- Electric components extended life.

Mobile installation to the overhead travelling crane

- Mobile installation through cable-holder carriages.
- Fixed installation through conduit on trays or grids.
- Power hose cables.
- Manoeuvre hose cables.
- Control hose cables.
- Bus hose cables.

Control station

- Weight display panel.
- Analogue control manipulators.
- Optical signals for anomalies.
- Adjustable and ergonomic seat.
- Rotating control station.
- "0" category emergency stop.
- Automatism to hoppers axle.
- Return to origin.

Overhead travelling crane

- Absolute encoders.
- Motorized cable reel
- Redundant anti-collision device
- Cabin area limitation.
- Brake opening confirmation.

Some project examples with cabinets in electrical room (CCR)

- Ecoparc 1 - Barcelona (2 EOT cranes).
- U.T.E. Montcada - Barcelona (2 EOT cranes).
- Sidonsa - France (2 EOT cranes).
- Tirme Methanization Plant - Palma de Mallorca (2 EOT cranes).
- Tirme - Palma de Mallorca (4 EOT cranes and 3 EOT cranes – implantation phase).

Installation Systems (GH-BUS)

Electric panel on EOT crane

- Power supply mobile installation (3x400v+PE) from the bay end at the rail height, to the EOT crane. Communication bus between the EOT crane PLCs in the control station and the emergency device through festoon system.
- Fixed wiring installation, from the bay end at the rail height, to the communication bus control station between EOT crane PLCs, from the control station and the emergency device, through conduit on trays or grids.
- Profibus field bus with absolute encoders.
- Instant weight display panel, accumulated weight by shift, EOT crane anomalies.
- Communication with Scada on Ethernet or Profinet net.
- Redundant anti-collision through absolute encoders.
- Cabin area limitation, through absolute encoders.

GH-BUS System

Control station

- Weight display panel.
- Analogue control joysticks.
- Anomalies optical signallers.
- Adjustable and ergonomic seat.
- Rotating control station.
- "0" category emergency stop.
- Automatism to hoppers axle.
- Return to origin.

Mobile installation to the EOT crane

- Mobile installation through festoon system
- Fixed installation through conduit on trays or grids.
- 3x400v+PE cable.
- Bus cable.
- Cable (emergency stop).

Overhead travelling crane

- Absolute encoders.
- Motorized cable reel.
- Redundant anti-collision.
- Cabin area limitation.
- Brake opening confirmation.

Some projects with the cabinets on the EOT Crane (GH-BUS)

- U.T.E. Meirama - Cerceda (5 EOT cranes).
- U.T.E. Miramundo - Medina Sidonia (1 EOT crane).
- Vertresa - Madrid (3 EOT cranes).
- U.T.E. Tecmed - Tenerife (1 EOT crane).
- Ecoparque La Rioja - Logroño (1 EOT crane).
- U.T.E. Sando - Malaga (1 EOT crane).
- Abogarse - Sevilla (1 EOT crane).
- Elecnor - Tenerife (1 EOT crane).

Installation systems (GH-WE)

Electrical panel on the EOT crane

- Shielded conduit installation for the power supply (3x400v+PE) along the bay.
- Fixed wiring installation for the emergency device and control station.
- Control and signalling communication between the EOT crane and its control station through Wifi (3, 4 or 5 Ghz).
- Profibus field bus with absolute encoders.
- Instant weight display panel, accumulated weight by shift, EOT crane anomalies.
- Communication with Scada on Ethernet or Profinet net.
- EOT cranes control commutation through PLC at the control station.
- Redundant anti-collision through absolute encoders.
- Cabin area limitation, through absolute encoders.

GH-WE System

Control station

- Weight display panel.
- Analogue joysticks.
- Anomalies optical signallers.
- Adjustable and ergonomic seat.
- Rotating control station.
- "0" category emergency stop.
- Automatism to hoppers axle.
- Return to origin.

- Wifi communication between control station and EOT crane 3, 4 or 5 Ghz.
- Transmission speed.
- Power supply by means of bus bar.
- Power insulating switch ("0" category).

3x400+PE

Overhead travelling crane

- Absolute encoders.
- Motorized cable reel.
- Redundant anti-collision.
- Cabin area limitation.
- Brake opening confirmation.

Some projects with electric cabinets on the EOT crane (GH-WE)

- Biocompost - Vitoria (2 EOT cranes).
- Urbaser - Zamora (1 EOT crane).
- U.T.E. Hornillos - Valencia (3 EOT cranes).
- U.T.E. Tem – Mataró (2 EOT cranes).
- Andritz – Istanbul (1 EOT crane).

Waste TreatmentOverhead travelling crane (WTC) table

Standard and optional elements. Installation examples

	GH-CCM	GH-BUS	GH-WE
DISTANCE >100mts	YES	YES	NO
ELECTRICAL CABINET'S LIFE	••••	•	•
CONDITIONING OF THE ELECTRICAL CABINET 4000 W	NO	YES	YES
COST OF THE INSTALLATION	••••	••	•
DIFFERENTIAL SELECTOR (MECHANICAL GRAB)	OPTIONAL	NO	OPTIONAL
ZONE LIMITATION	YES	YES	YES
REDUNTANT ANTI – COLLISION DEVICE	YES	YES	YES
VISUAL SCREEN	YES	YES	YES
PC COMUNICATION	YES	OPTIONAL	YES
ABSOLUTE ENCODERS	YES	YES	YES
INCREMENTAL ENCODERS	NO	NO	NO
INTERNET MAINTENANCE	YES	OPTIONAL	YES
WEIGHT IN COURSE	YES	YES	YES
WEIGHTING CATEGORY III	OPTIONAL	OPTIONAL	OPTIONAL
VOLUMETRIC SCANNER	OPTIONAL	OPTIONAL	OPTIONAL
PROGRAMMABLE ACC/ DEC RAMPS (ACCELERATION/DECELERATION)	OPTIONAL	OPTIONAL	OPCIONAL
ACCUMULATIVE OF WEIGHTS	YES	YES	YES
ANOLAMIES IN VISUAL DISPLAY UNIT	YES	YES	YES
REGENERATIVE FREQUENCY INVERTERS	OPTIONAL	OPTIONAL	OPTIONAL
BRAKE OPENNING CONFIRMATION	YES	YES	YES
MOTORIZAD CABLE REEL	YES	YES	YES
AUTOMATIC DEVICE OF THE ELECTRICAL CABINET	YES	YES	YES
DEVICE OF THE CONTROL CABIN	NO	YES	YES
MAGNETIC END STOPS	YES	OPTIONAL	OPTIONAL
FLOATING FRAMEWORK (4 CELLS)	OPTIONAL	OPTIONAL	OPTIONAL
RADIO REMOTE CONTROL FOR MAINTENANCE	OPTIONAL	OPTIONAL	OPTIONAL
FIX CABLE	YES	YES	YES
MOBILE CABLE	YES	YES	NO
BUS BAR	NO	NO	YES
EMERGENCY STOPS IN HOOPERS	YES	OPTIONAL	OPTIONAL
ACCES POINT/CLIENT WIFI	OPTIONAL	NO	YES
VNS0 COMBINATOR	YES	YES	YES
WINCC LICENCE	OPTIONAL	OPTIONAL	OPTIONAL

Selection of crane components:

OPEN CRAB OR HOIST?

- These are process cranes playing a crucial role. In case of failure the whole installation stops.

  Therefore, it is recommended to have at least other crane as a back up, so that it can be used in case of need.
- The requirements of these type of installations for waste processing in tons per hour, generally involves a high number of cycles/hour for the crane.
- In order to be able to perform the number of cycles/hour that these types of installations usually require, it is necessary to have speeds for the mechanisms considerably higher than those in other crane applications.
- These are cranes which, even with no load, bear approximately 60% of the SWL, due to the weight of the grab. Thus, when they are loaded, they bear loads close to the SWL.
- For this reason, the F.E.M. (European Federation of Materials Handling) classification for this kind of installations and cranes; mechanisms is generally M8 and, in certain cases, lighter, i.e. M7.
- The high mass and volume of the grabs makes necessary to reinforcing the crabs from which they are suspended and adjust the accelerations to avoid being drawn when braking.
- In many cases, the uneven waste surface in the pit causes slanted grab positions, which makes the ropes to perform also in the same way. Therefore the rope guides used on the standard lifting equipments are not recommended for this industry.
- The experience points out that, when selecting this type of cranes, it is advisable to consider not only the current waste handling operations in t/hour, but also the future ones that could increase the service requirements.

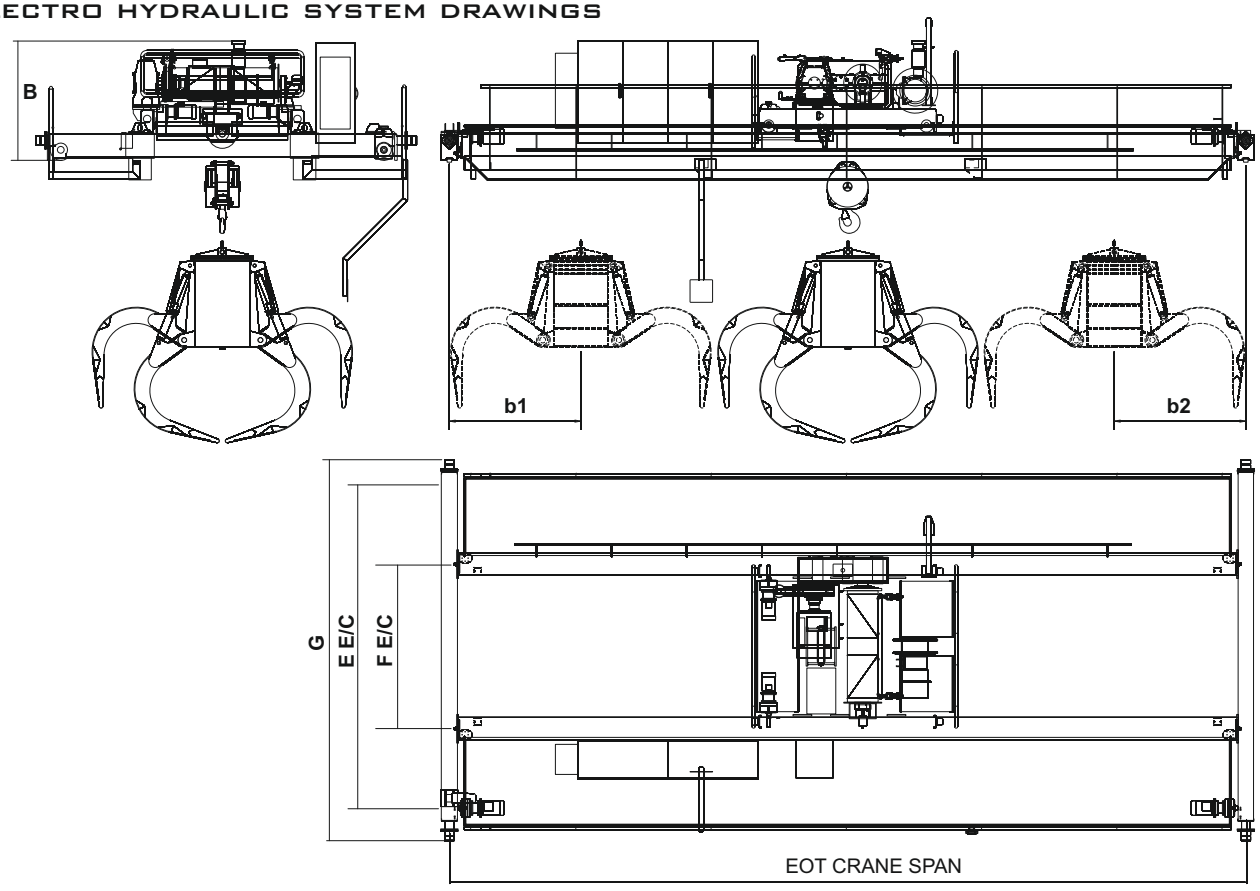
Due to the specific operation and environment, GH recommends the use of special designed WTC components to ensure the highest ROI (Return On Investment).

WTC Overhead Travelling Cranes Table

Electro hydraulic system table

Gear box type	Load cap. in ton.	Rail	H m	Lifting speed m/min.	FEM group	span (m) of the EOT crane	"Orange peel" grab m^3	Maximum Orange peel grab opening	b1 mm	b2 mm	A mm	B mm	E E/C mm	F E/C mm	G mm	RV Máx Kg	RV Mín Kg	RT Máx Kg	RF Kg
GHF	3,2	A-65	10÷30	16÷40	M8	5	2÷2,5	3075	1537	1538	3085	1650	2800	5000	5565	3456	2069	346	484
						10										4547	2053	455	637
						15										5644	2781	564	790
						20										6518	3472	652	913
						25					2955	1782			5625	7751	4594	775	1085
	4		10÷30	16÷40	M8	5	3	3075	1537	1538	3085	1650	2800	5000	5565	3733	2192	373	523
						10										4885	2115	489	684
						15										6003	2822	600	840
						20										7303	3917	730	1022
						25					2955	1782			5625	8127	4618	813	1138
	5		10÷30	16÷38	M8	5	3÷3,5	3280	1640	1640	3345	1650	2800	5000	5565	4071	2480	407	570
						10										5367	2259	537	751
						15										6532	2918	653	914
						20					3215	1782			5625	7856	3989	78	1100
						25										8832	4813	883	1237
	6,3		10÷30	16÷38	M8	5	4÷4,5	3650	1825	1825	3585	1650	2800	5000	5565	4598	3052	460	643
						10										6430	2795	643	900
						15					3455	1782			5625	7666	3334	767	1073
						20										8813	4132	881	1233
						25										9817	4928	982	1374
GHG	8	A-65	10÷30	16÷40	M8	5	5÷6	3915	1957	1958	4200	1730	2800	5000	5565	5462	3876	546	765
						10					4060	1862			5625	7819	3376	782	1095
						15										9054	3659	905	1268
						20					3980	1950		5500	6300	10411	4539	1041	1458
						25										11947	5790	1195	1672
	10		10÷30	16÷40	M8	5	8÷9	4475	2237	2238	4550	1730	2800	5000	5565	5605	4732	561	785
						10					4410	1862			5625	8391	3804	839	1175
						15										9978	4154	998	1397
						20					4330	1950		5500	6300	11307	4863	1131	1583
						25										12776	5961	1278	1789
	12		10÷30	16÷40	M8	5	8÷9	4475	2237	2238	4270	2000	2800	5000	5625	6268	5269	627	878
						10										9322	4073	932	1305
						15					4180	2090		5500	6300	11139	4473	1114	1560
						20										12372	4998	1237	1732
						25					4130	2140			6470	14244	6444	1424	1994
GHI	13,5	A-75	10÷30	16÷50	M8	5	10	4615	2307	2308	4975	2225	3100	5200	5825	7725	6795	773	1082
						10										11365	4875	1137	1591
						15					4885	2315		5800	6600	13369	5026	1337	1872
						20										15245	5975	1525	2134
						25					4835	2365			6770	16938	7112	1694	2371
	15		10÷30	16÷40	M8	5	10÷12	4960	2480	2480	5125	2225	3100	5200	5825	7737	7633	774	1083
						10					5035	2315		5800	6600	11936	5434	1194	1671
						15										14015	5380	1402	1962
						20					4985	2365			6770	16060	6360	1606	2248
						25										18195	7855	1820	2547

Electro hydraulic system drawings

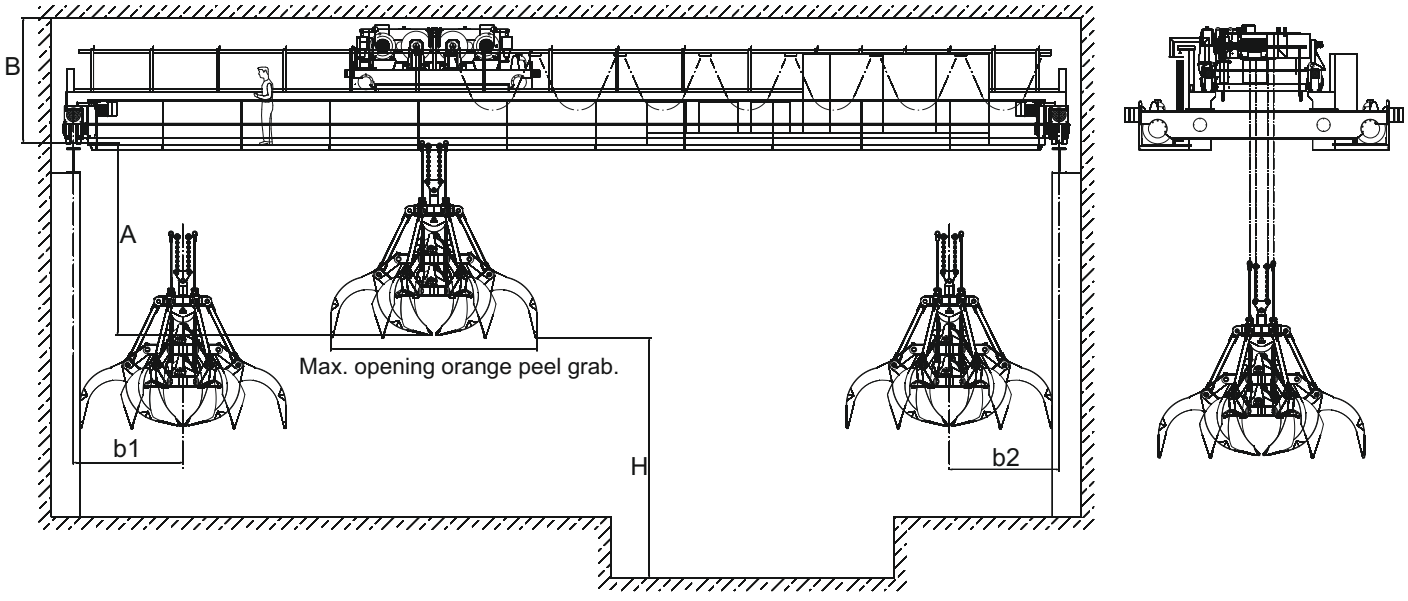


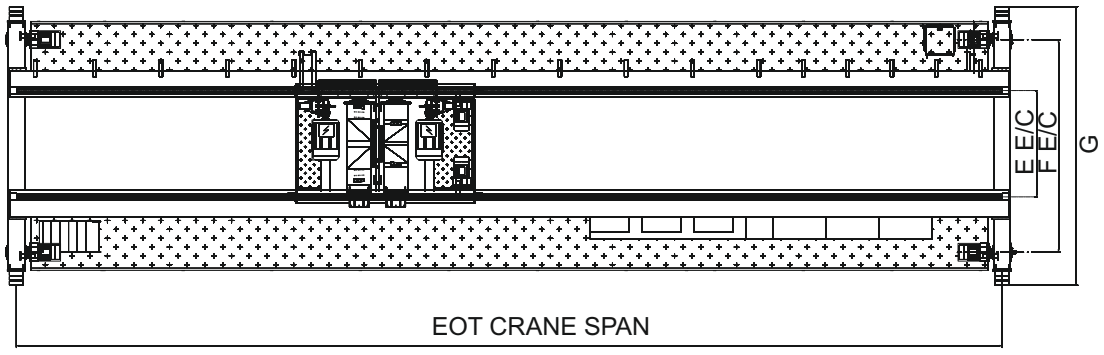
WTC Overhead Travelling Cranes Table

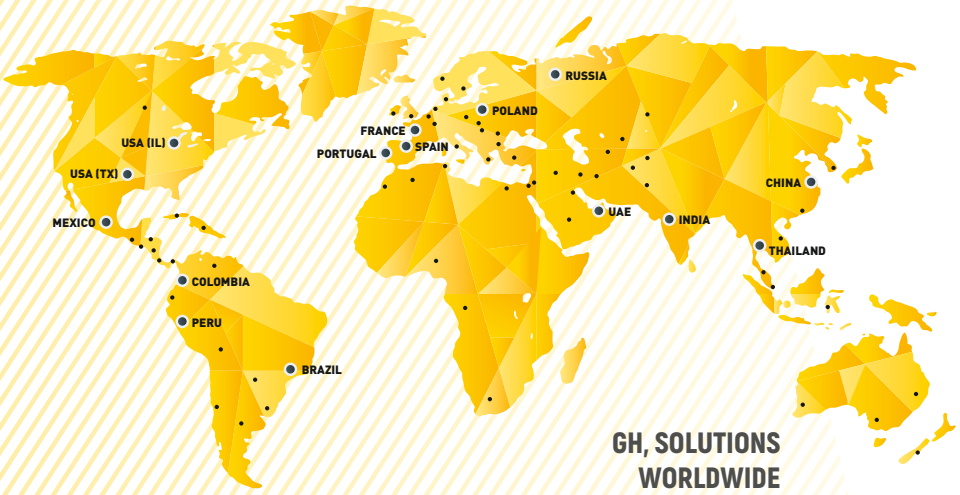
Mechanical system table

Gear box type	Load cap. in ton.	Rail	H m	Lifting speed m/min.	FEM group	span (m) of the EOT crane	"Orange peel" grab m^3	Maximum Orange peel grab opening	b1 mm	b2 mm	A mm	B mm	E E/C mm	F E/C mm	G mm	RV Máx Kg	RV Mín Kg	RT Máx Kg	RF Kg
GHG	12	A-75	10÷30	16÷40	M8	20	5÷6,3	4920	2500	2500	3730	2290	2800	5200	6600	16808	7433	1681	2401
						25								5400	6800	19250	9250	1925	2750
						30					3660	2360			6960	21408	10992	2141	3058
	13		10÷30	16÷48	M8	20	6,3÷8	5350	2700	2700	4240	2290	2800	5200	6600	17548	7693	1755	2507
						25					4170	2360		5400	6960	20792	10208	2079	2970
						30								5600	7160	22835	11765	2284	3262
GHI	15	A-75	10÷30	16÷80	M7	20	8÷10	5660	2900	2900	4400	2580	2800	5400	6960	22315	9535	2232	3188
						25										24693	10869	2469	3528
						30								5600	7160	26848	12328	2685	3835
GHJ	18	A-100	10÷30	16÷80	M8	20	10	5660	2900	2900	4400	2920	2800	5400	6960	28495	11455	2850	4071
						25								5600	7160	31622	13190	3162	4517
						30										33918	14558	3392	4845
	20		10÷30	16÷80	M8	20	12,5	6120	3100	3100	4800	2920	2800	5400	6960	29945	12005	2995	4278
						25								5600	7160	33182	13630	3318	4740
						30										35926	15299	3593	5132
	25		10÷30	16÷80	M7	20	12,5÷16	6650	3400	3400	5080	2970	2800	5400	6960	33385	13915	3339	4769
						25								5600	7160	36363	14887	3636	5195
		A-120				30										39707	16893	3971	5672

Mechanical system drawings







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Brazil Cabreúva
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China Shanghái
GH (SHANGHAI)
LIFTING EQUIPMENT CO., LTD.
T: +86 21 5988 7676
ghchina@ghsa.com

Colombia Bogotá
GH COLOMBIA SAS
T: +57 1 750 4427
yezpeleta@ghsa.com

France Couëron
GH FRANCE SA
T: +33(0) 240 861 212
ghfrance@ghsa.com

India Pune
GH CRANES INDIA PVT. LTD.
T: +91 89561 35444
ghindia@ghsa.com

Mexico Querétaro
GRÚAS GH MEXICO SA DE CV
T: +52 44 22 77 55 03
+52 44 22 77 50 74
ghmexico@ghsa.com.mx

Peru Lima
GH PERÚ S.A.C.
T: +51 987816231
gferradas@ghsa.com

Poland Kłobuck
GH CRANES SP. Z O.O.
T: +48 34 359 73 17
intertech@ghsa.pl

Portugal São Mamede do Coronado
GH PORTUGAL
T: +351 229 821 688
geral@ghsa.com

Russia Moscow
GH RUSSIA
T: +7 (495) 745 69 26
ghrussia@ghsa.com

Thailand Chonburi
LGH Cranes
T: +66 (0) 2327 9399
M: +66 (0) 8 4660 1365
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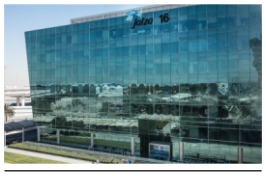

UAE Dubai
GH Cranes Arabia FZCO
Office no. 517, 5th Floor, Jafza
Building 16, Jebal Ali Free Zone.
P.O Box Number - 263594
T: +971 4 8810773
gharabia@ghcranes.com

USA Illinois
GH CRANES USA
T: (815) 277 5328
ghcranesusa@ghsa.com

USA Texas
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T: (972) 563 8333
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