

Laboratorio di MECCANICA

MEZZI DA LAVORO

Costruzioni da **4** a **5**

- 4 - Sollevatore telescopico
- 5 - Escavatore

AVVISO

Per garantire un adeguato funzionamento del motore elettrico, durante la produzione è stata aggiunta una piccola quantità di grasso. In presenza di temperature elevate tale sostanza può sciogliersi divenendo untuosa.

Nel caso in cui il motore contenuto nel kit sia sporco, puoi semplicemente pulirlo con delle salviette.

Il grasso utilizzato non è né tossico, né pericoloso.



V34071

ATTENZIONE!

Solo per bambini di 8 anni e oltre. Le istruzioni per gli adulti sono incluse e devono essere rispettate.

Manuale da leggere e conservare per future referenze.

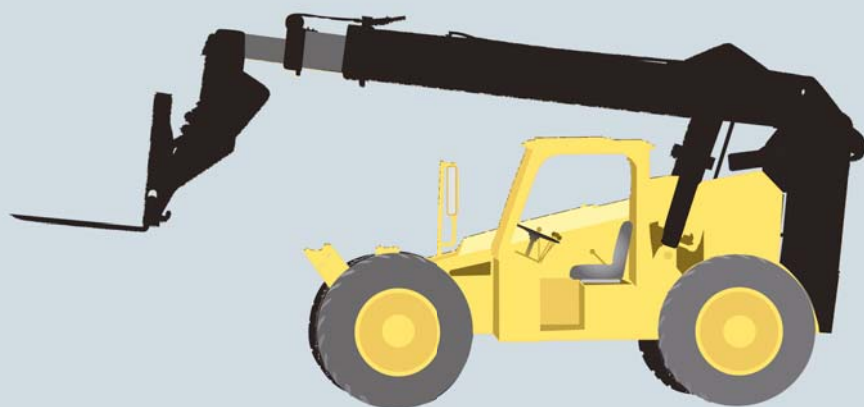
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62019 Recanati (MC) Italy
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4 SOLLEVATORE TELESCOPICO



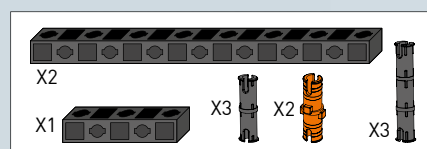
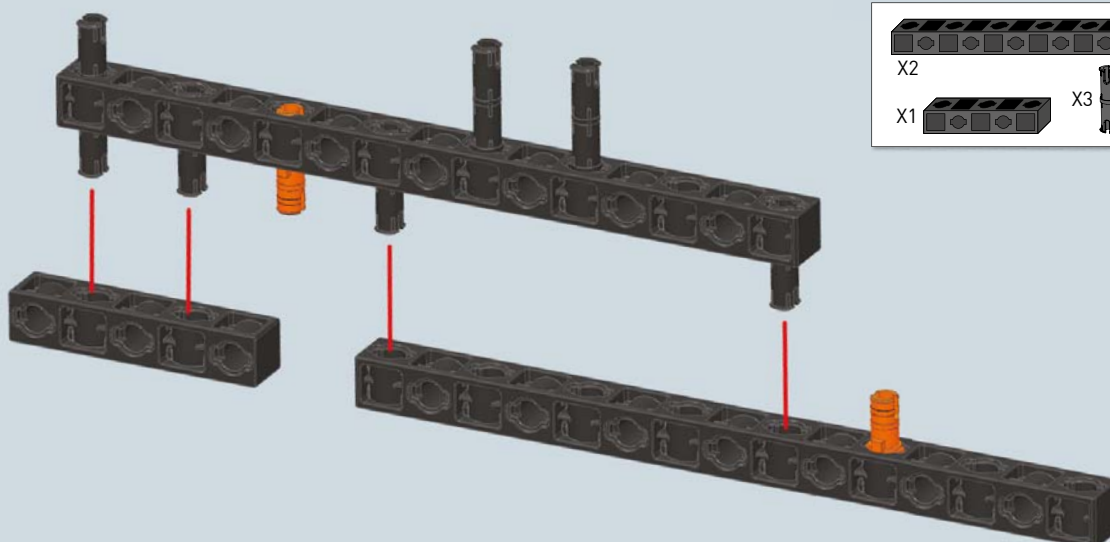
Il sollevatore telescopico è una macchina movimento terra caratterizzata dall'avere un braccio costituito da più sfilì, che scorrono l'uno all'interno dell'altro. Il corpo macchina è asimmetrico, con la cabina da un lato e il braccio sollevatore dall'altro. Per bilanciare il peso del materiale trasportato frontalmente, tutti gli elementi più pesanti come il motore o le batterie, vengono montati sul retro.

Grazie alla struttura telescopica, il braccio può essere allungato fino ad altezze considerevoli, che raggiungono i 17 m nei modelli più grandi. Il sollevamento è garantito dal circuito idraulico a singolo o doppio cilindro. A seconda dell'accessorio montato in fondo al braccio, si possono svolgere diversi tipi di lavoro, dalla movimentazione di materiale al sollevamento di persone ed attrezzature.

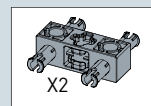
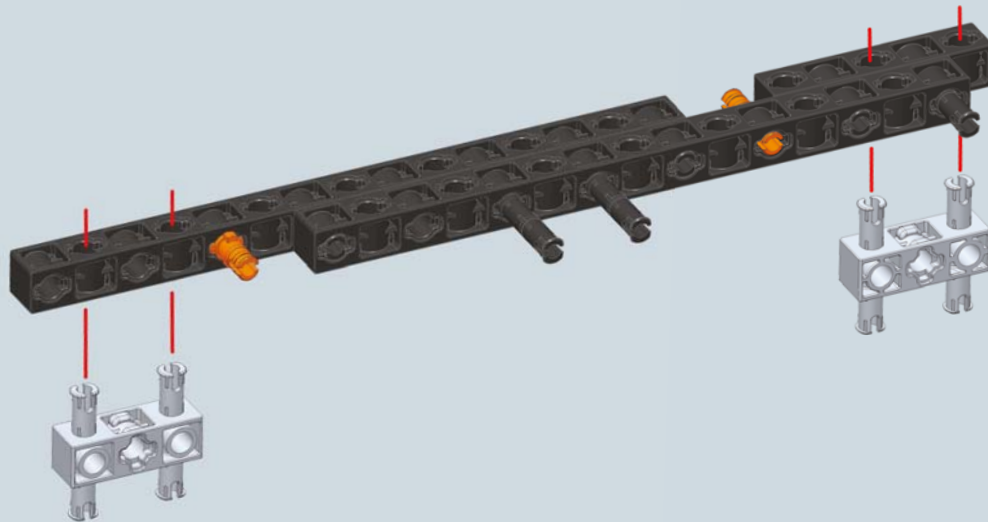


Iniziamo col costruire il lato sinistro del telaio a cui è connessa la cabina.

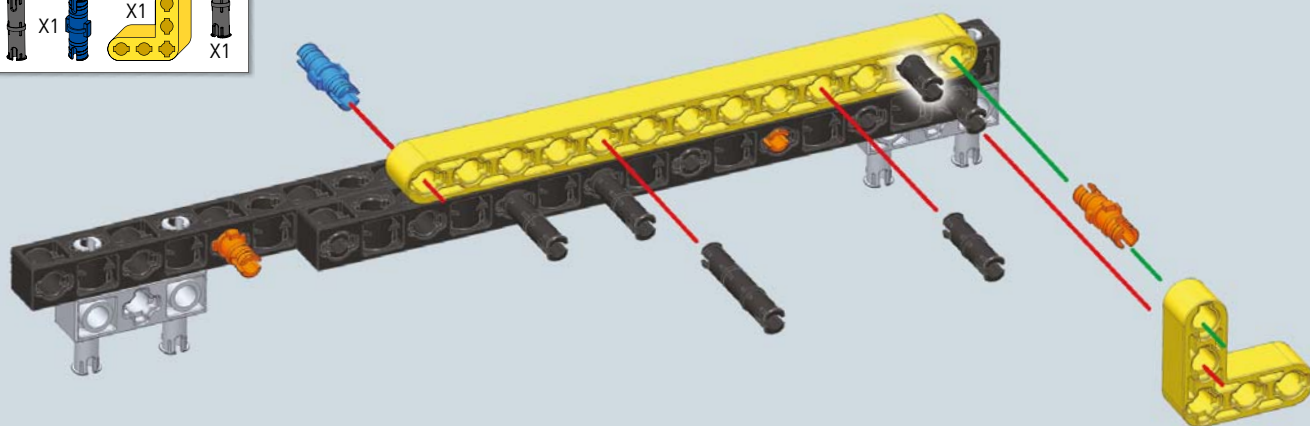
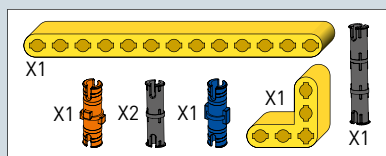
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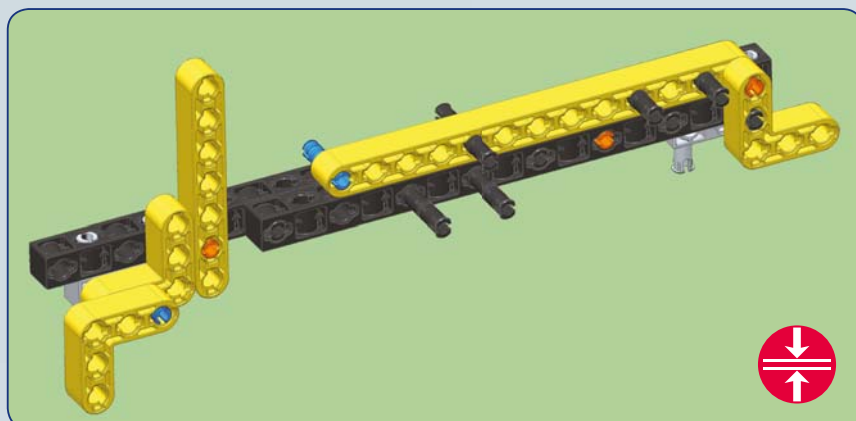
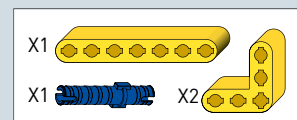
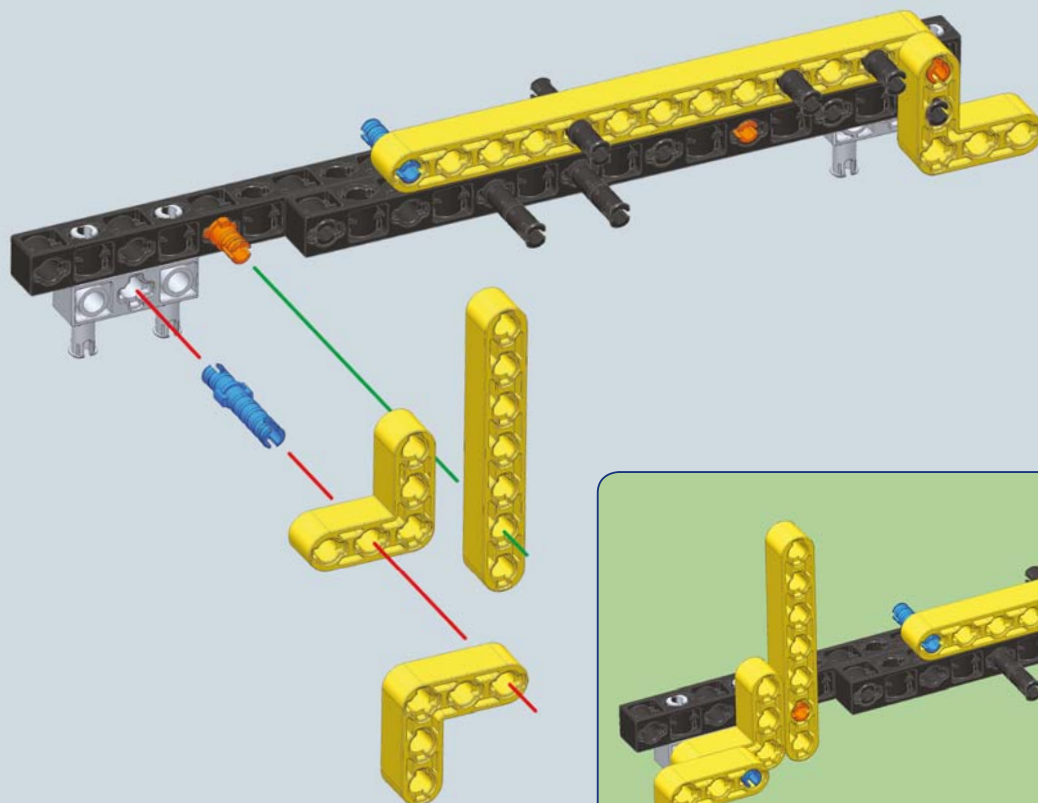
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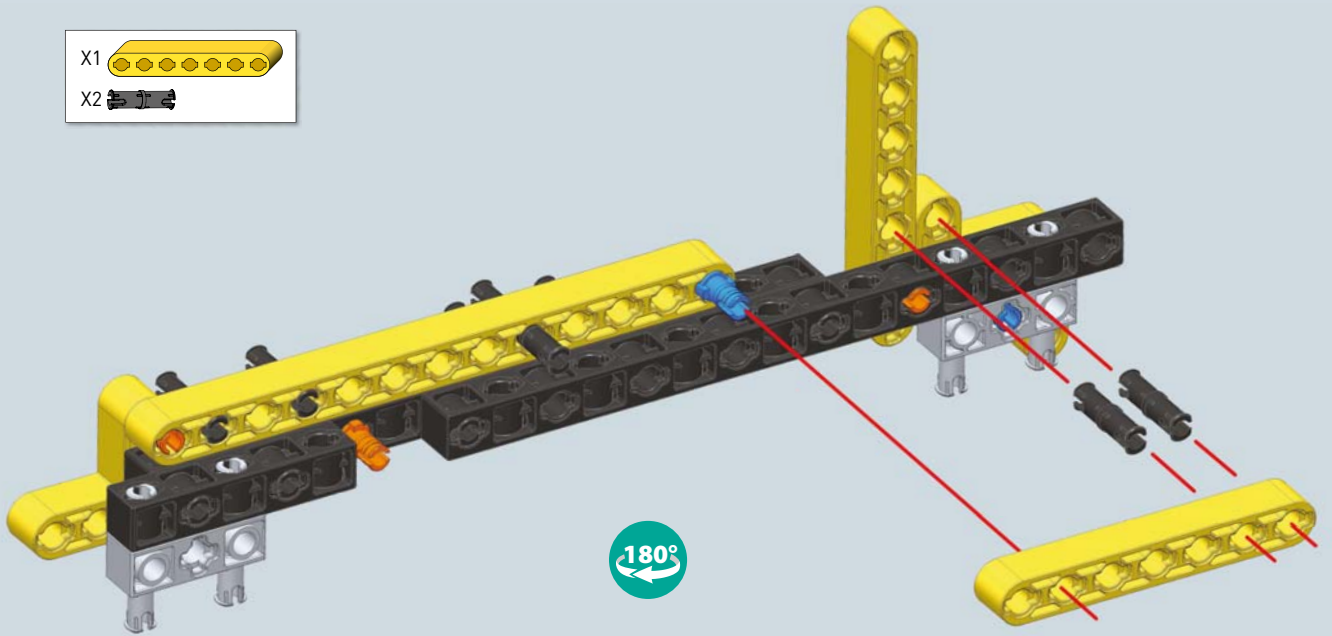


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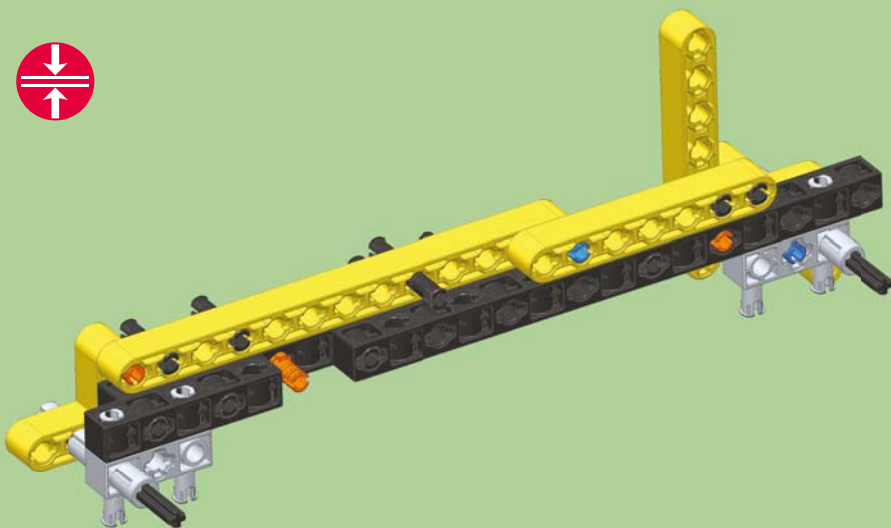
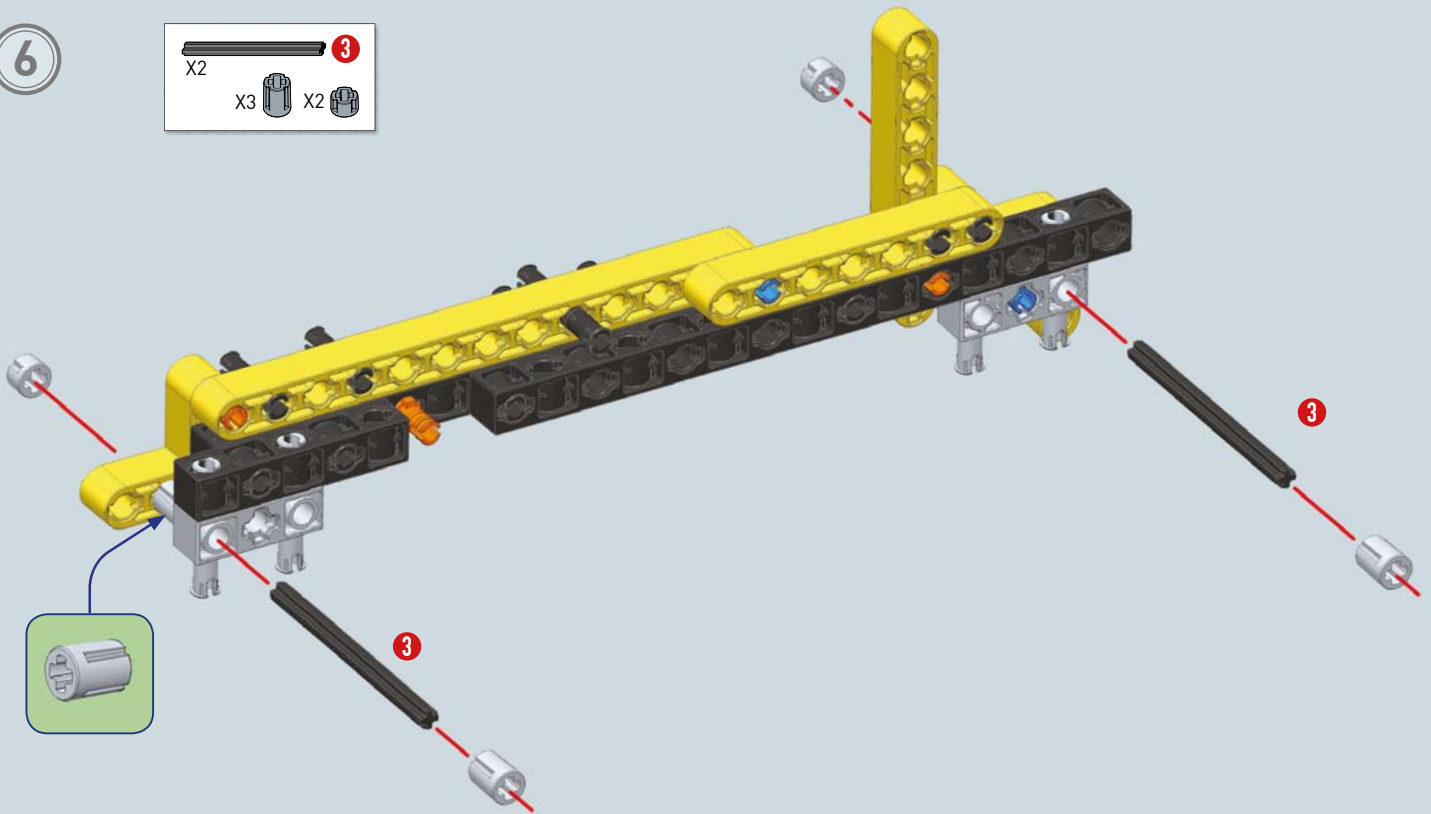
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- X1 
- X2 

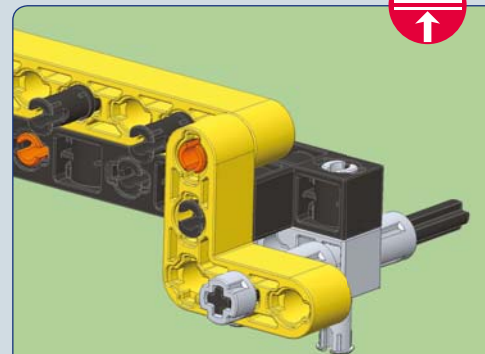


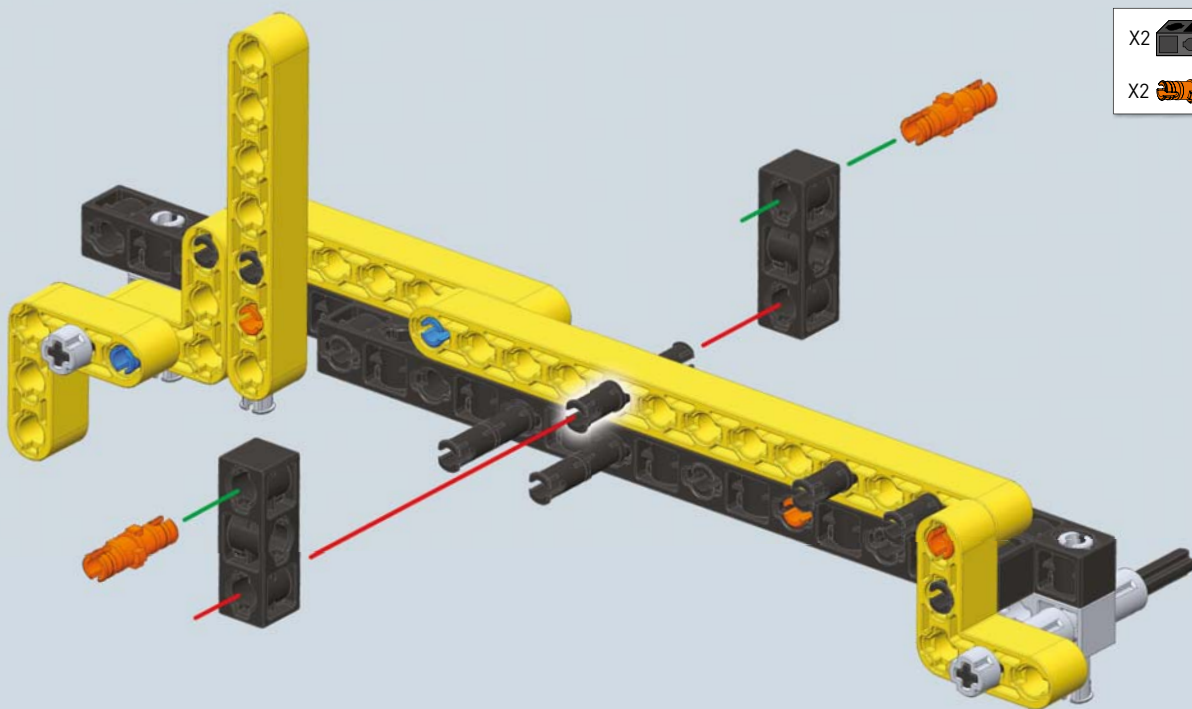
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- X2  3
- X3  X2 



- 1:1  3

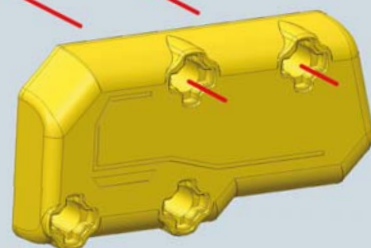
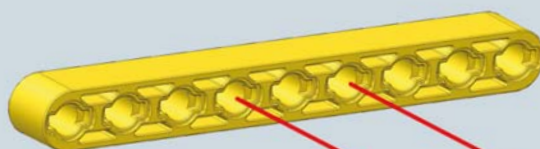




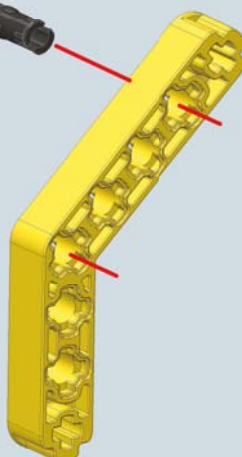
- X2
- X2

7

- X1
- X1
- X2



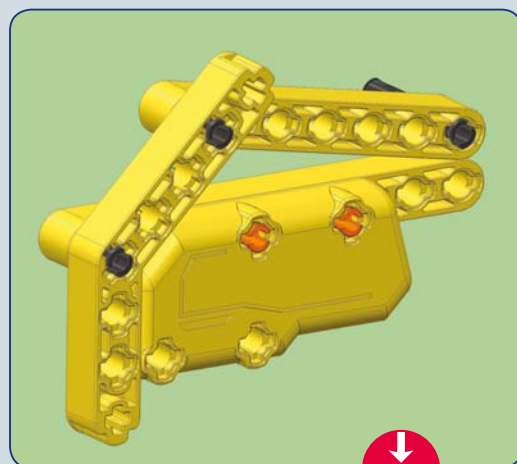
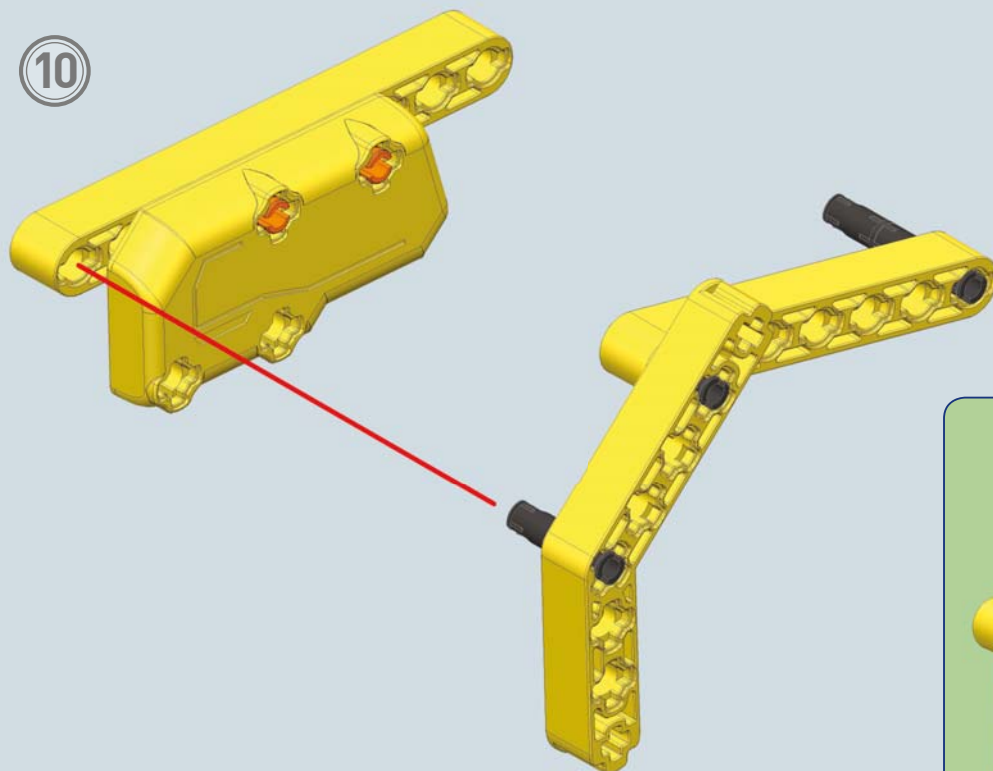
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- X1
- X1
- X2
- X1

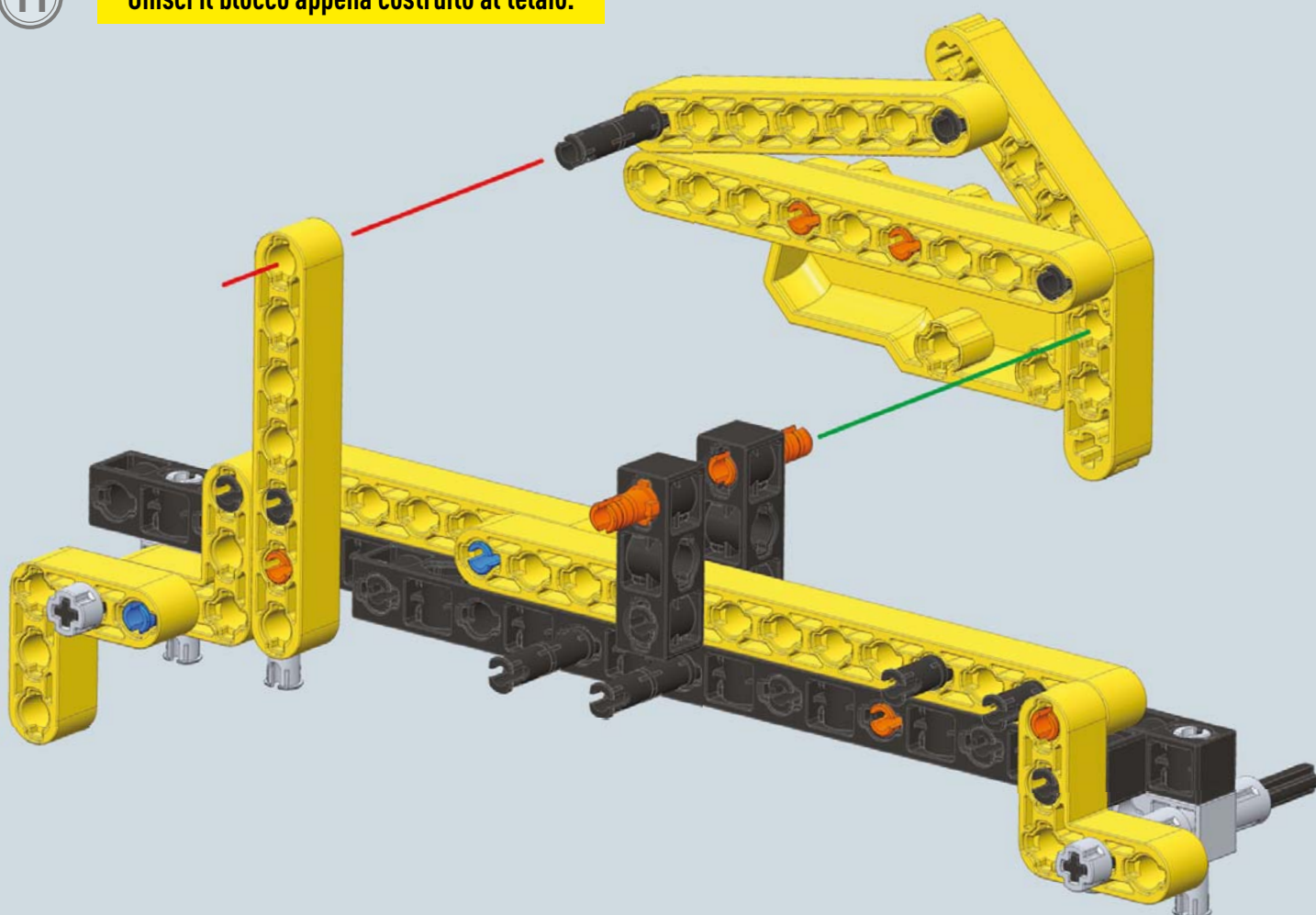
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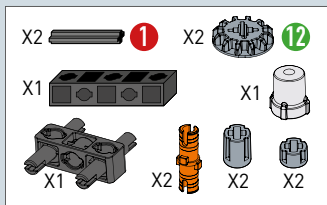
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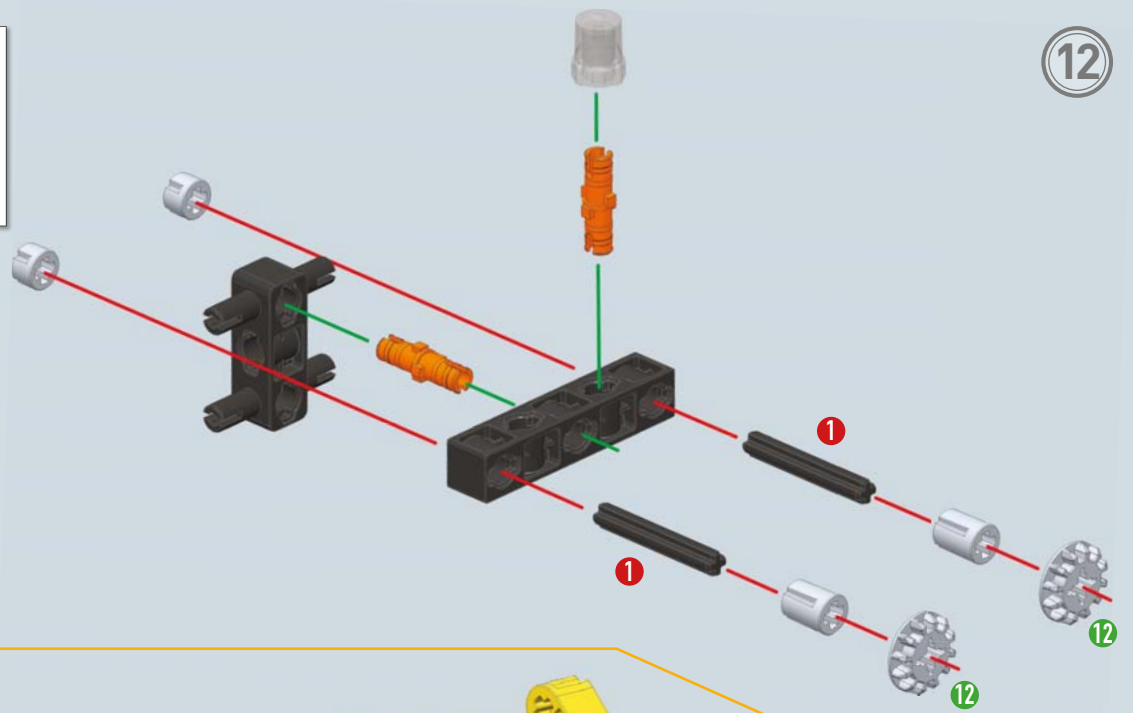
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Unisci il blocco appena costruito al telaio.

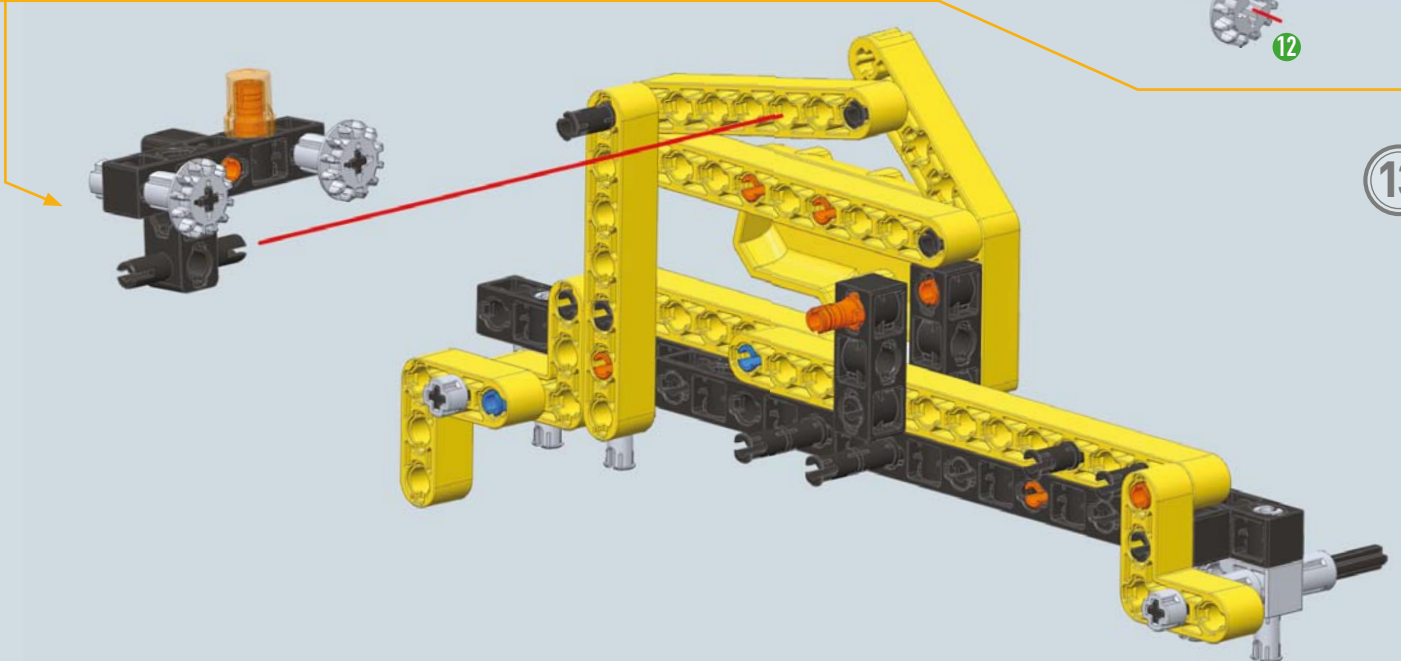




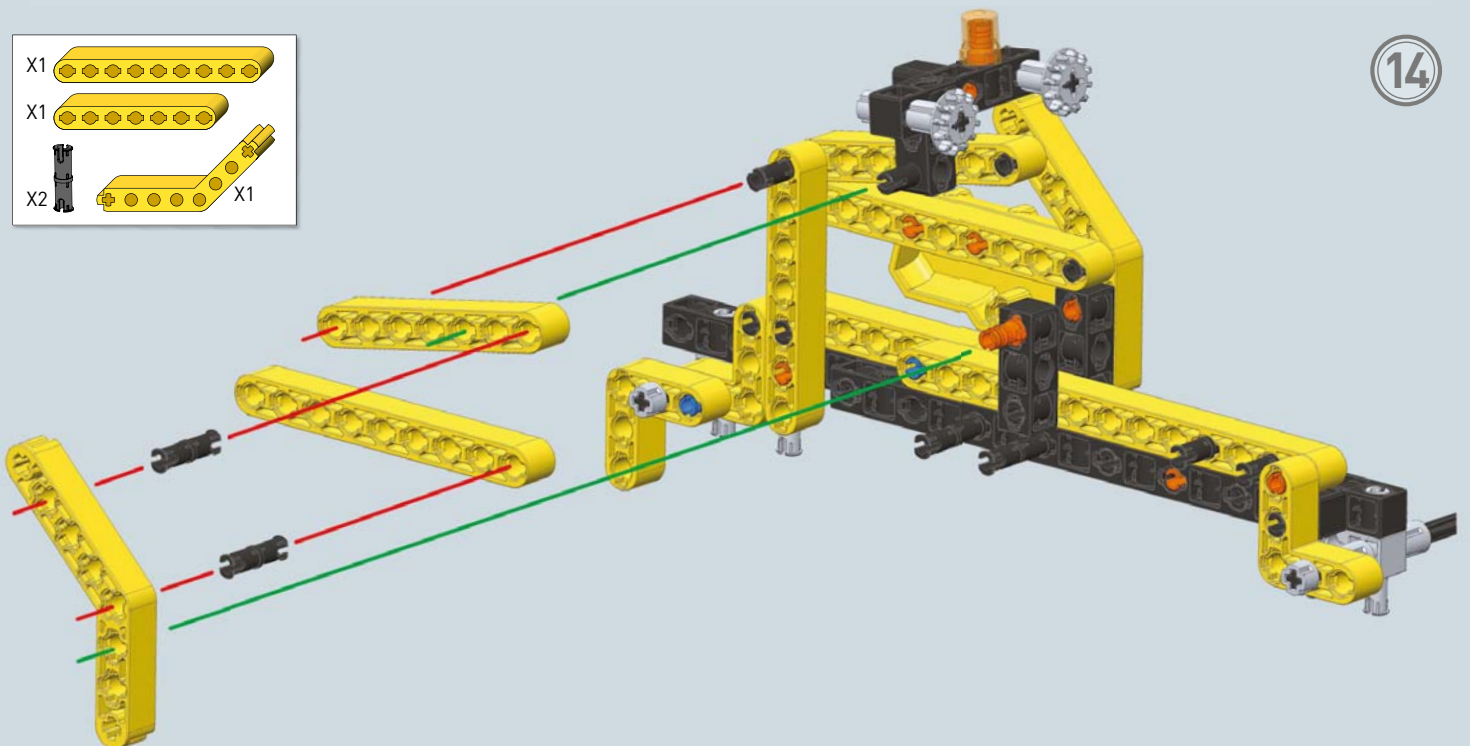
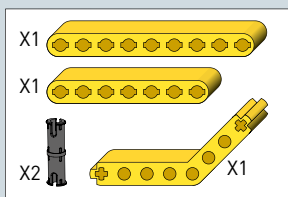
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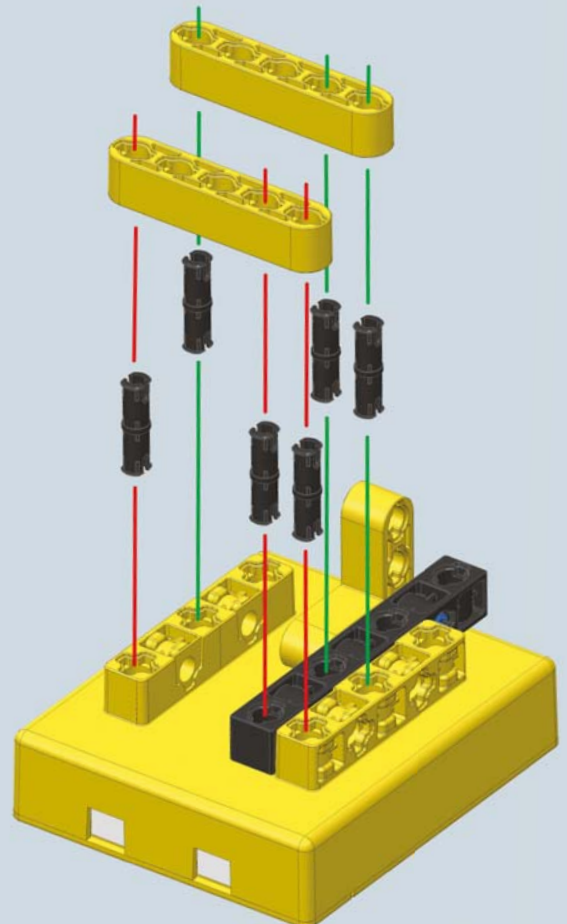
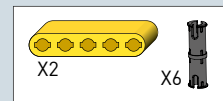
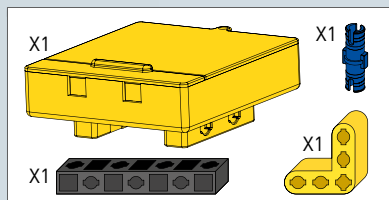
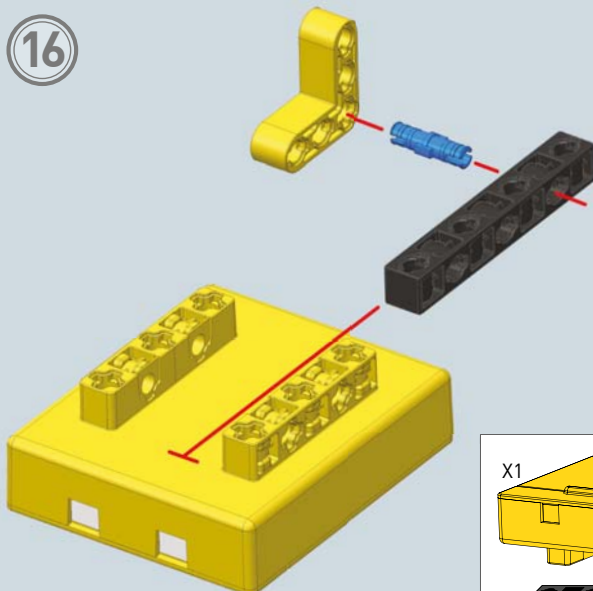
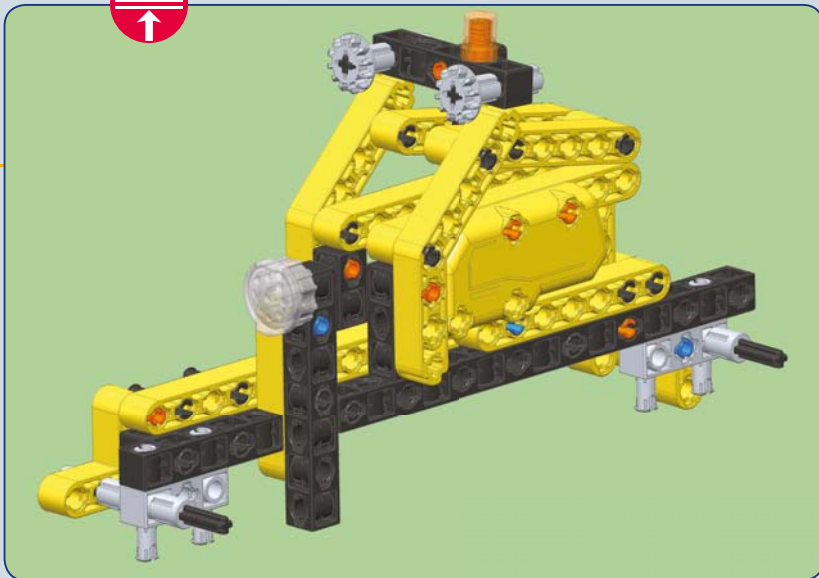
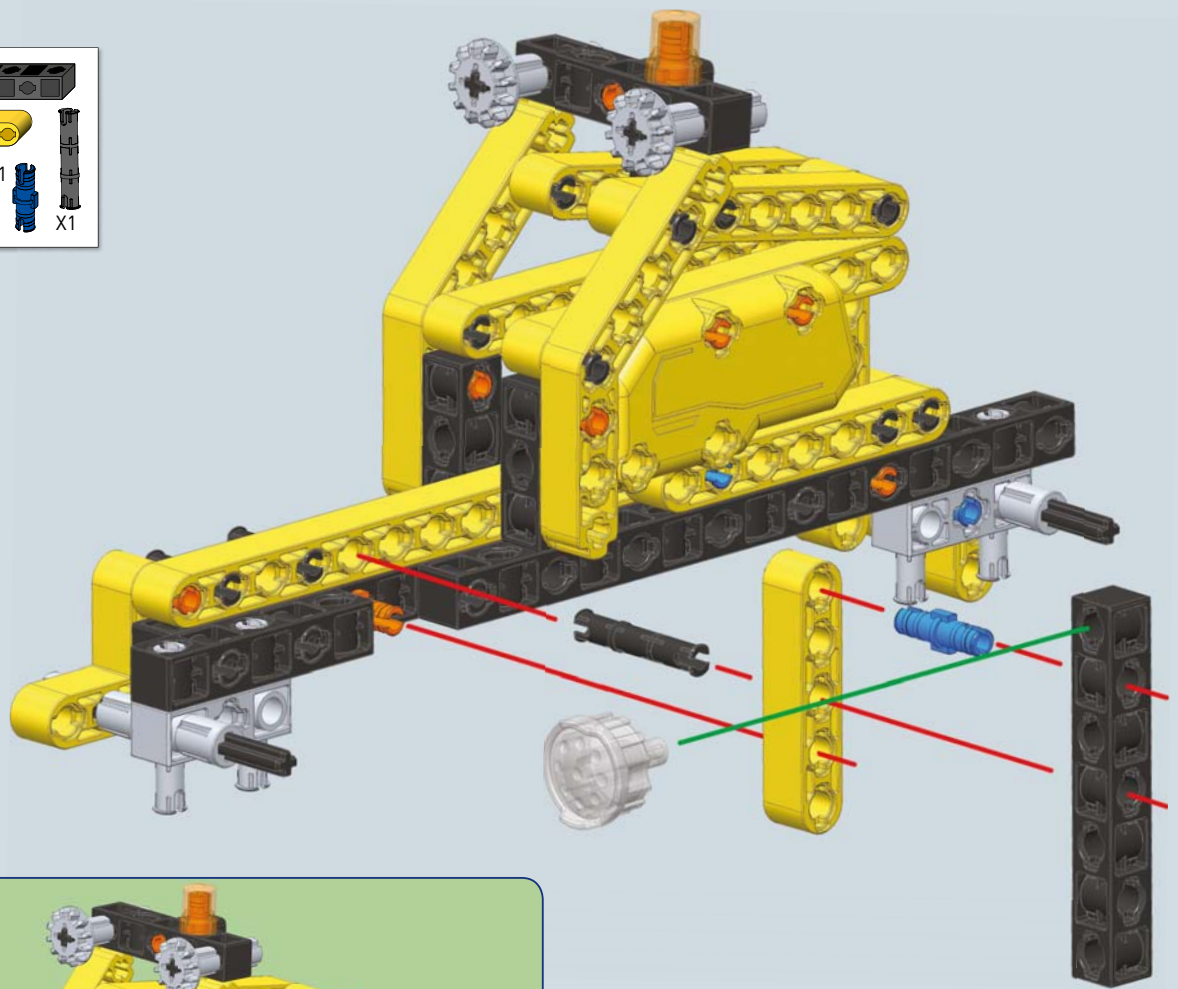
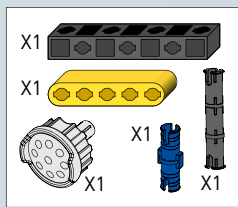


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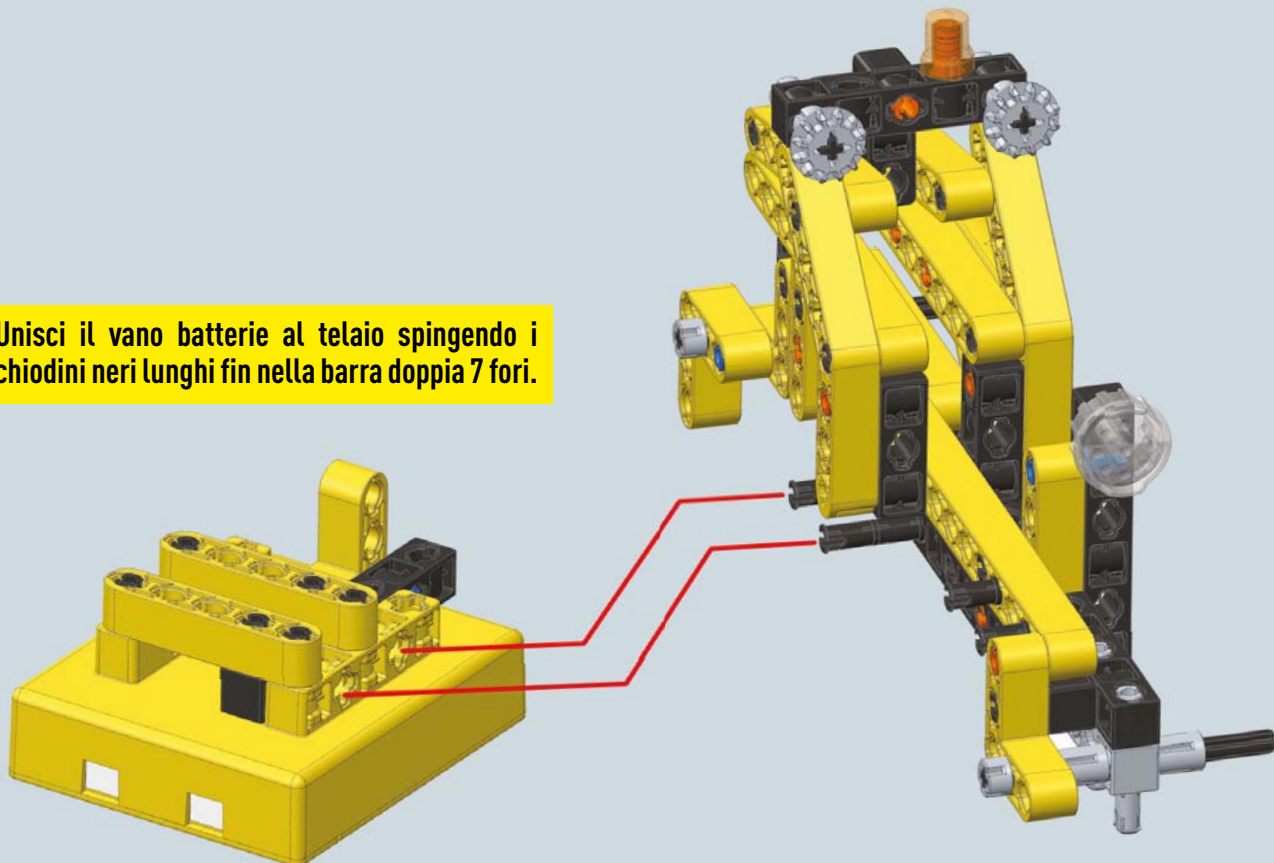


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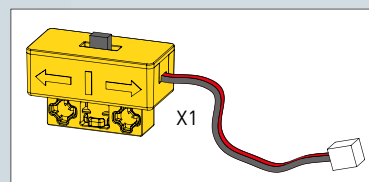
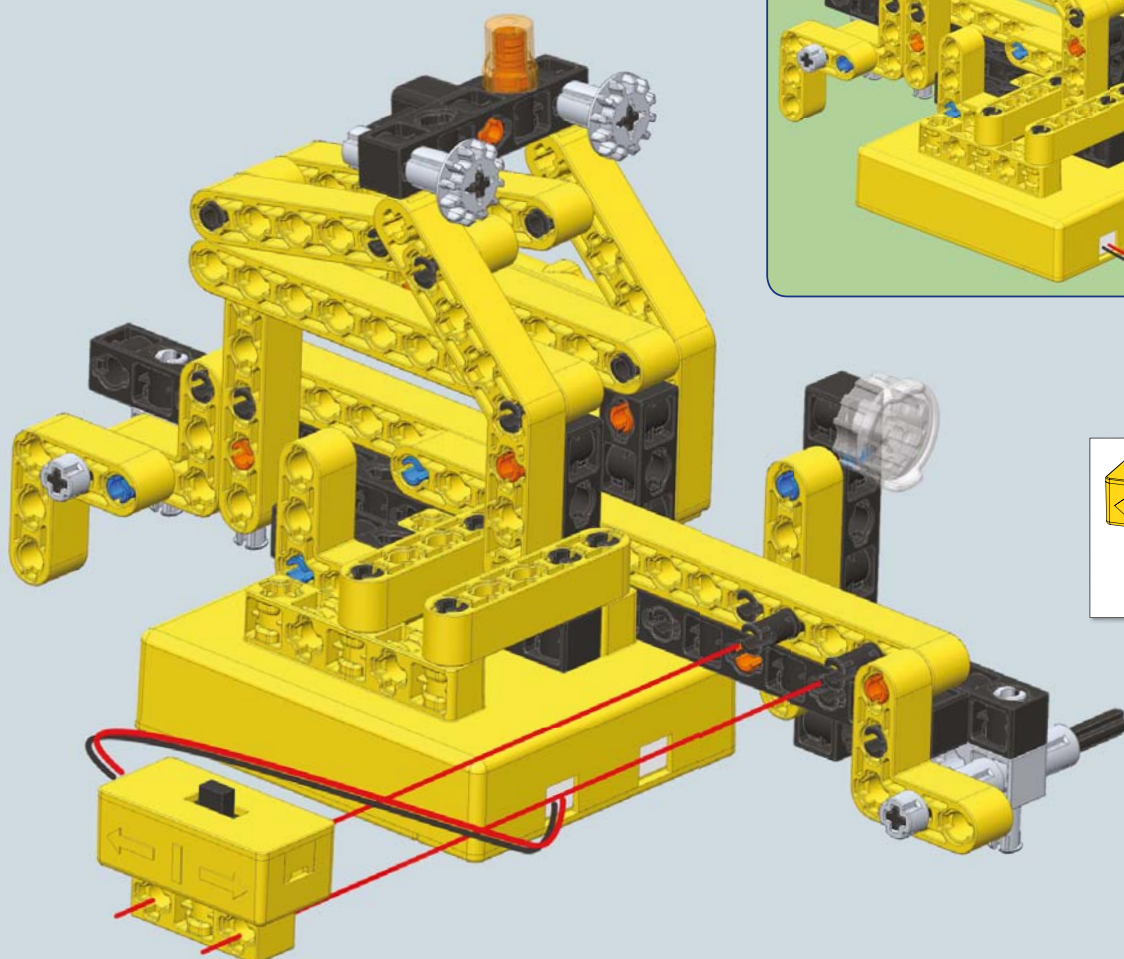
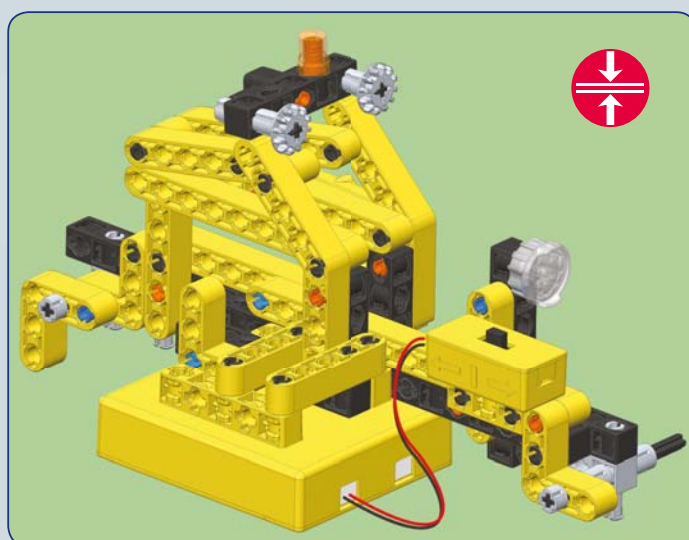




Unisci il vano batterie al telaio spingendo i chiodini neri lunghi fin nella barra doppia 7 fori.

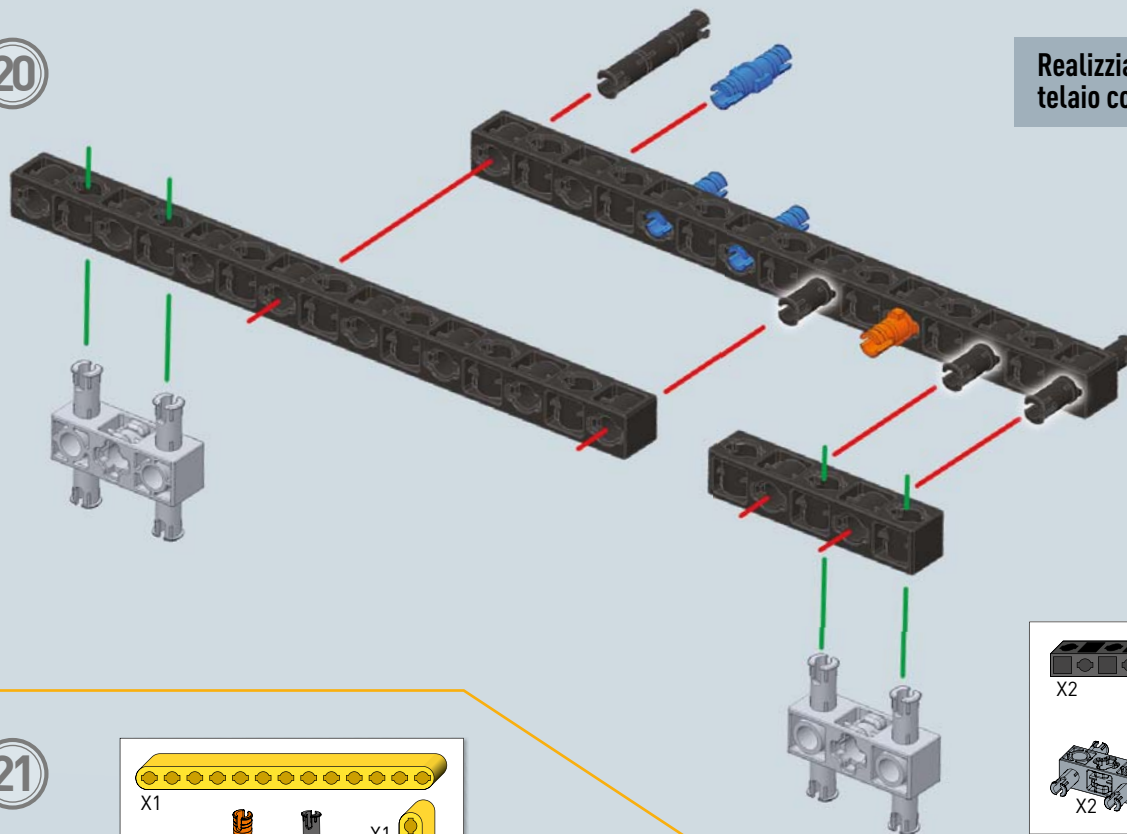


Collega lo switch al vano batterie e poi fissalo sul telaio.

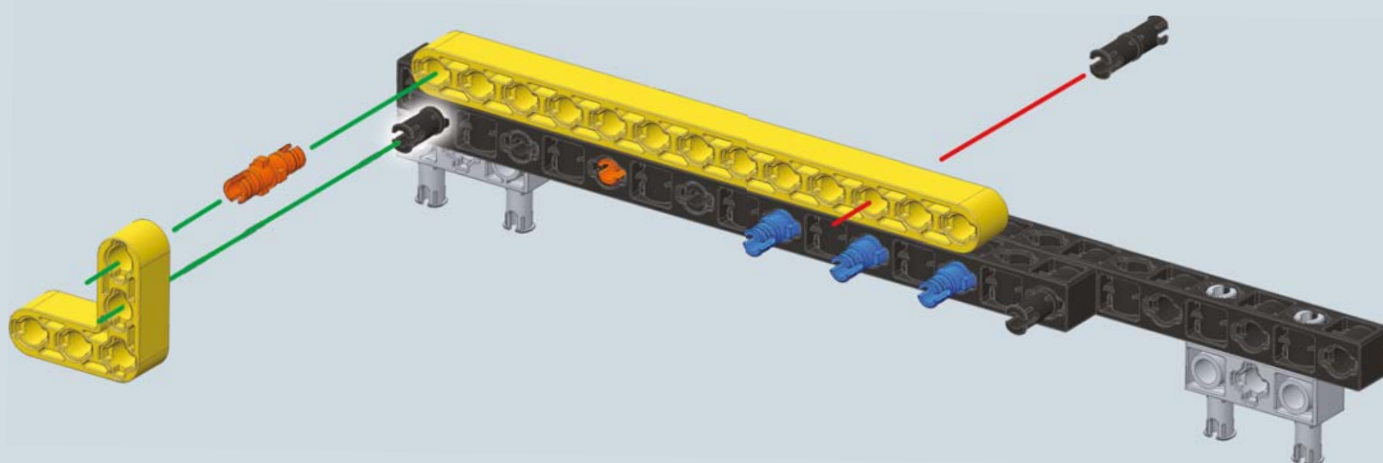
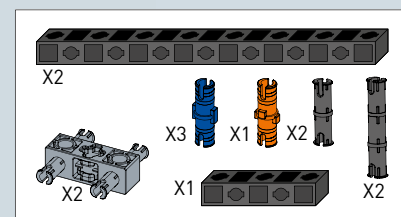
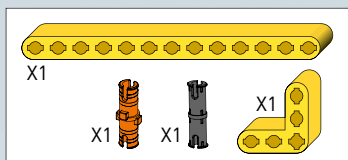


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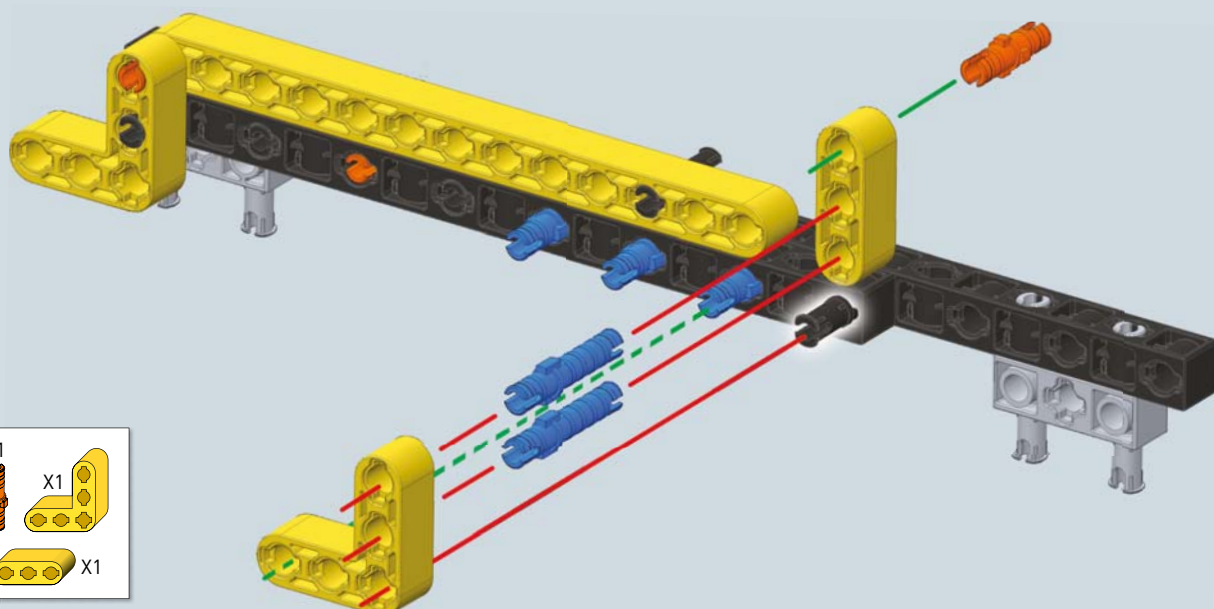
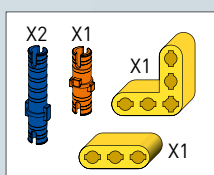
Realizziamo ora l'altro lato del telaio con il blocco motore.



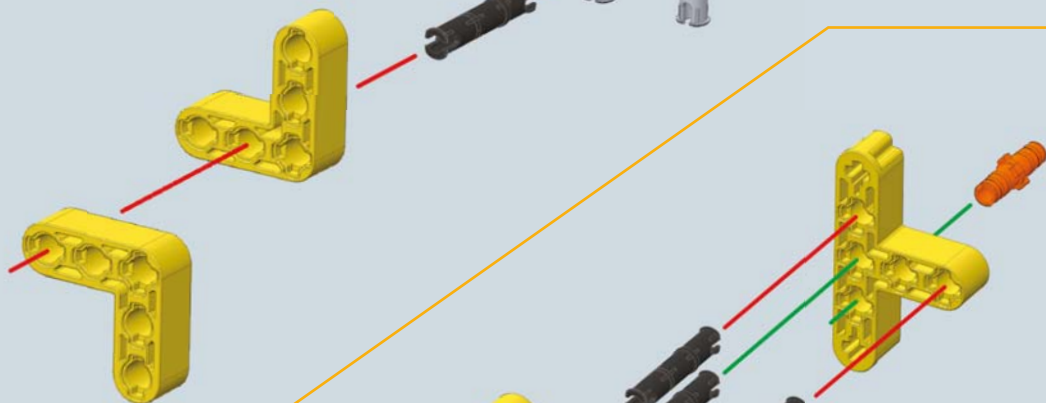
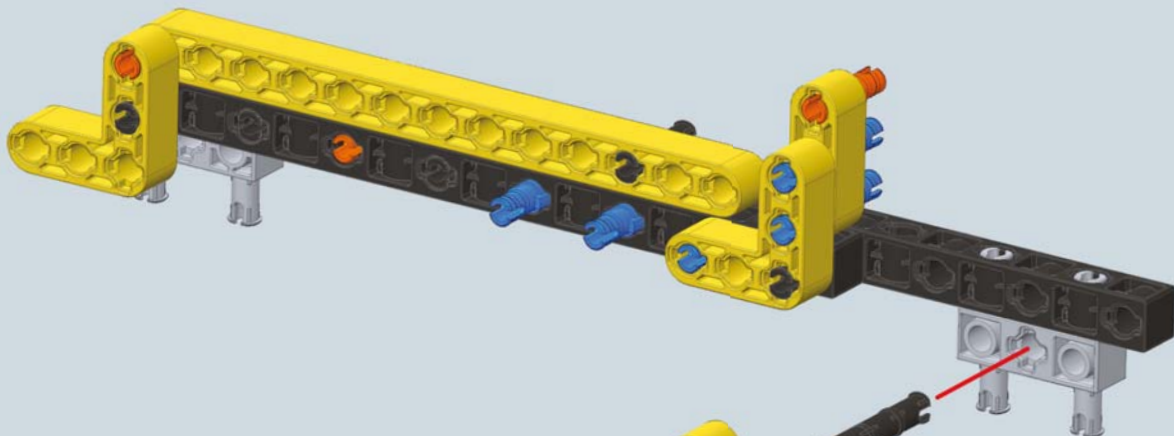
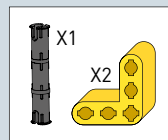
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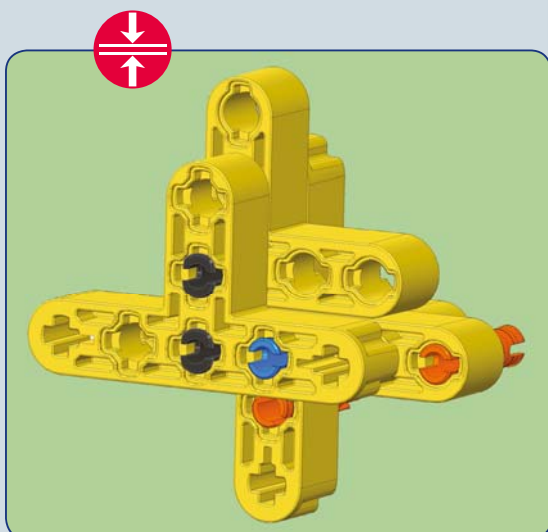
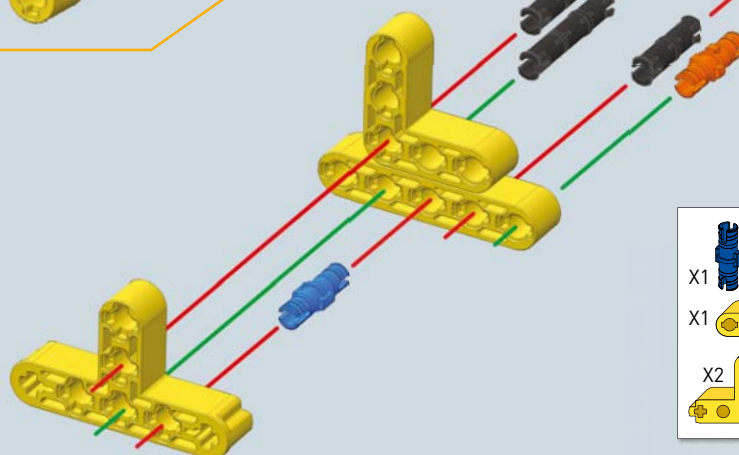
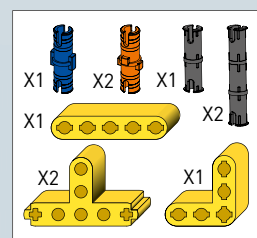
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23

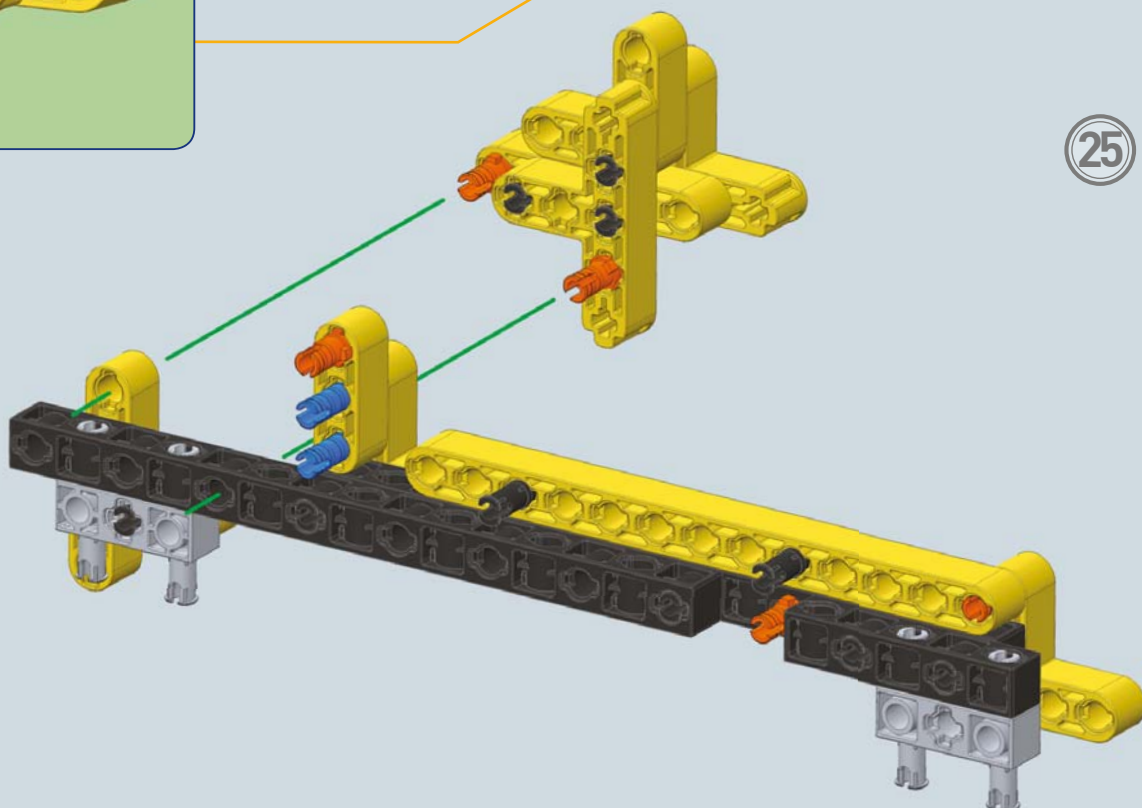


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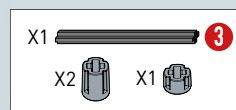
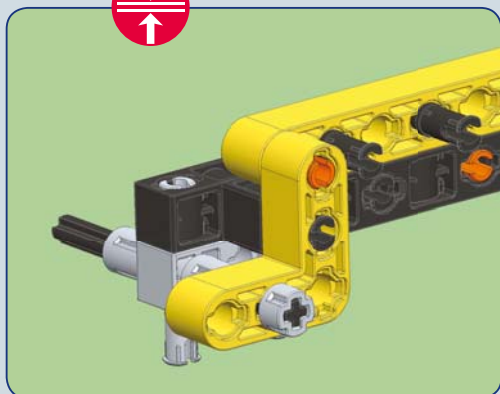
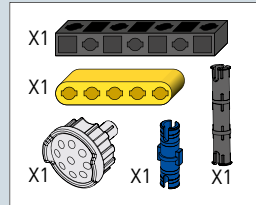
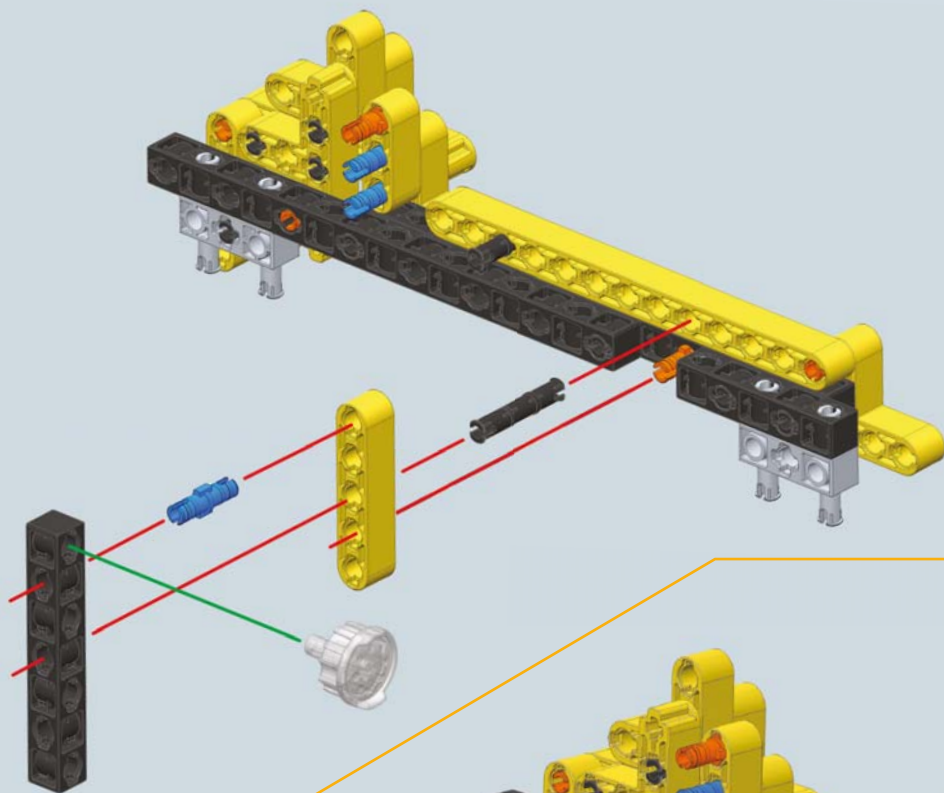


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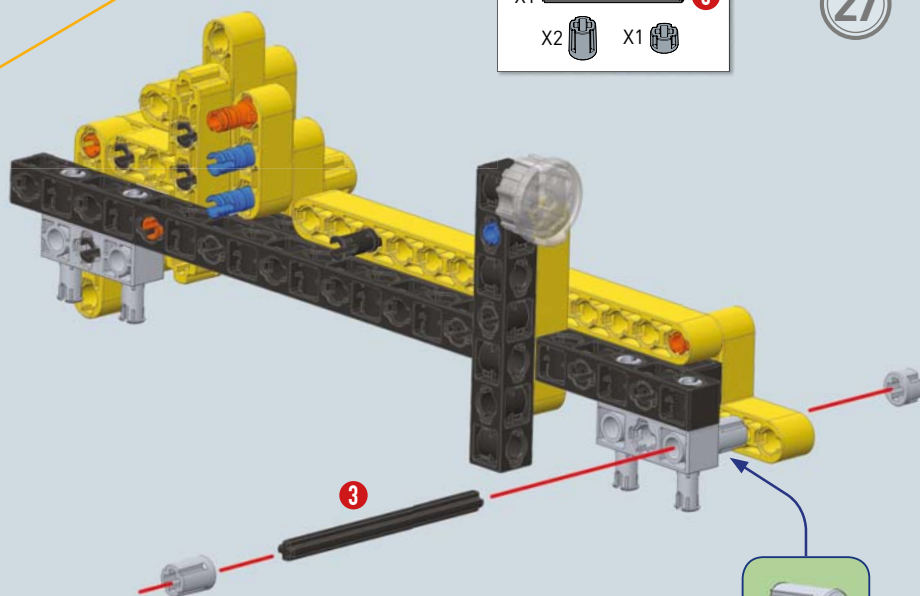
180°



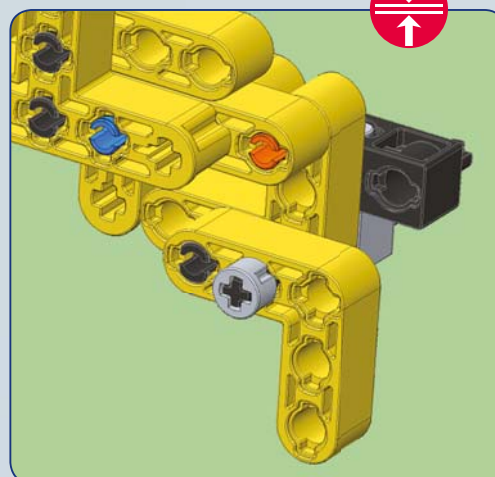
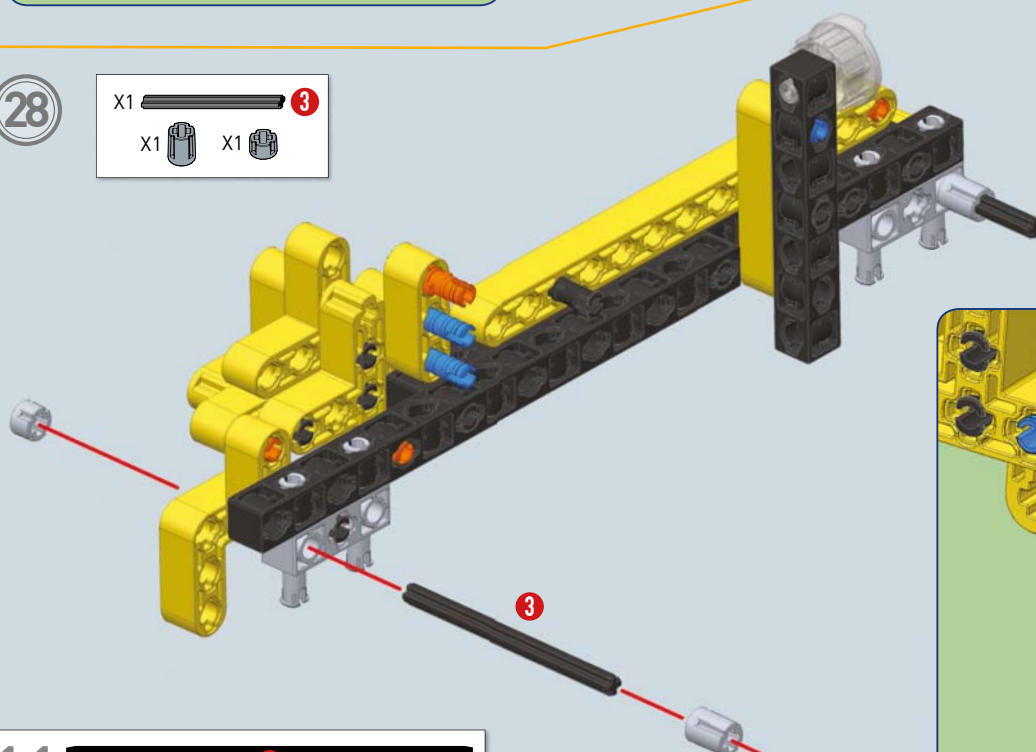
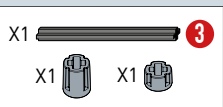
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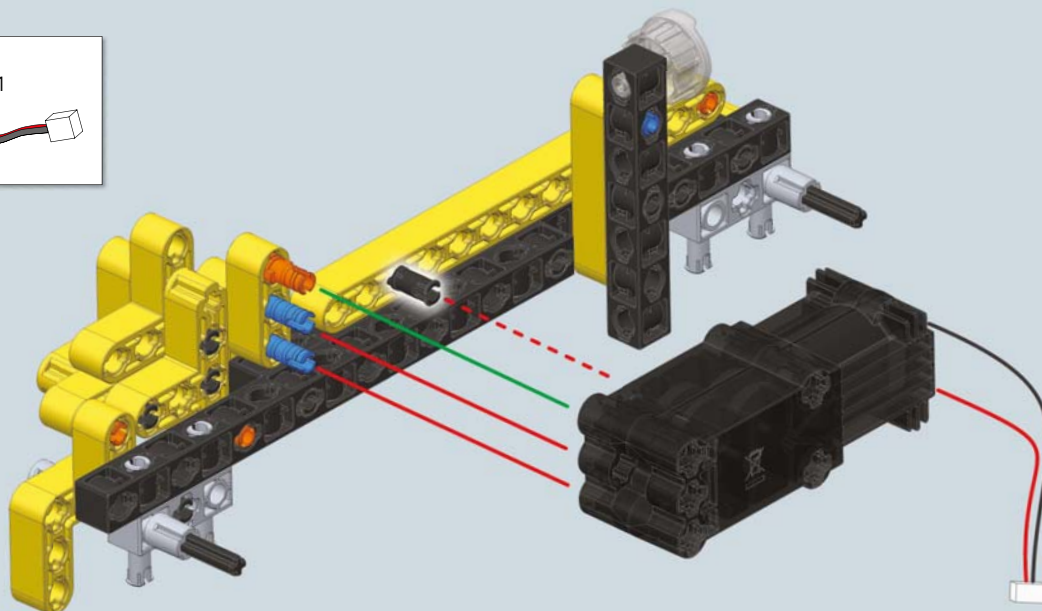
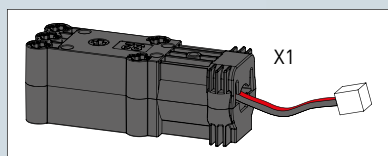
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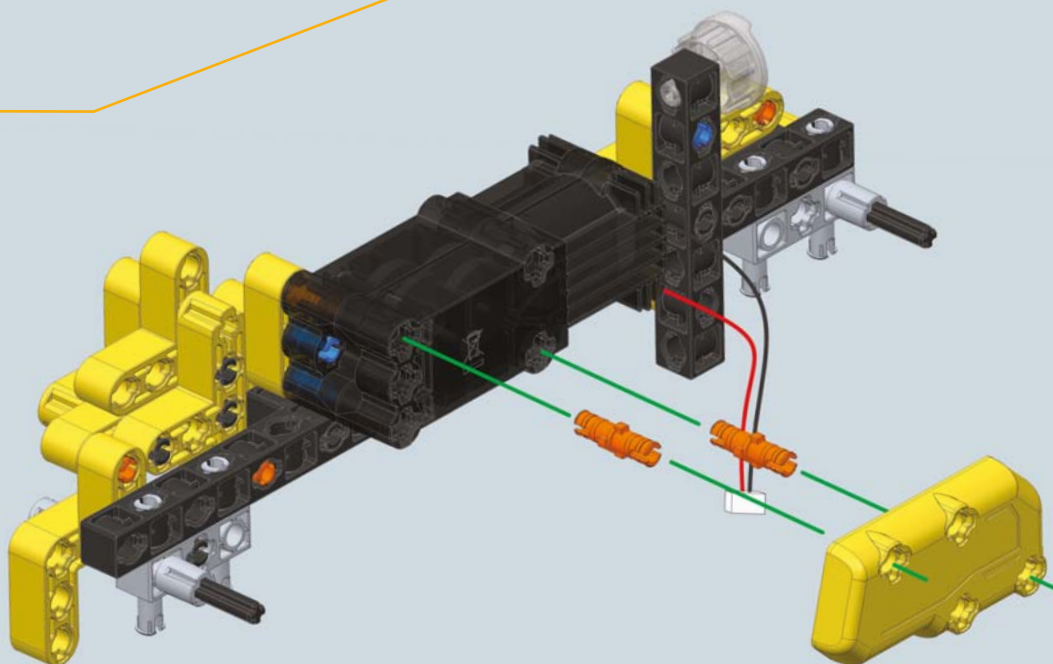
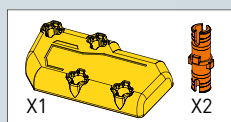
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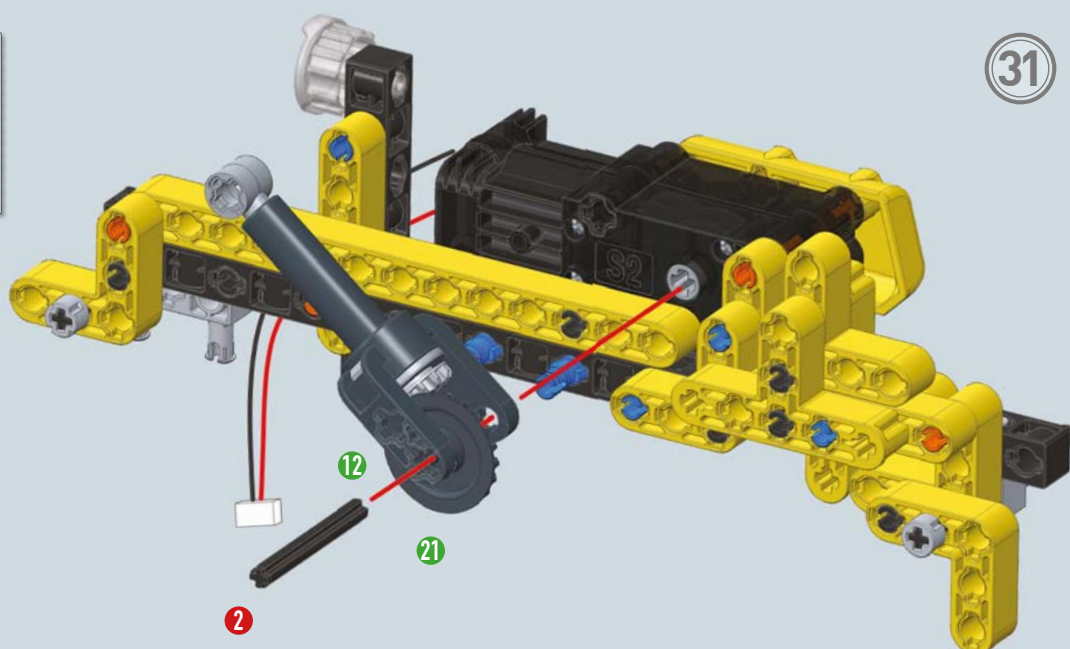
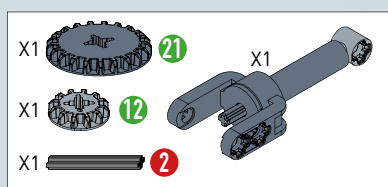
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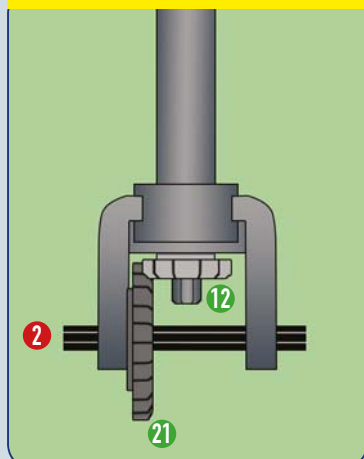
30



31



Controlla l'assemblaggio

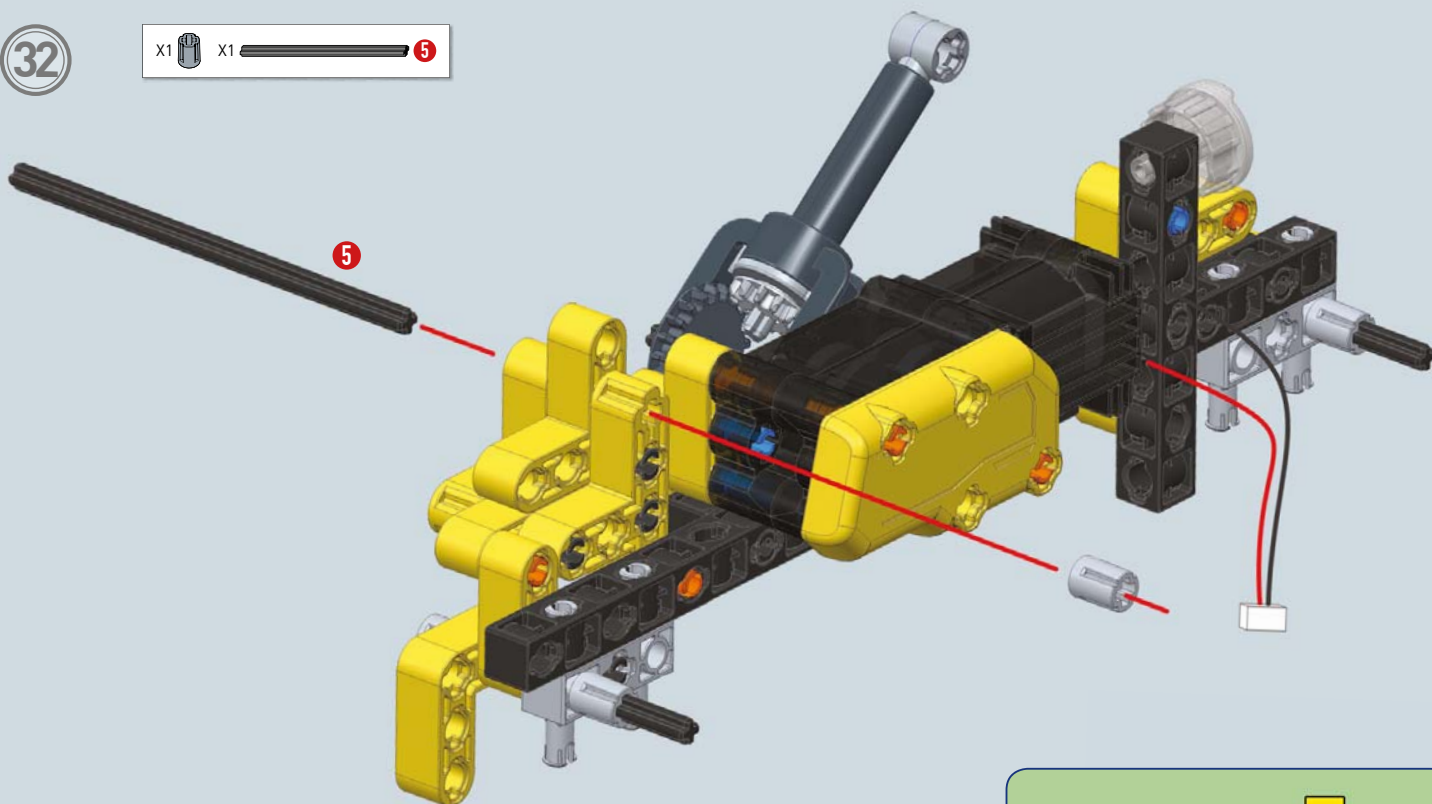


Per assemblare l'attuatore, segui le istruzioni stampate sul foglio delle avvertenze, contenuto nella scatola.

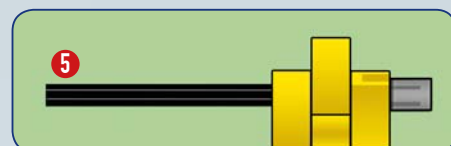
1:1 2

32

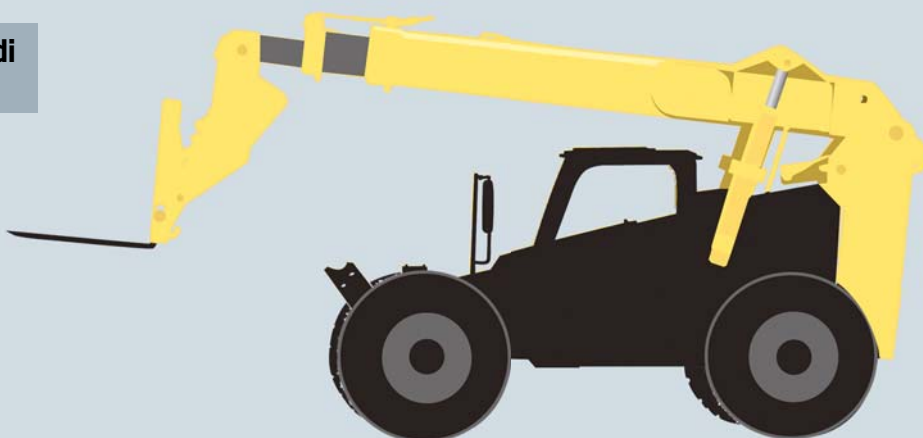
X1  X1  5



1:1  5

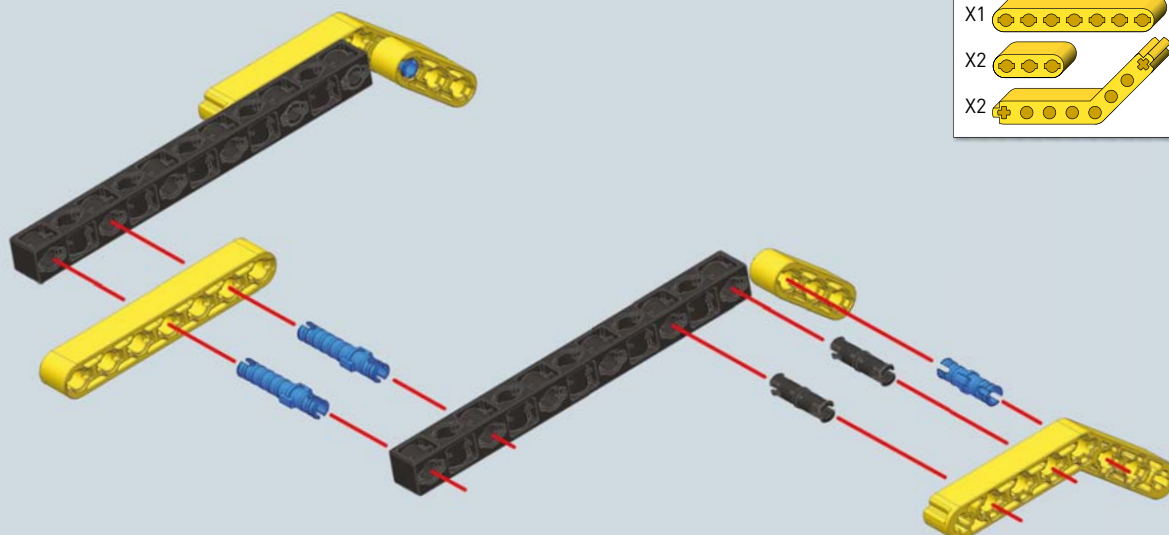


Andiamo adesso a costruire il braccio di sollevamento telescopico.



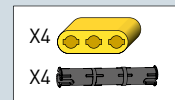
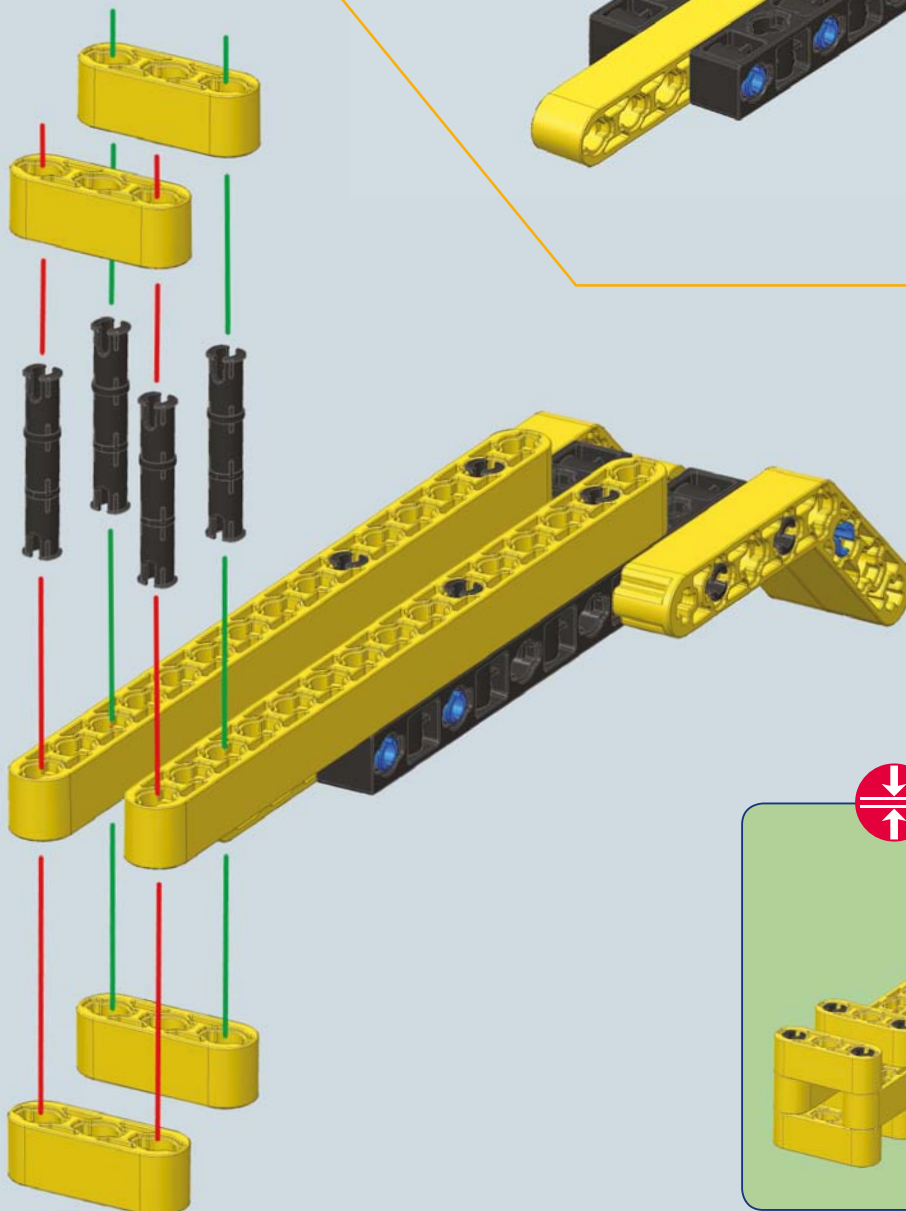
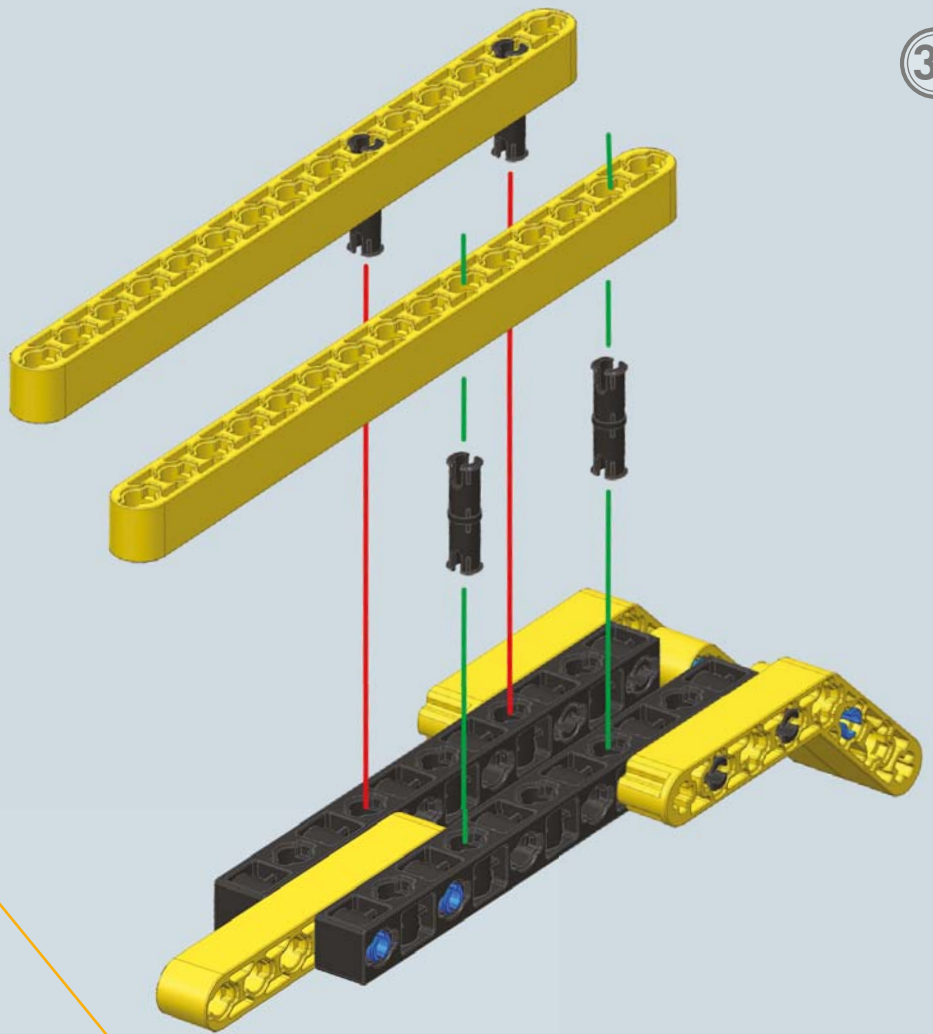
33

X2 
 X1 
 X2 
 X2 
 X4  X2  X2 

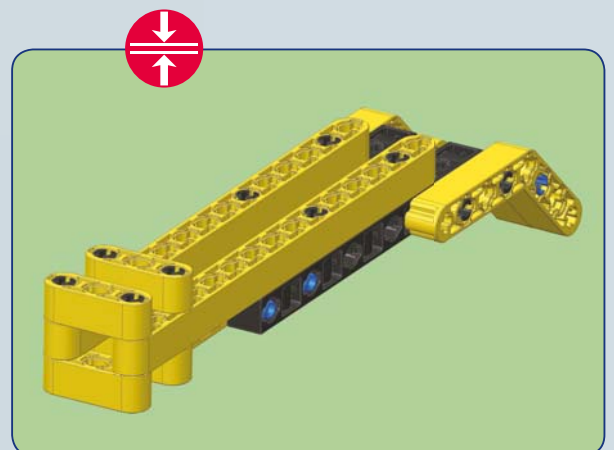


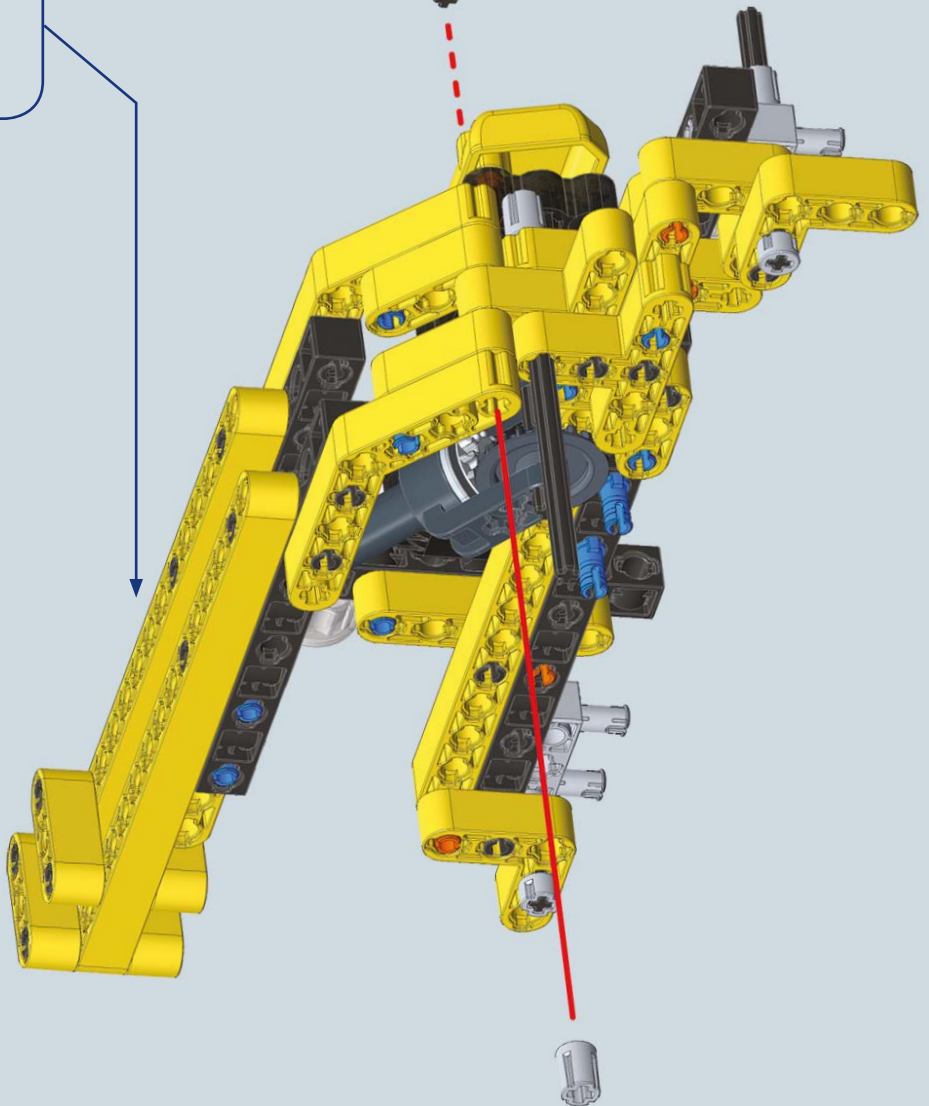
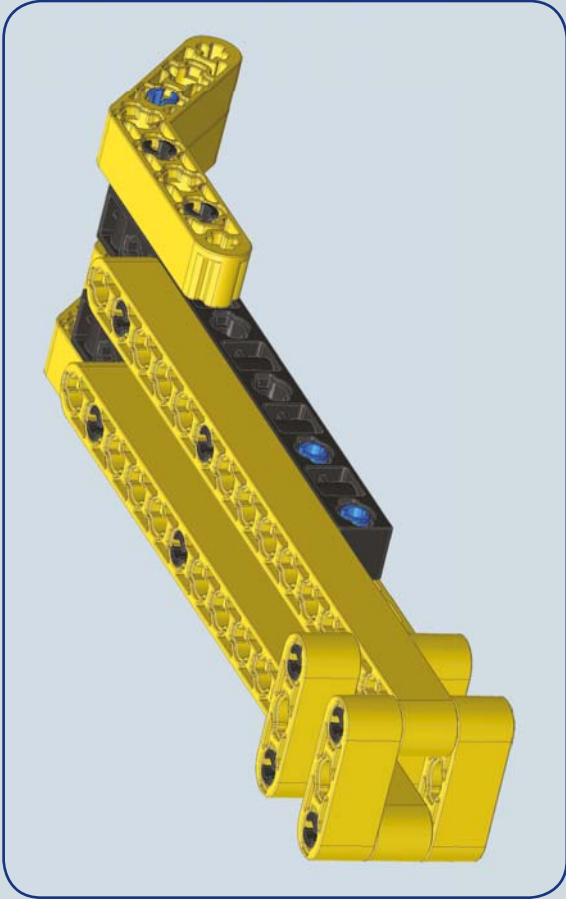


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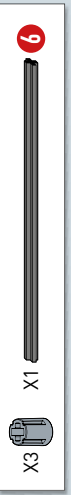


35





6



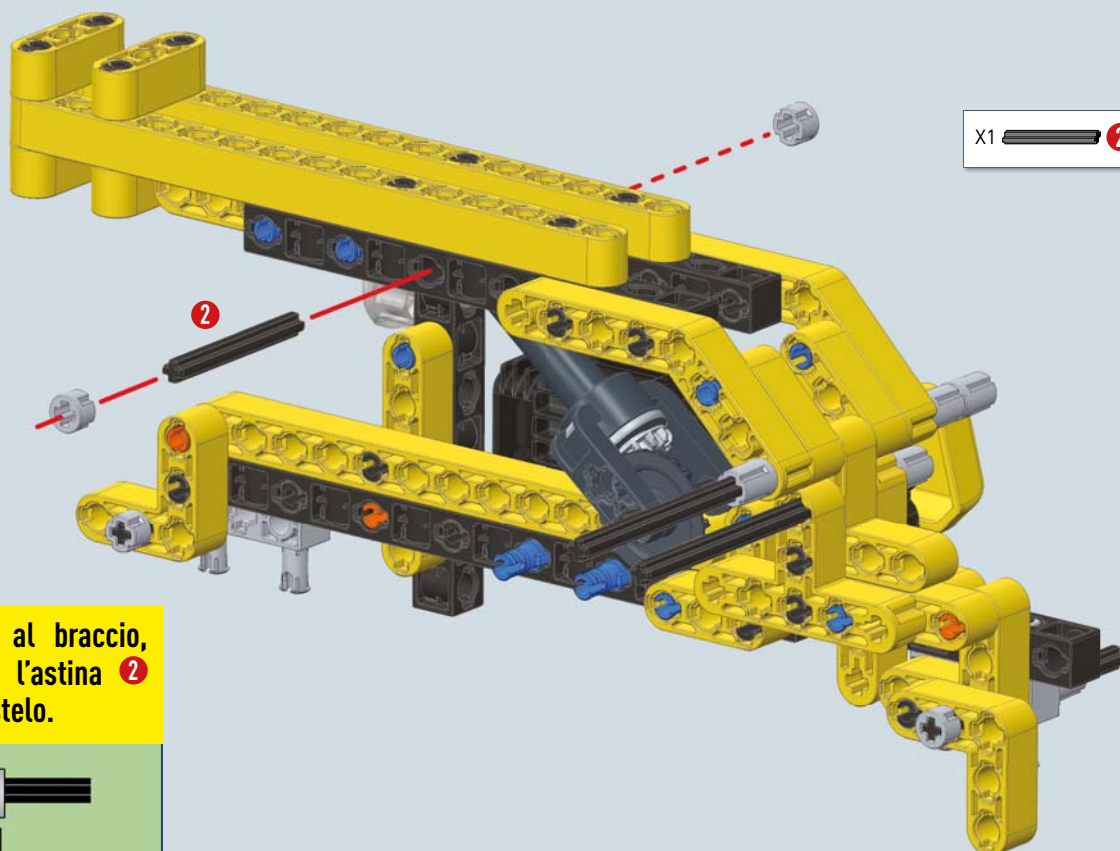
X1



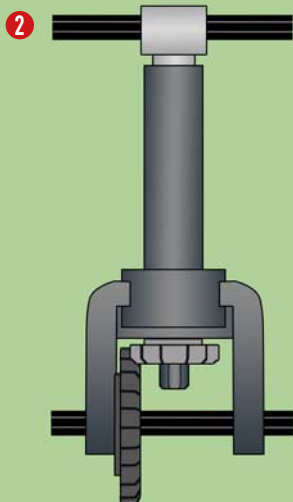
X3

1:1

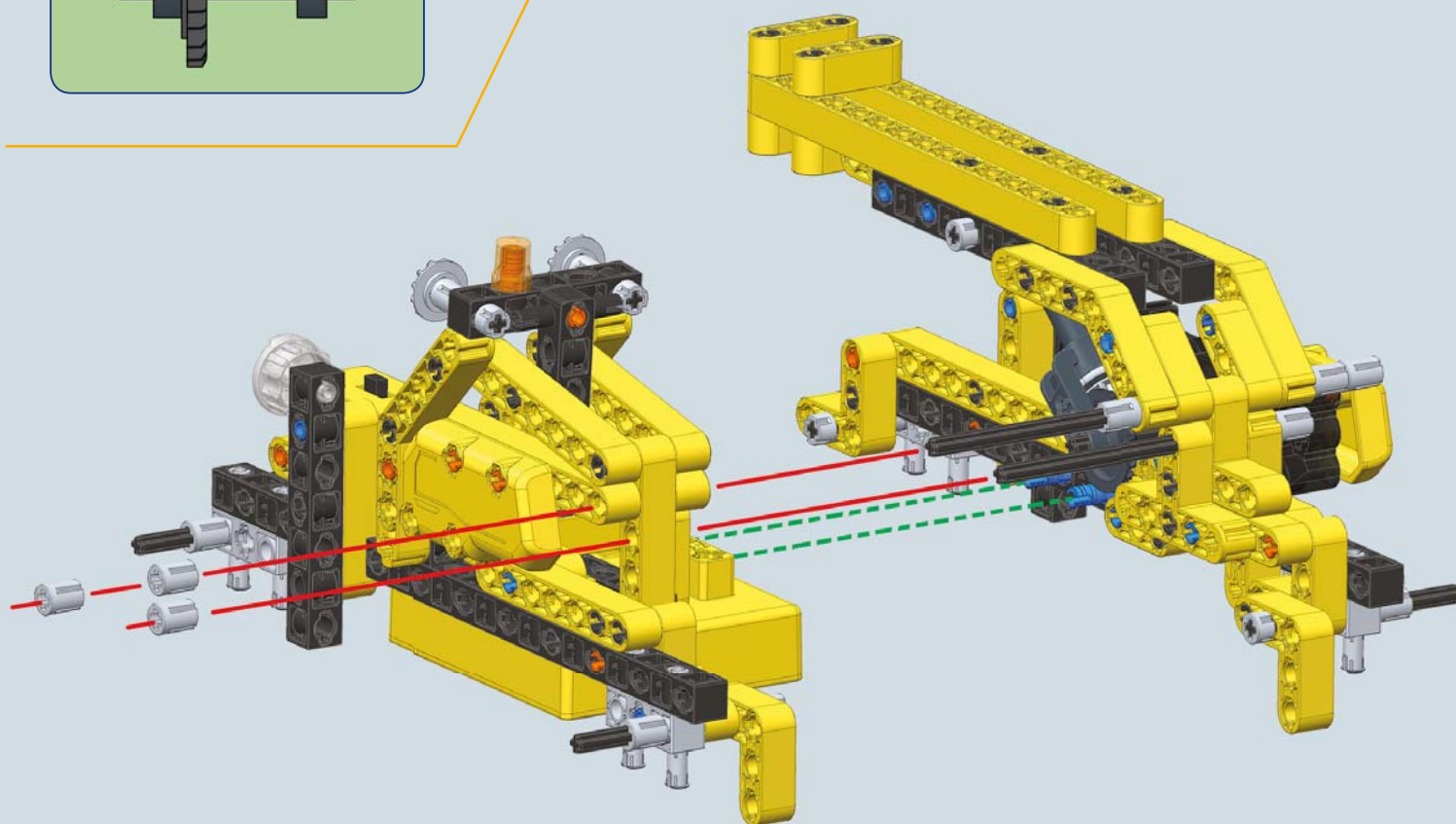
6



Fissa l'attuatore al braccio, facendo scorrere l'astina 2 nella testa dello stelo.

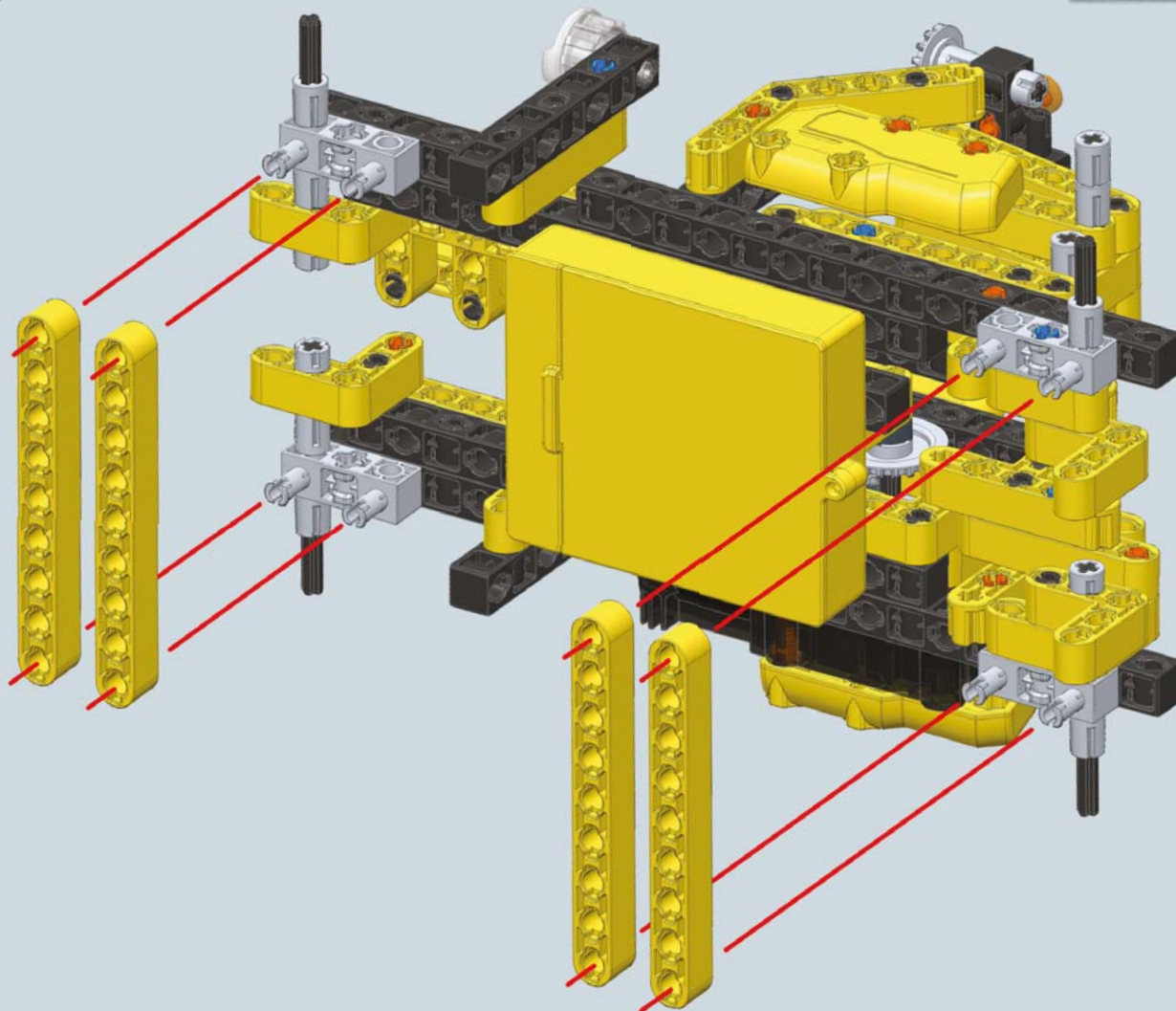


Unisci le due metà del telaio, fissando i due chiodini blu del lato col motore al vano batterie, e infilando le astine come in figura.



39

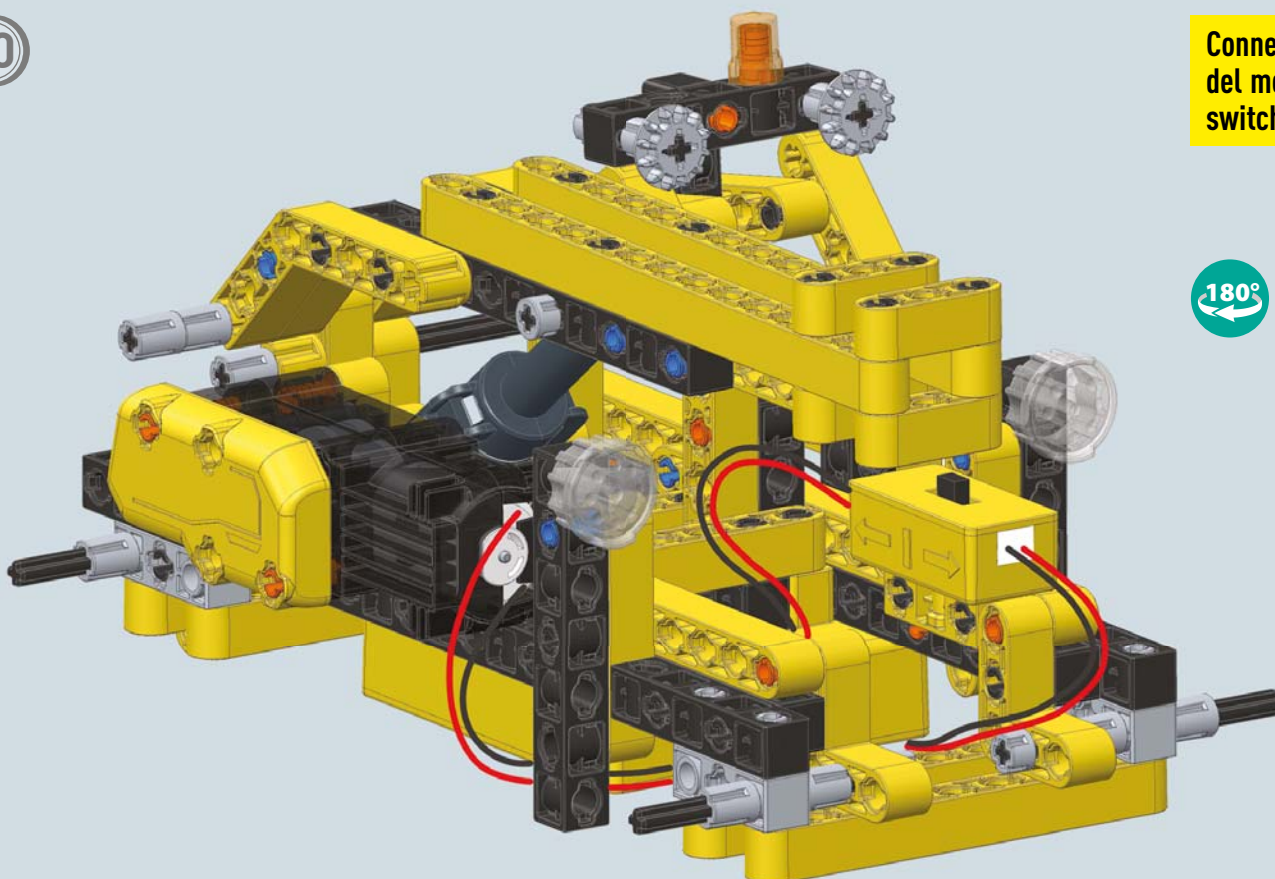
X4

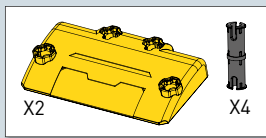


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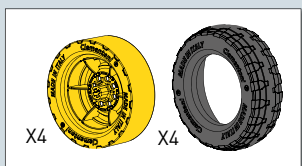
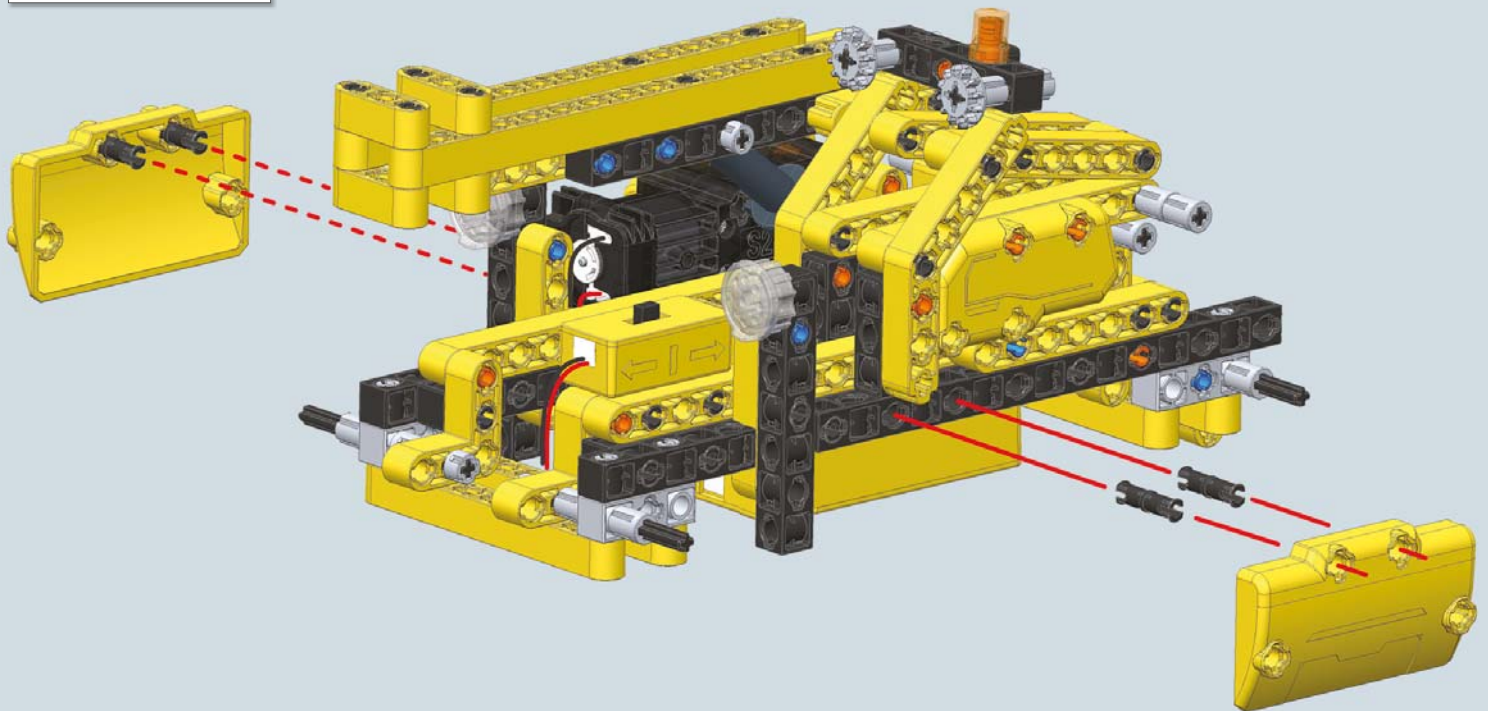
Connetti il cavo
del motore allo
switch.

180°

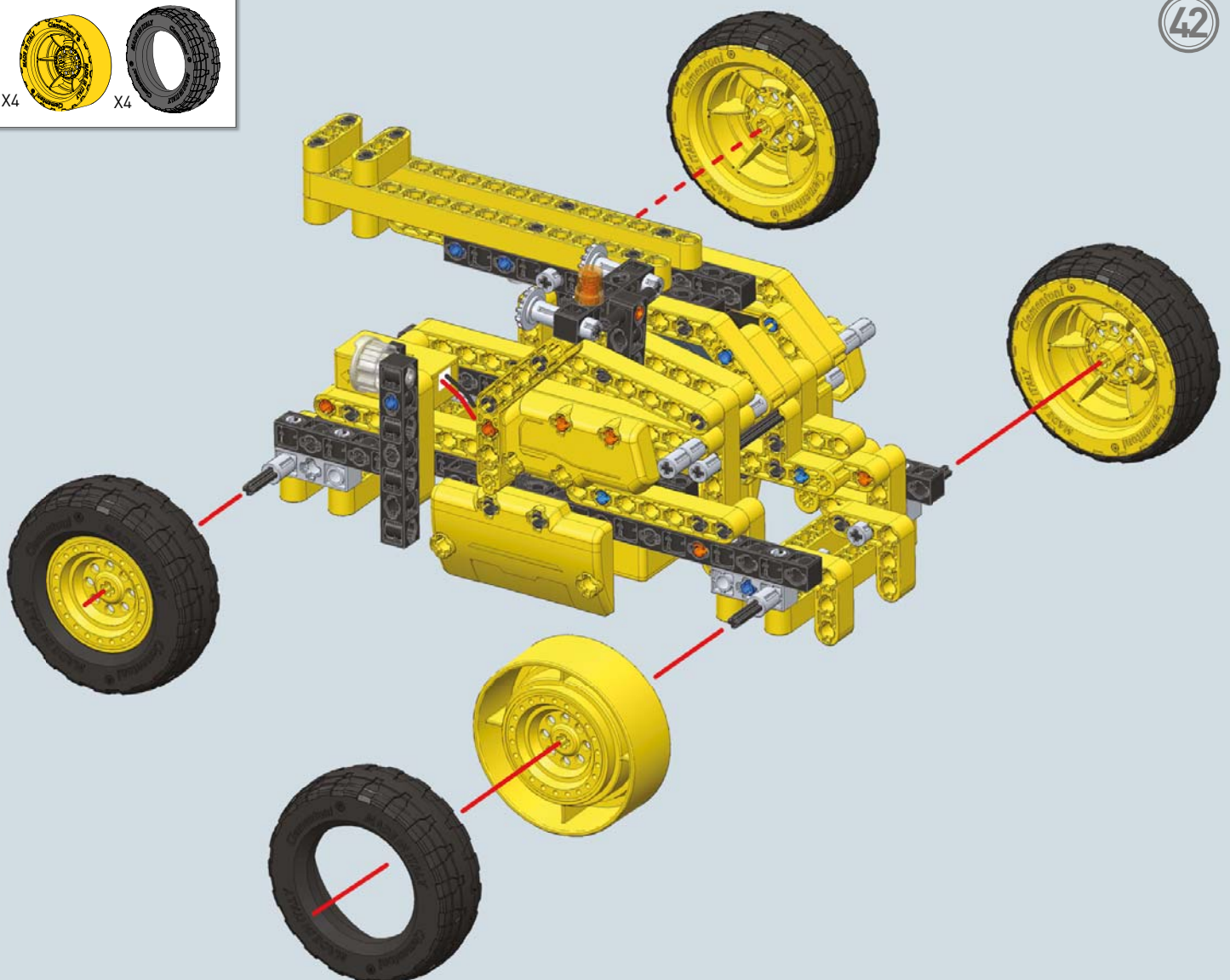




41



42



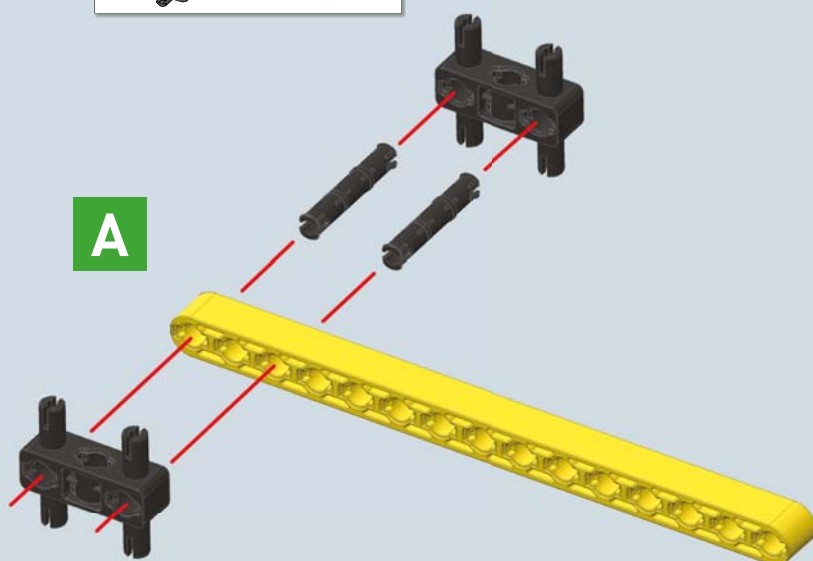
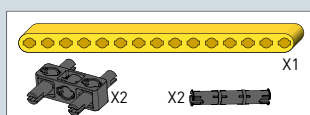


Notizie tecniche e curiosità

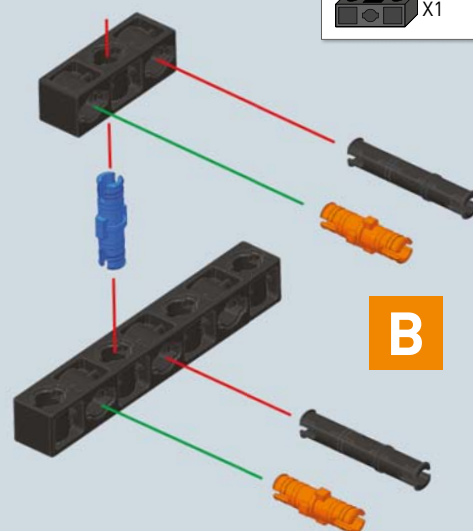
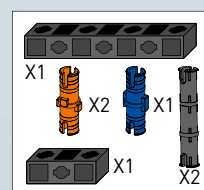
Il braccio telescopico può essere formato anche da 4 bracci (nei modelli più grandi) che scorrono l'uno dentro l'altro. Grazie a questa configurazione, la macchina può sollevare materiale fino a grandi altezze.

All'aumentare della lunghezza del braccio però, diminuisce di conseguenza capacità di sollevamento: la leva che si viene a creare sul braccio di sollevamento è una leva di 3° genere (sempre svantaggiosa), perciò se il braccio si allunga, la forza applicata dalla resistenza (posta sulle forche) tenderà a far sbilanciare tutto il veicolo, aumentando il rischio di rovesciamento.

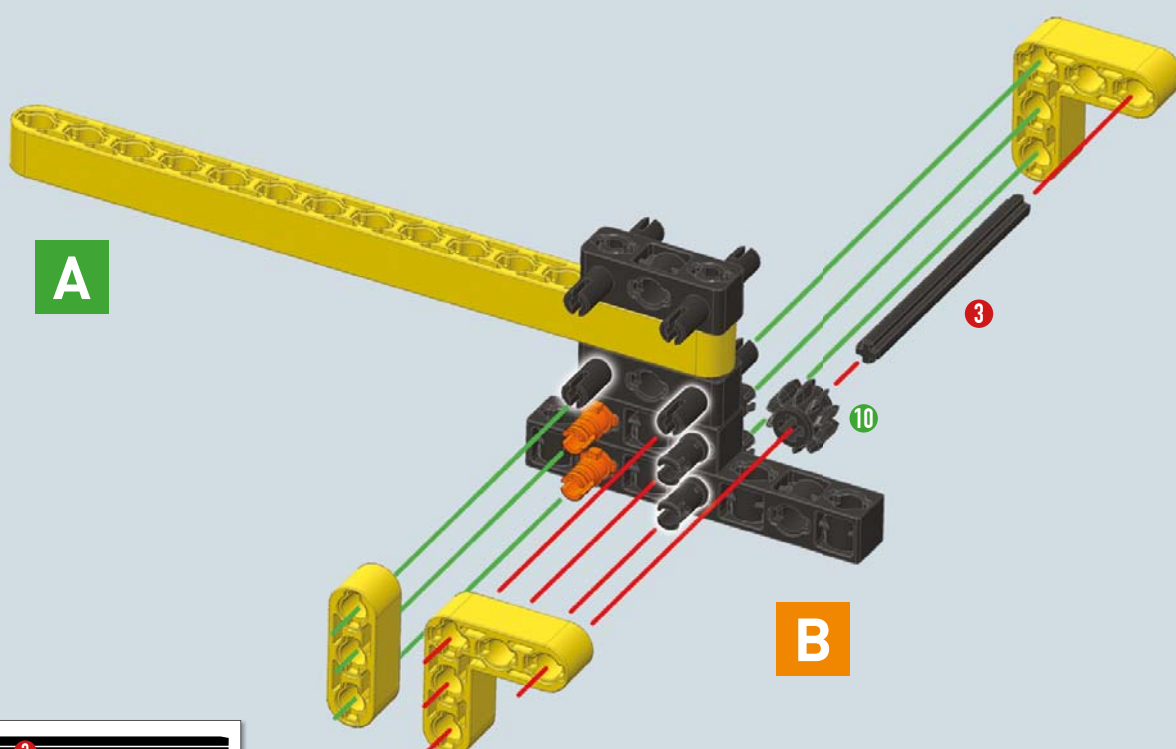
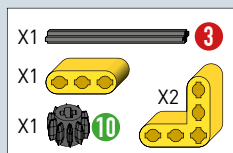
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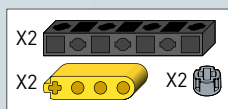


44

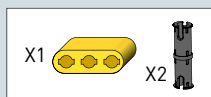
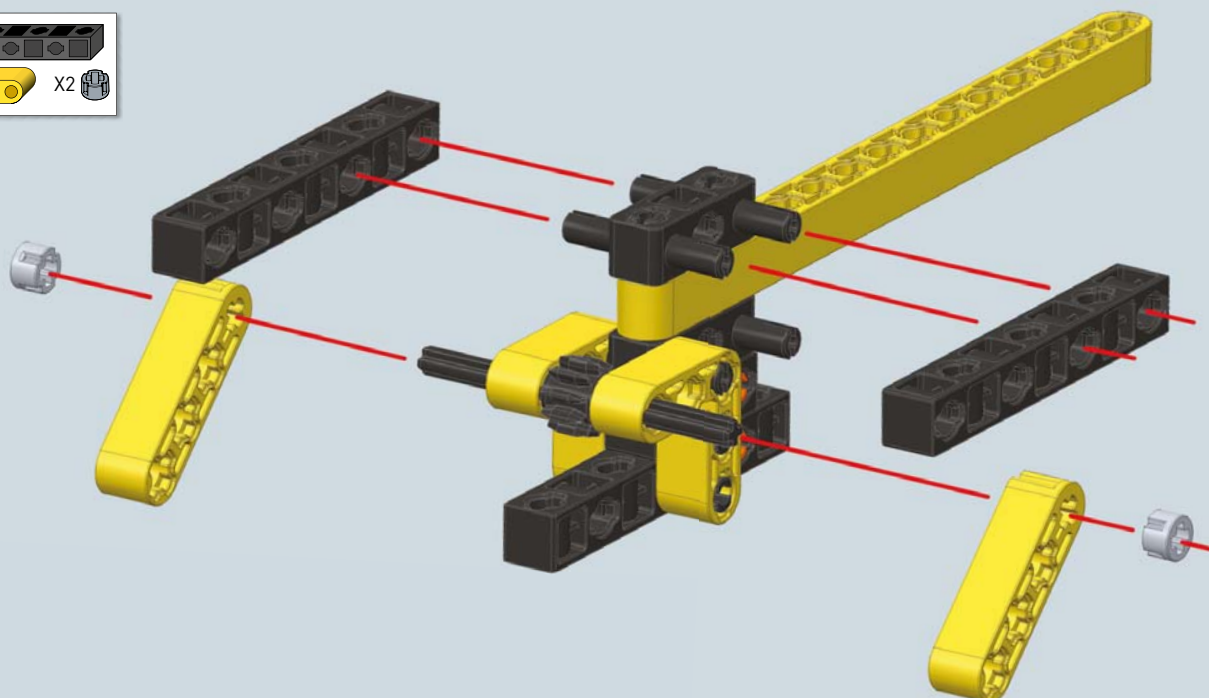


45

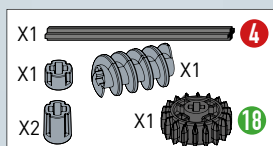
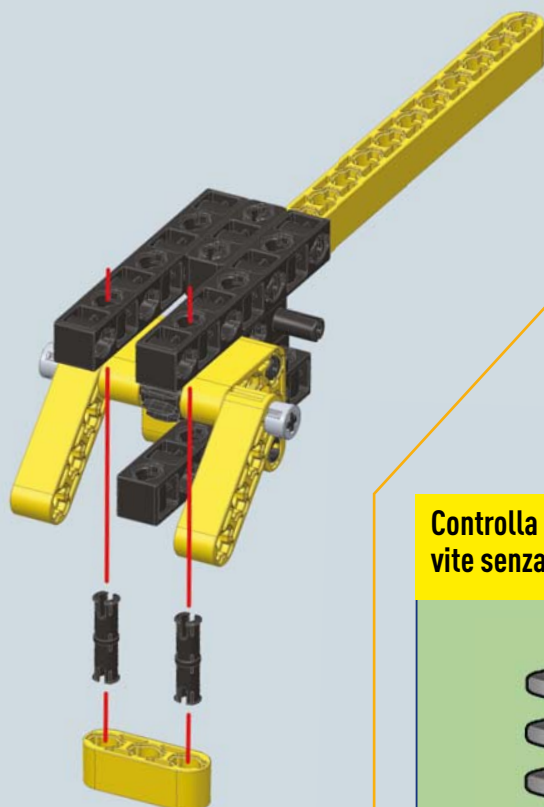




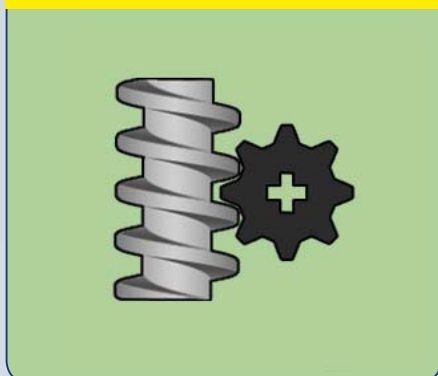
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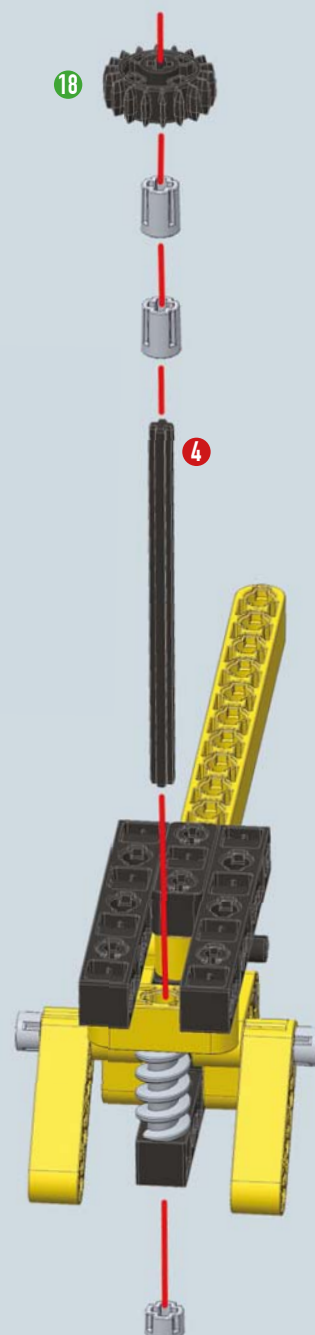
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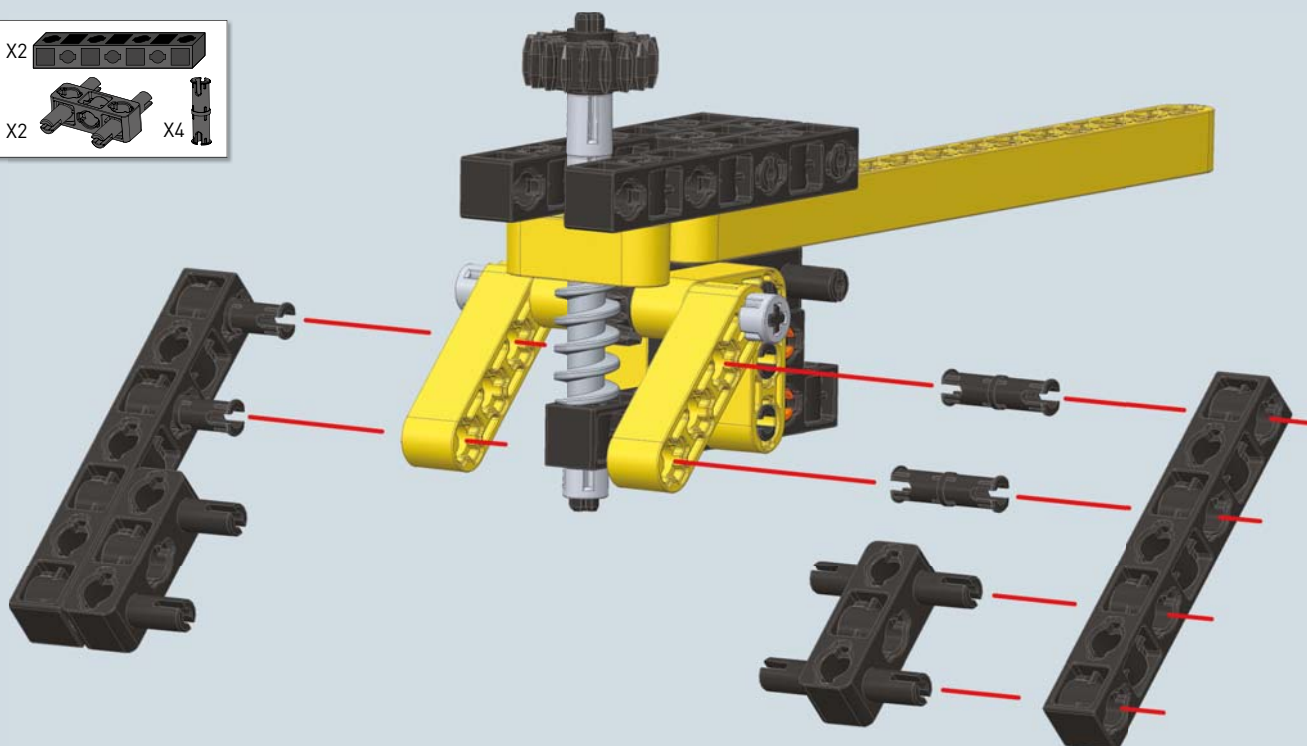
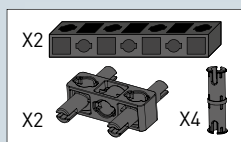
Controlla l'accoppiamento tra la vite senza fine e la ruota 10 denti.



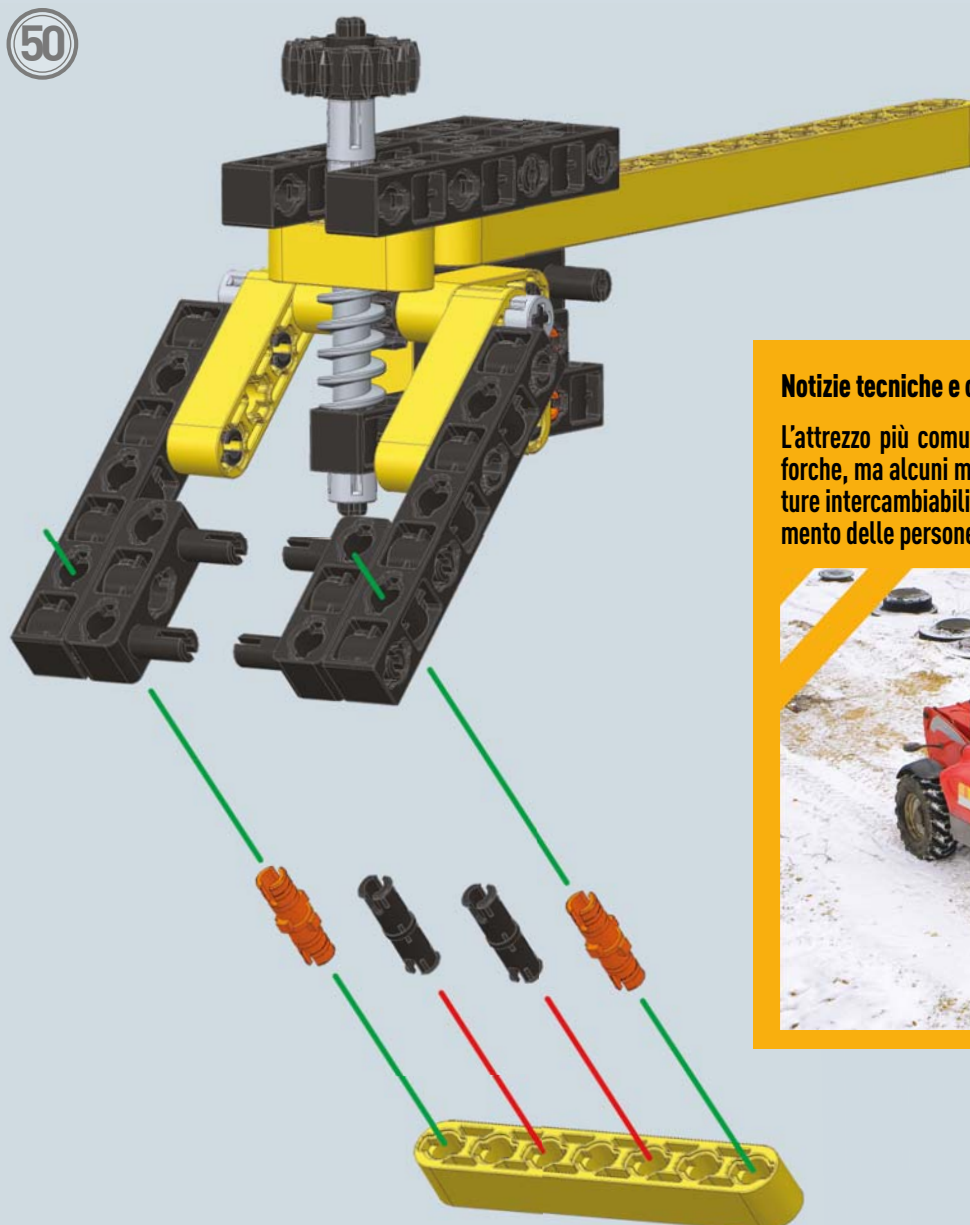
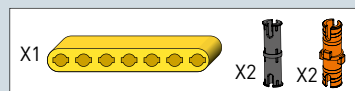
48



49



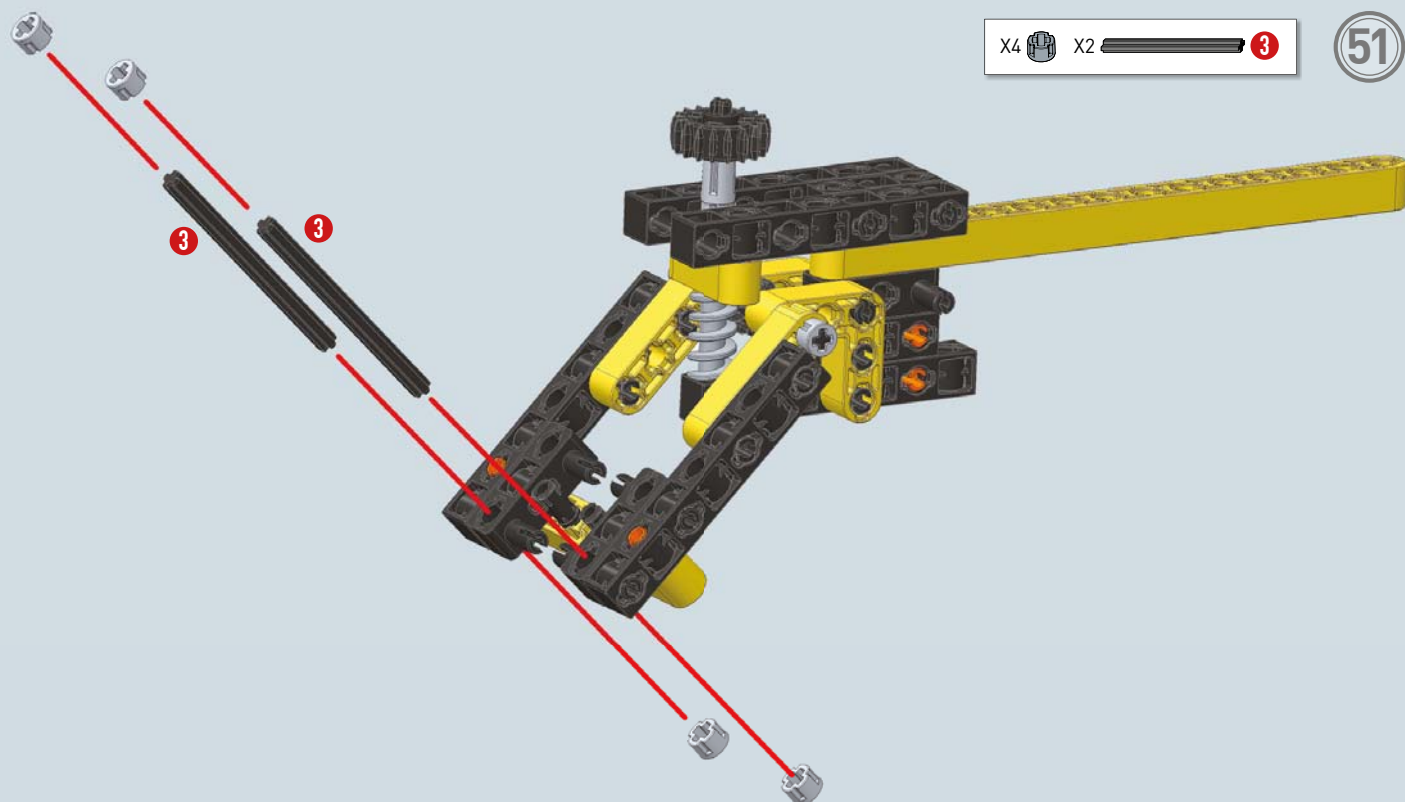
50



Notizie tecniche e curiosità

L'attrezzo più comunemente associato al braccio telescopico sono le forche, ma alcuni modelli prevedono la possibilità di montare attrezzature intercambiabili, come pale, argani e persino cestelli per il sollevamento delle persone.

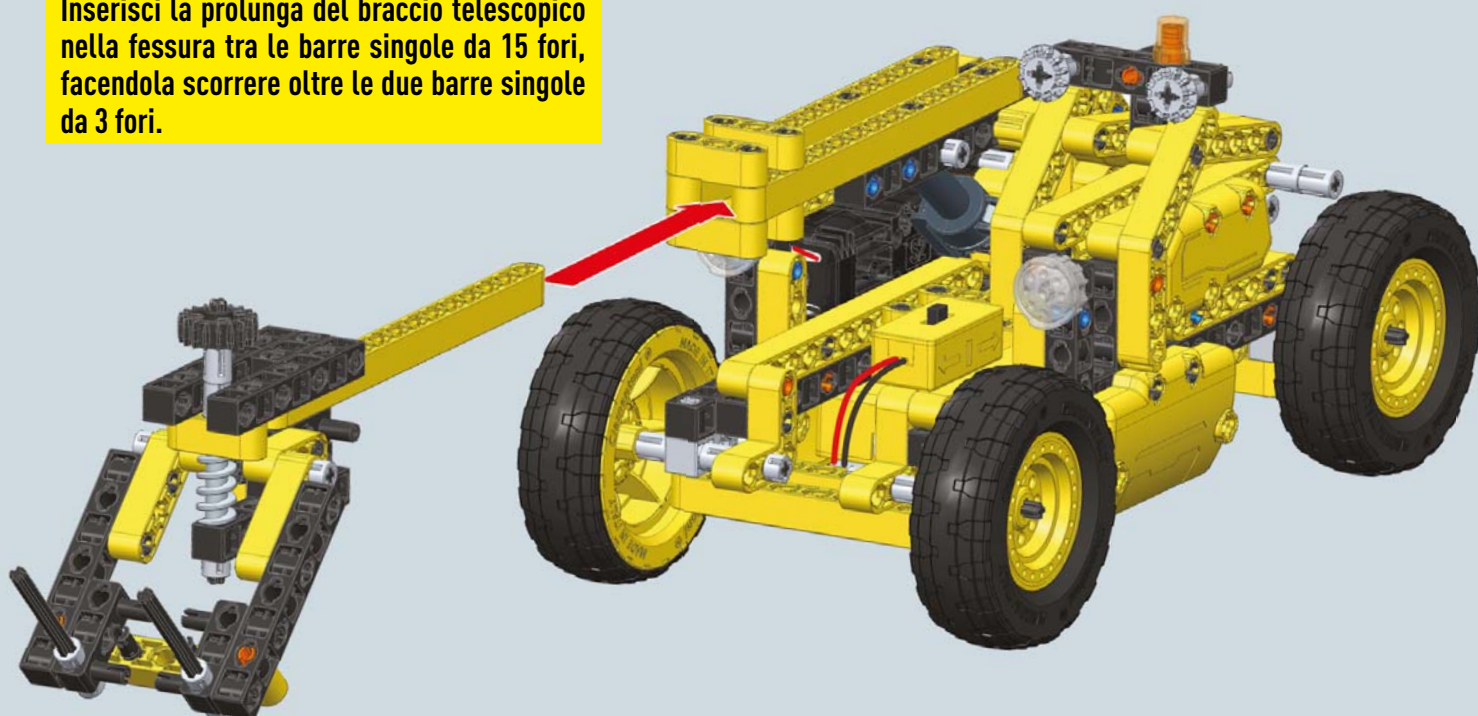




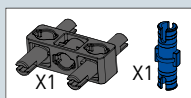
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52

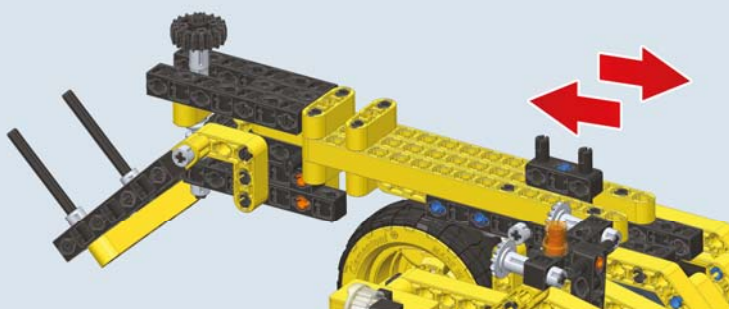
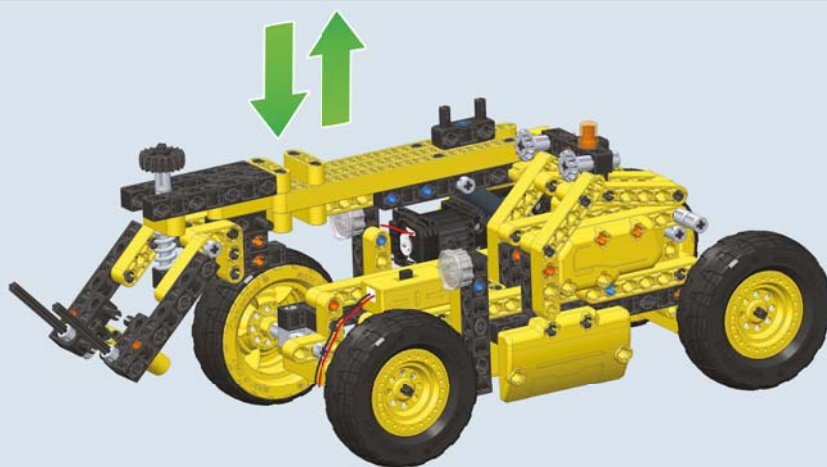
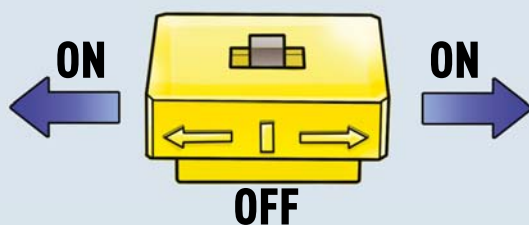
Inserisci la prolunga del braccio telescopico nella fessura tra le barre singole da 15 fori, facendola scorrere oltre le due barre singole da 3 fori.



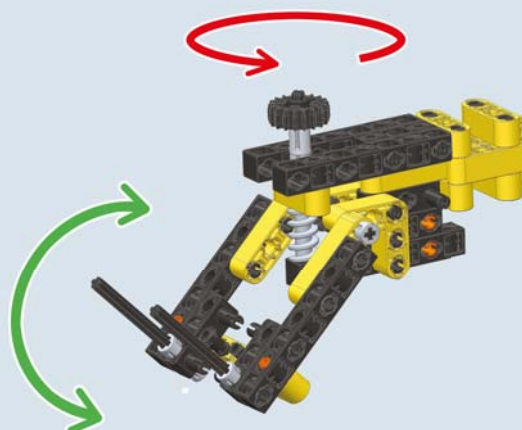
53



Grazie al motore puoi attivare il braccio di sollevamento telescopico. Usa lo switch per regolare il sollevamento o l'abbassamento.



Puoi regolare la lunghezza del secondo braccio spingendo la barra con perni avanti e indietro.



Puoi regolare l'inclinazione delle forche usando la ruota dentata.



L'escavatore è una macchina progettata per scavare il materiale terroso grazie ad una benna o cucchiaia.

Anche se lo scavo è la sua attività principale, il mezzo è molto versatile e può essere impiegata in diversi processi costruttivi, a seconda dell'accessorio montato sul braccio:

- Con le cesoie/martello idraulico, per opere di demolizione.
- Con la pinza, per lo spostamento di rotaie.
- Con il gancio per il sollevamento dei materiali.

E' costituito da due parti principali:

- Il carro: è il corpo base, che monta tutti gli organi per il movimento della macchina.
- La torretta: è la struttura superiore, in grado di ruotare di 360° rispetto al corpo base. Sulla torretta sono montati il motore, la cabina e il braccio escavatore



Il corpo base può essere cingolato o munito di ruote e solitamente monta una lama di rinterro frontale azionata da cilindri idraulici.

La lama è utile sia per le operazioni di livellamento o spostamento del terreno, sia per stabilizzare il mezzo durante le operazioni di scavo.

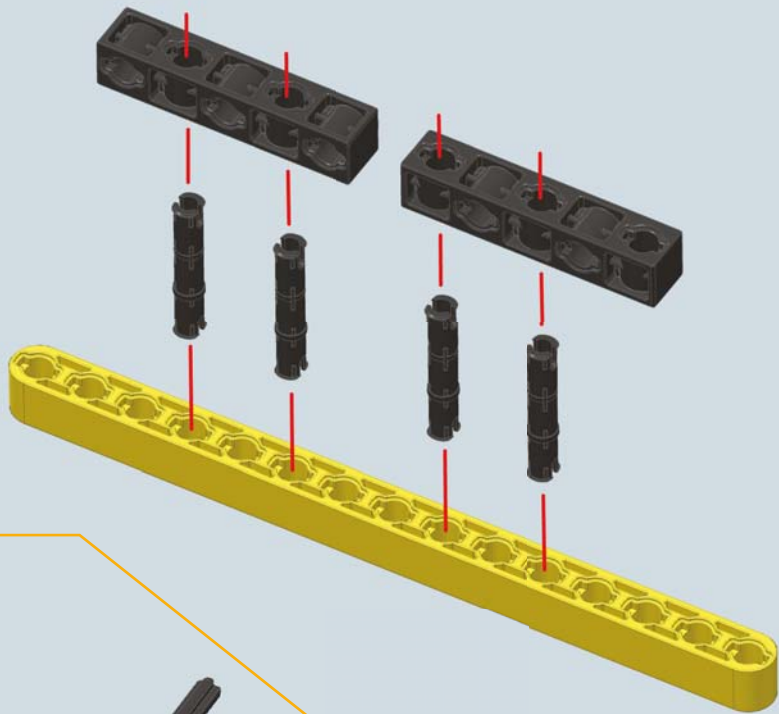
Il braccio escavatore è anch'esso movimentato da un circuito idraulico che indirizza il fluido ad appositi cilindri, per l'attivazione delle parti articolate.



1

X1

X2 X4

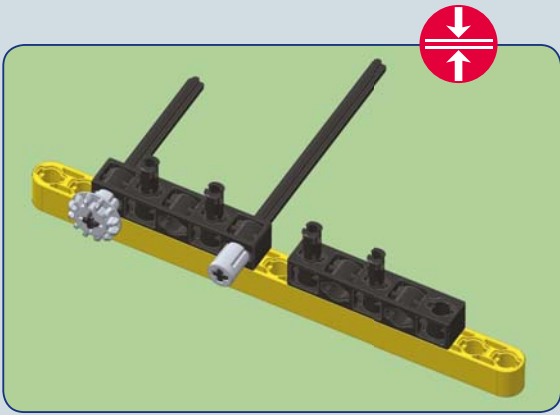
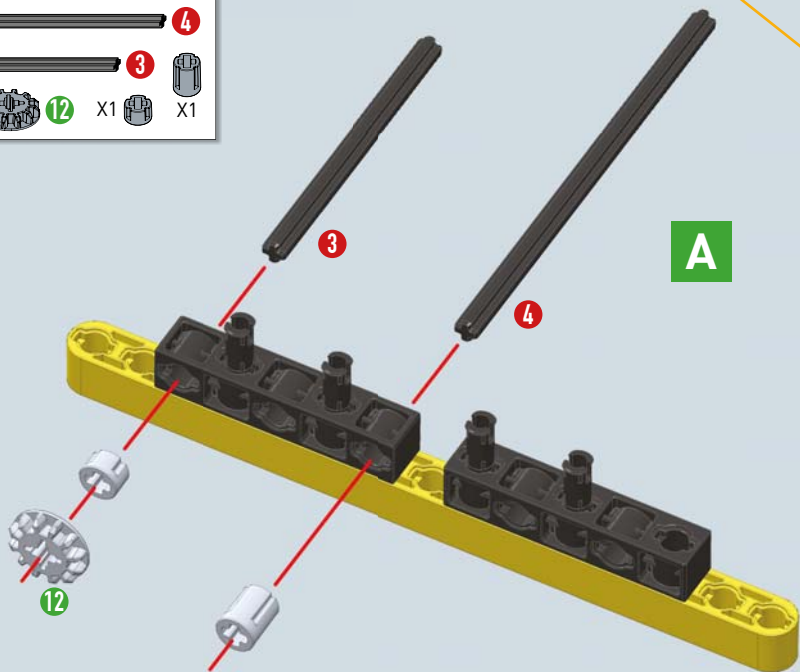


2

X1 4

X1 3

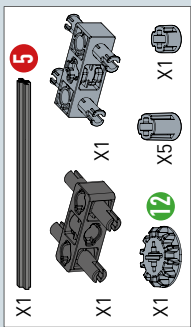
X1 12 X1 X1



1:1

1:1

3

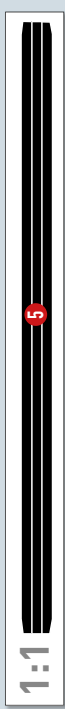
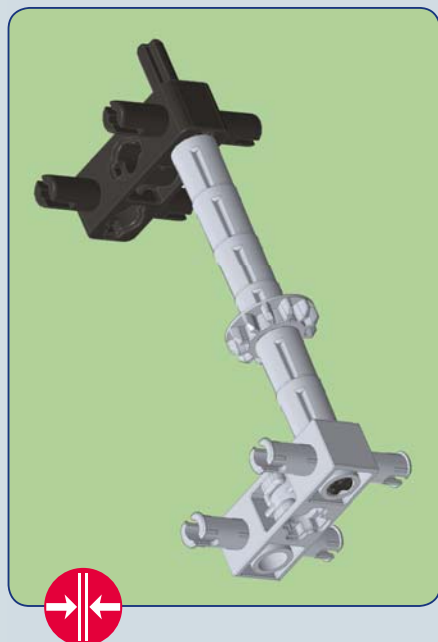
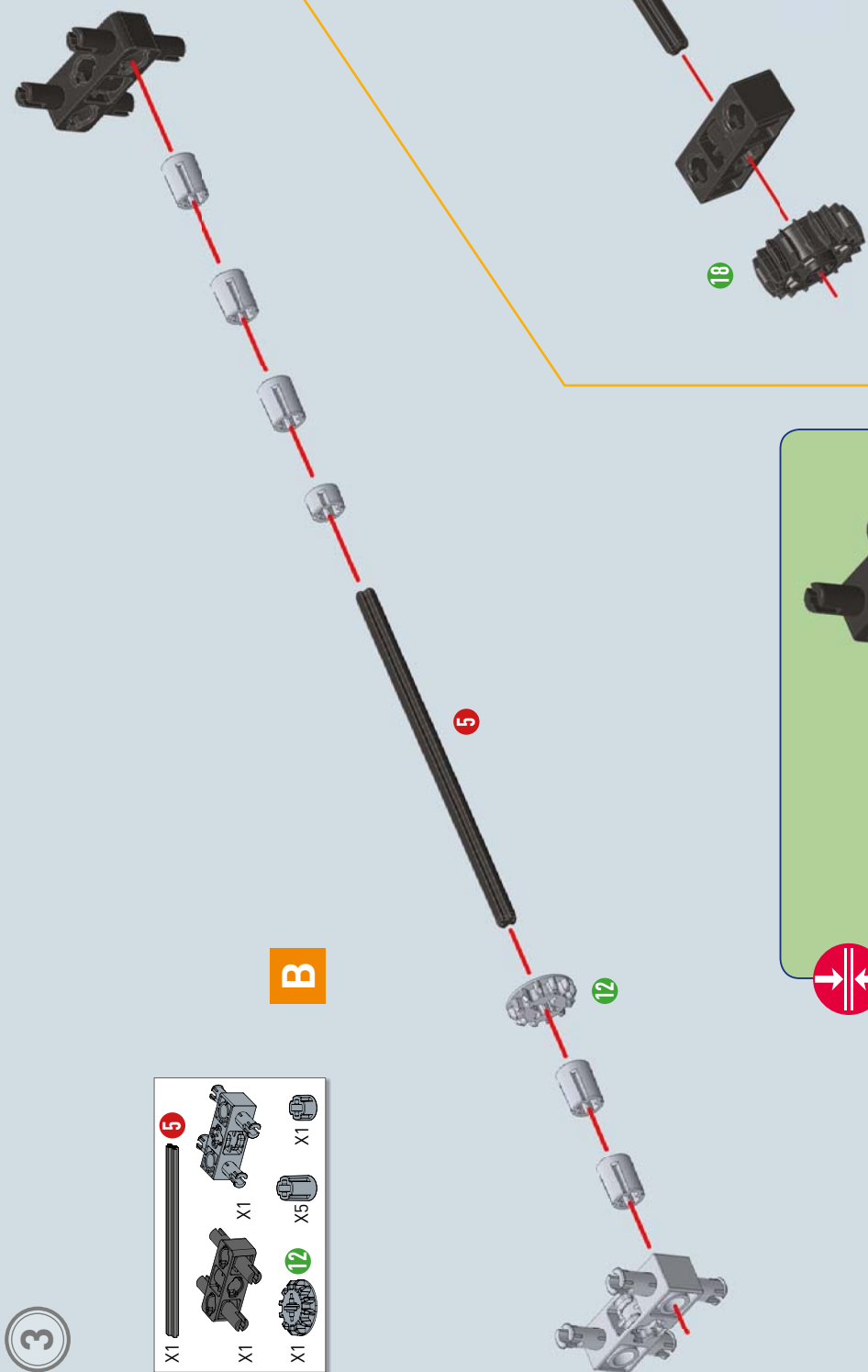


B

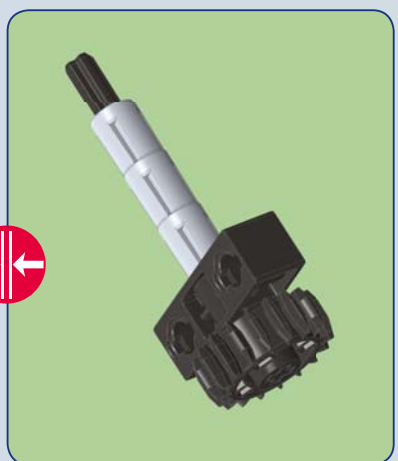
4



C

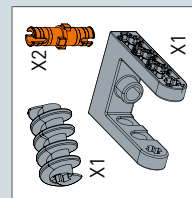
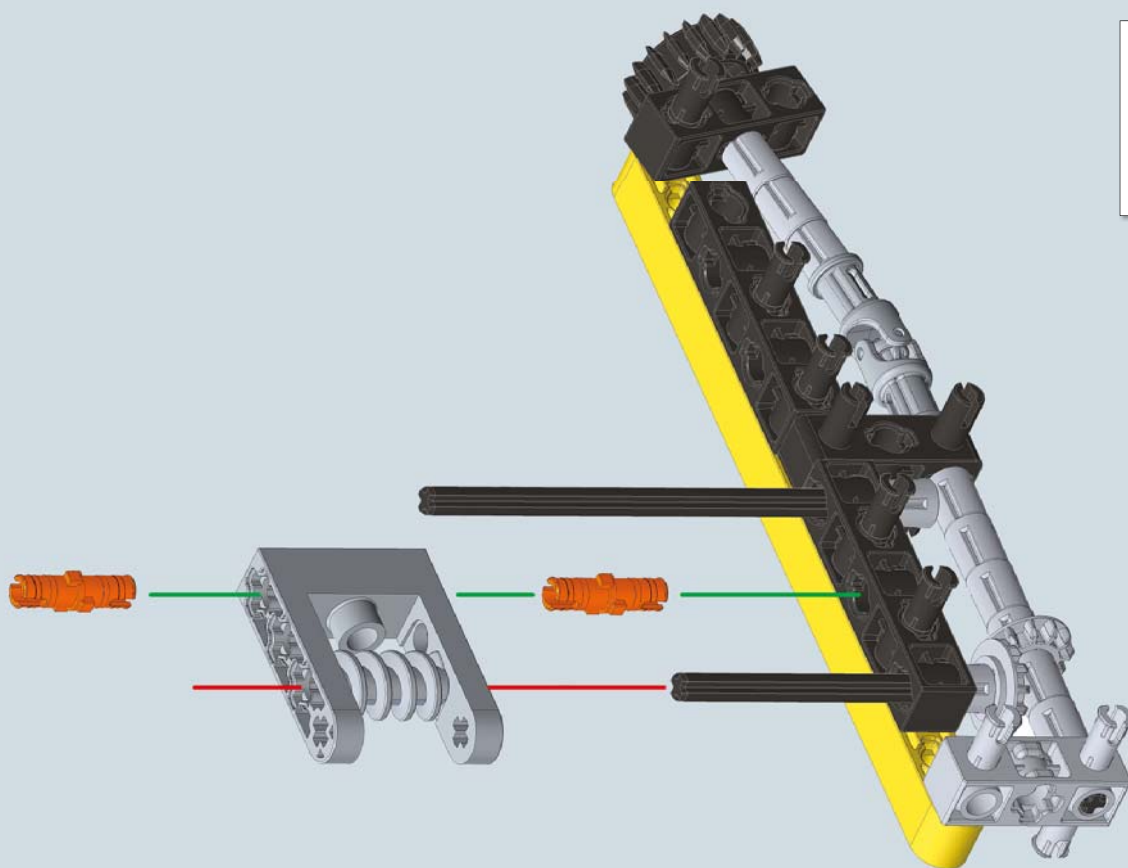


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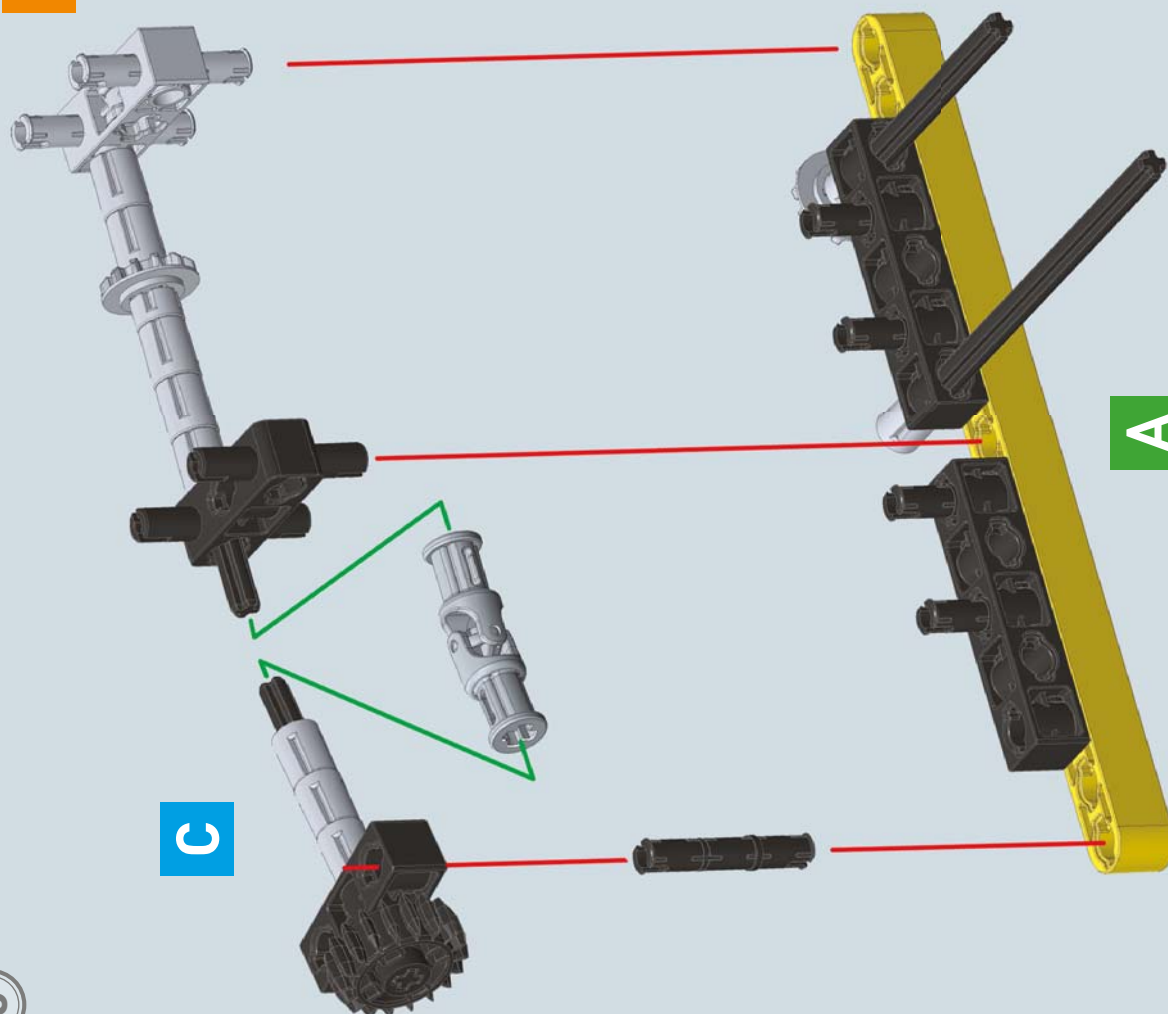


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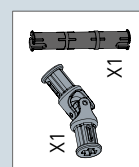
6



B

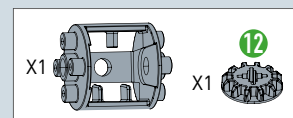
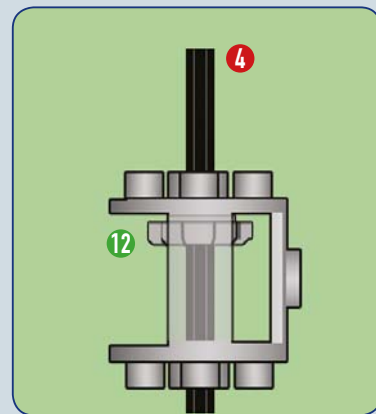
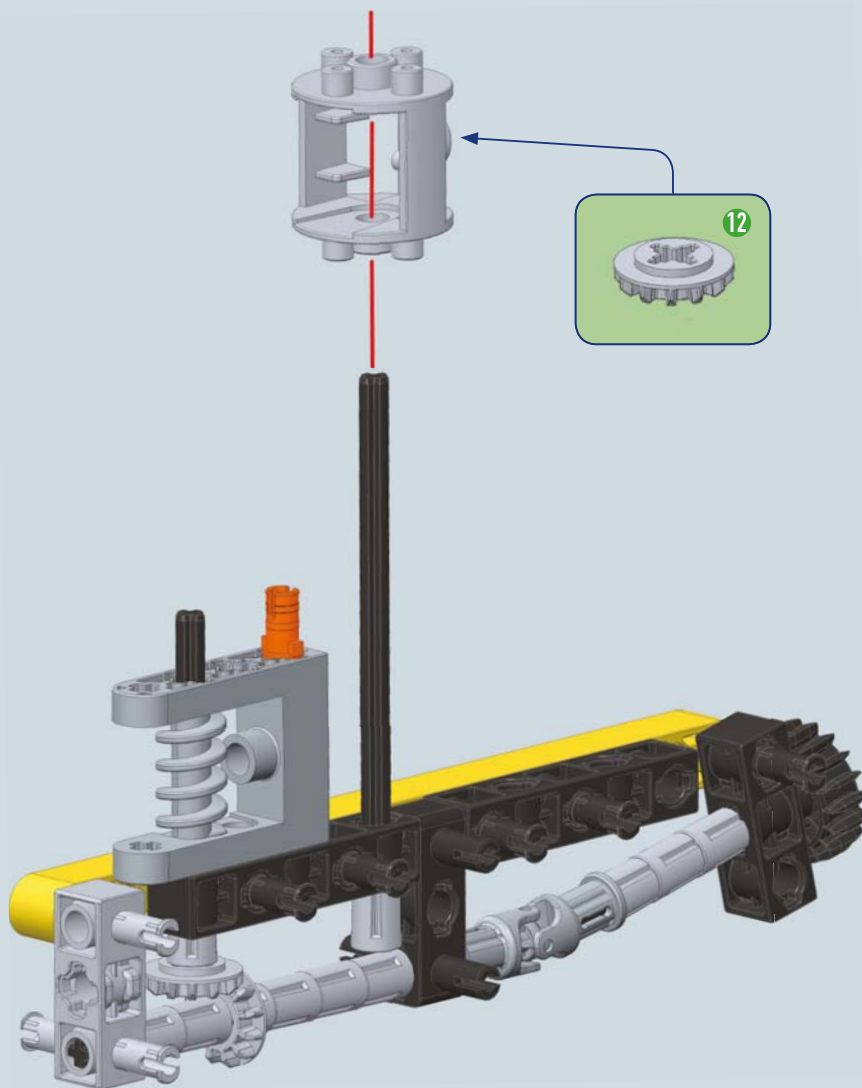


Per assemblare il giunto cardanico, segui le istruzioni stampate sul foglio delle avvertenze, contenuto nella scatola.

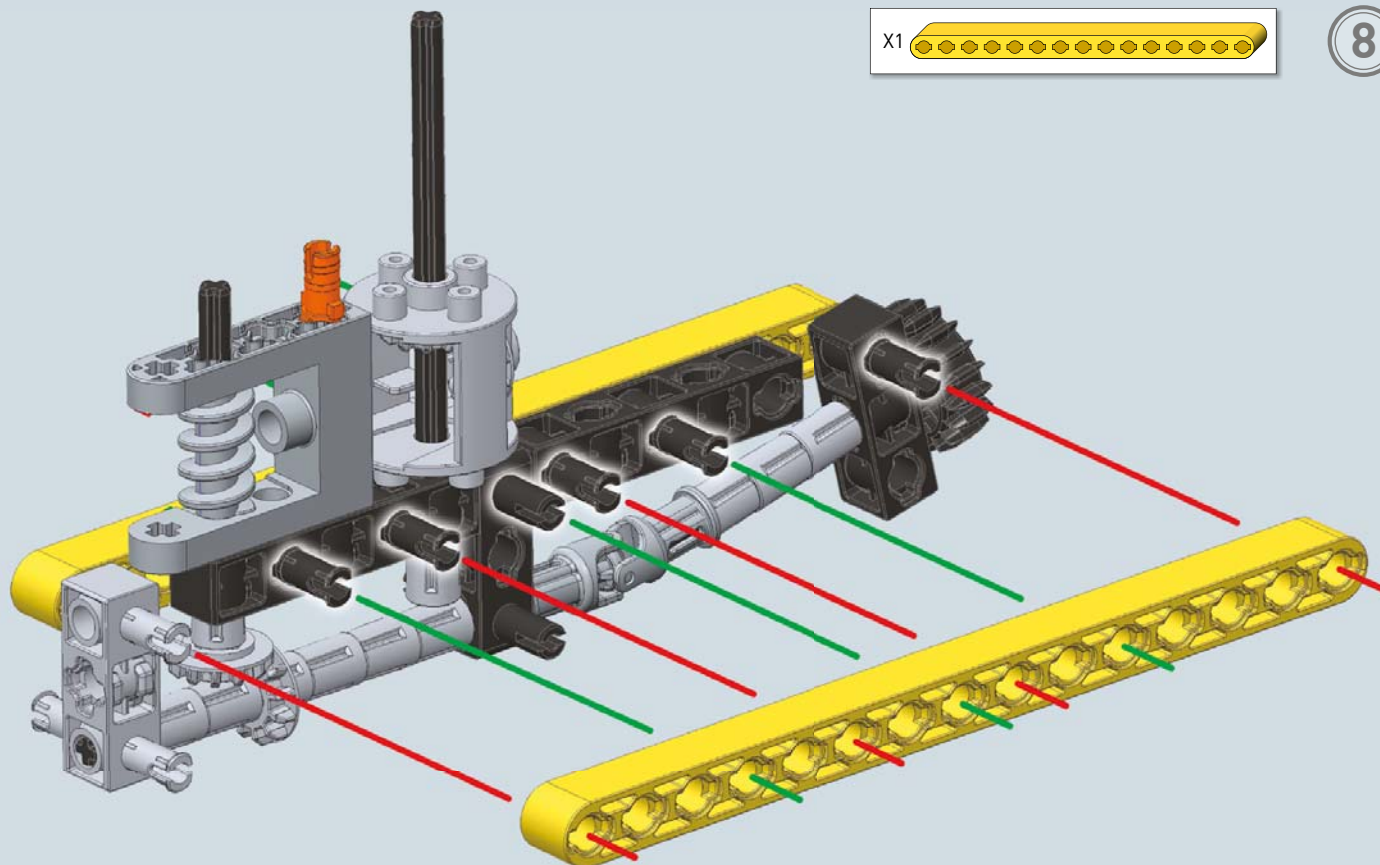


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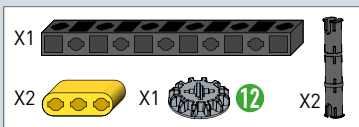
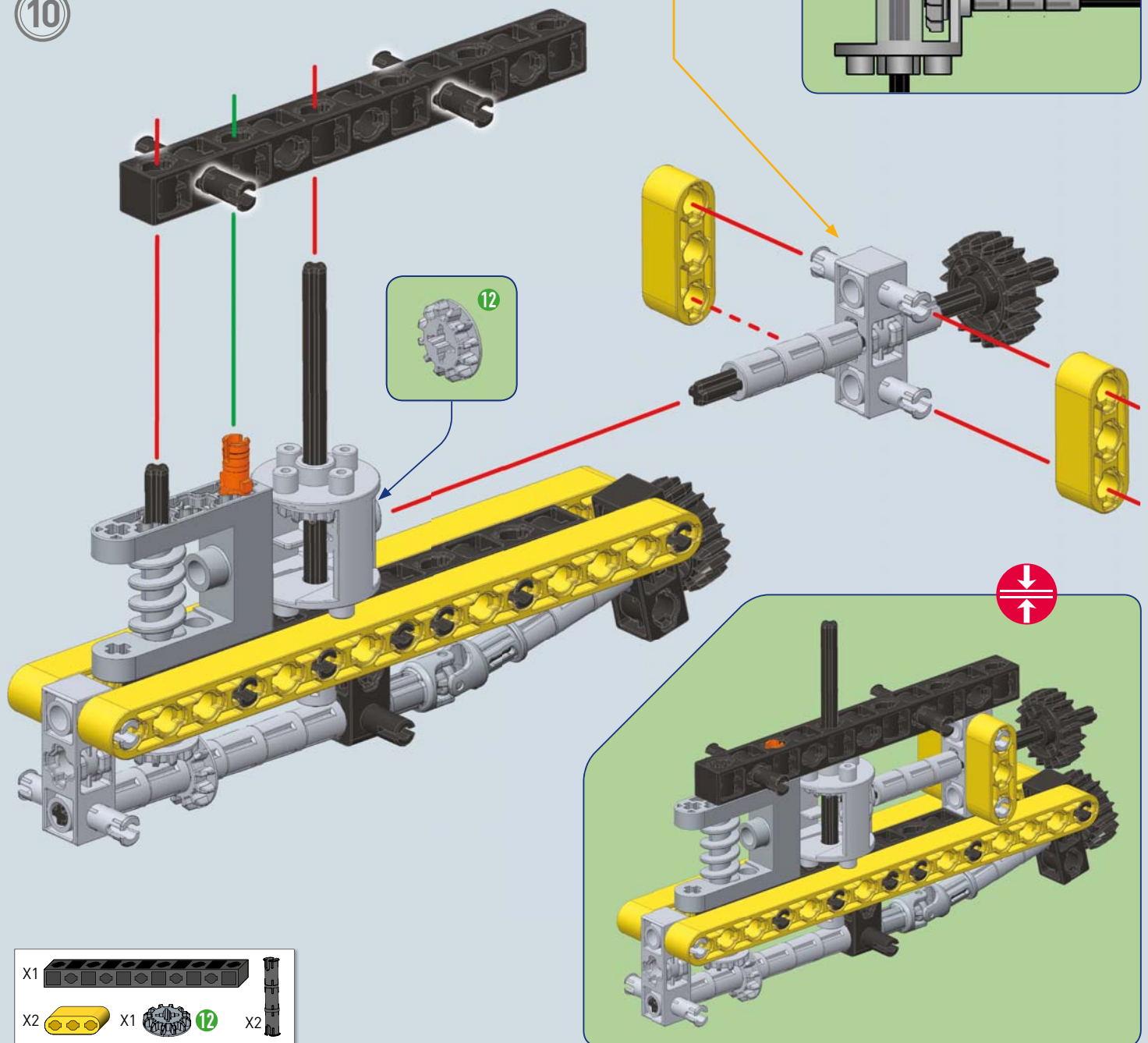
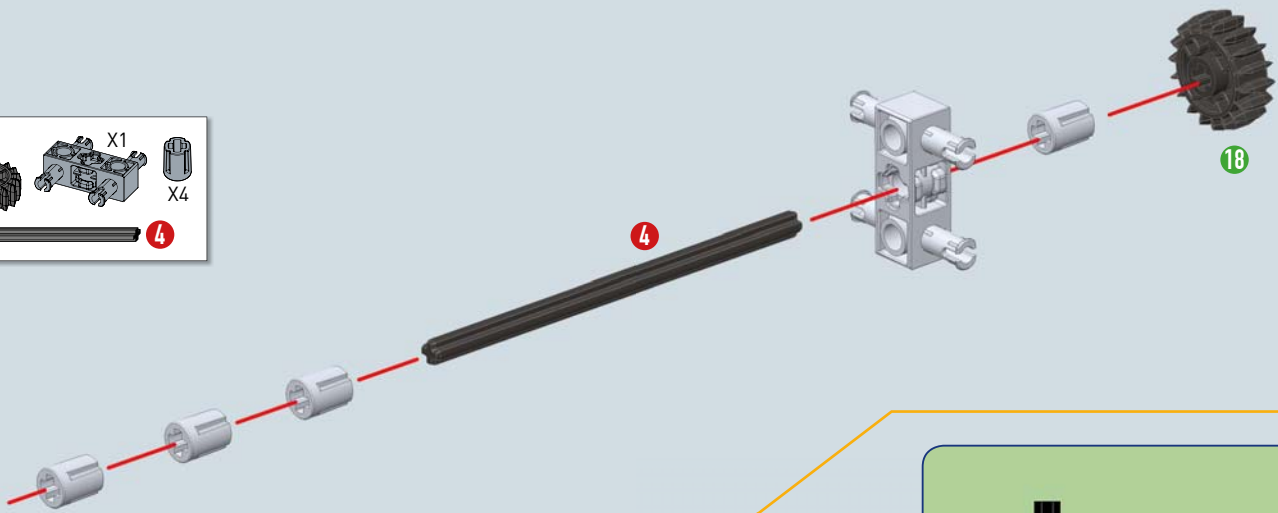
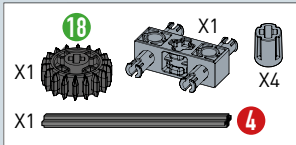
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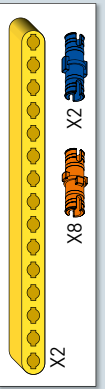
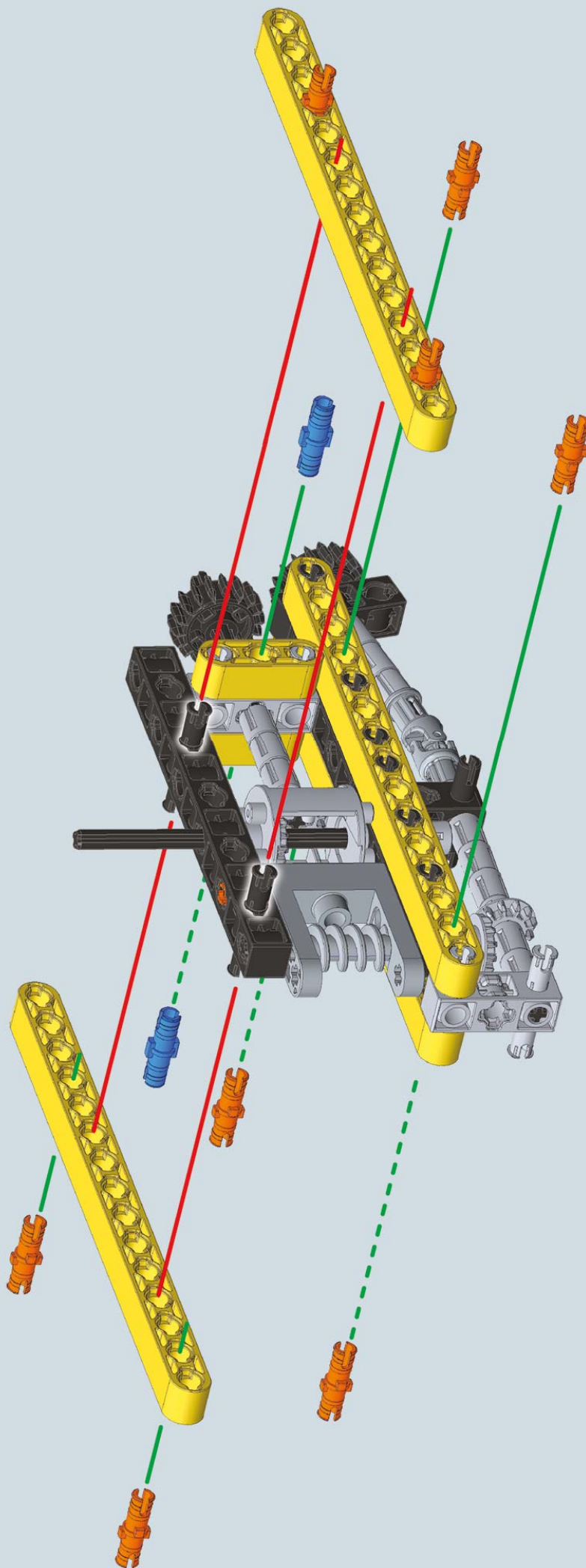


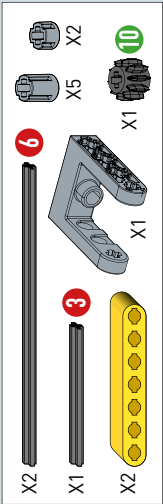
8



9

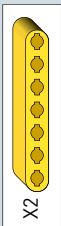
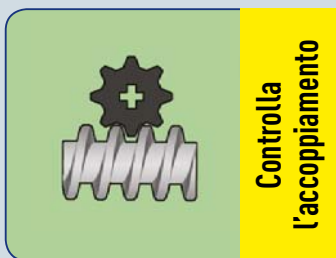


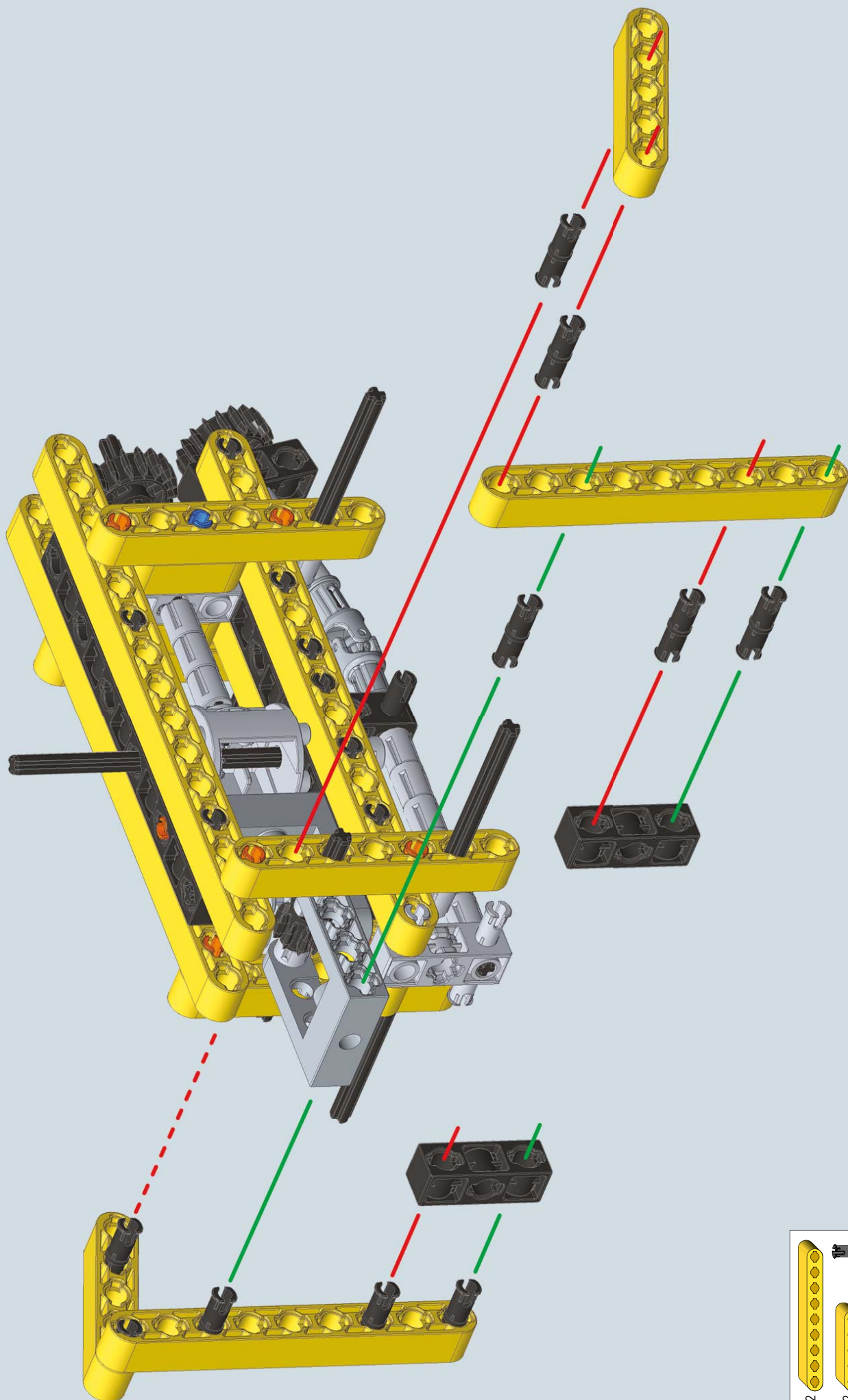




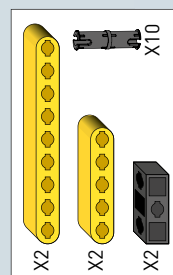
Centra gli anelli lungo l'astina 6.

Lascia uno spazio tra i due anelli, al centro dell'astina 6.



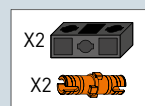
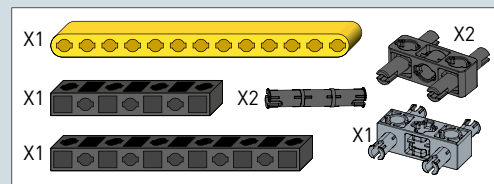
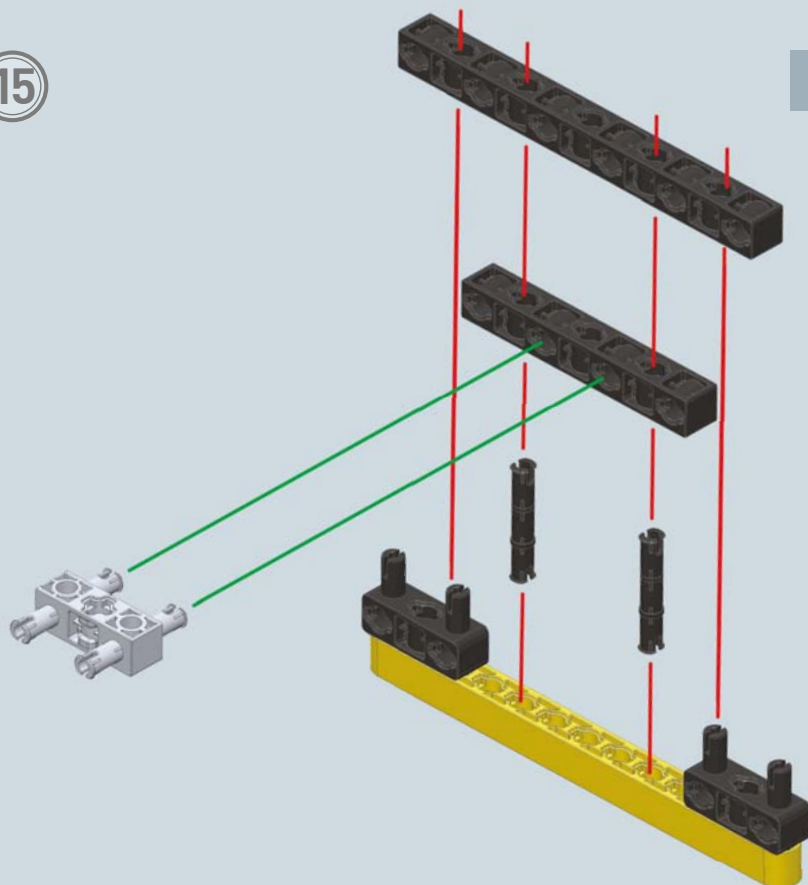


14



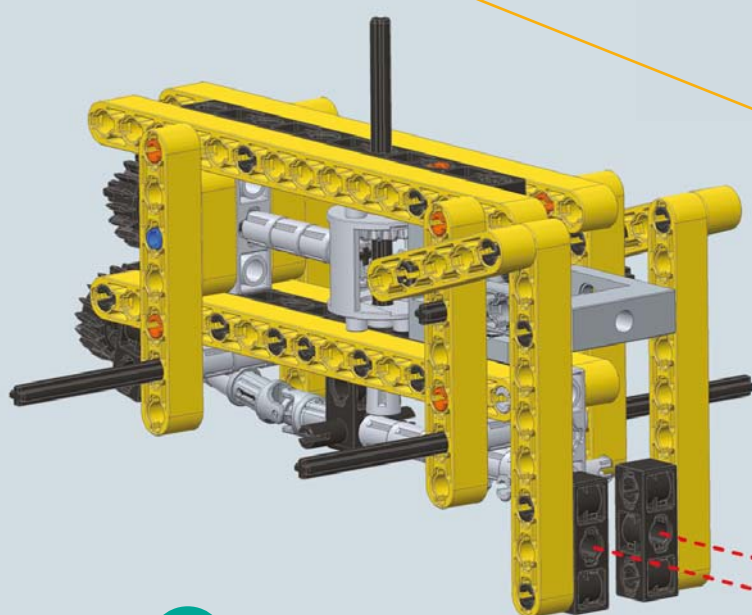
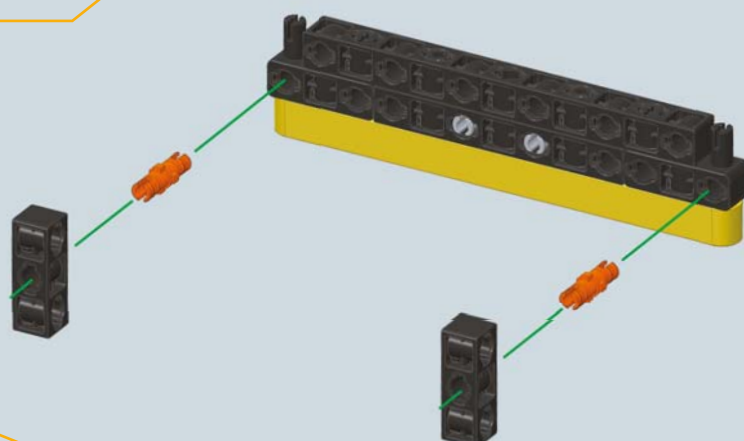
15

Realizziamo la lama di rinterro da unire poi al carro.

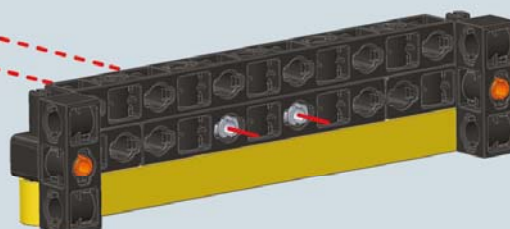


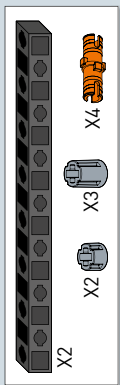
16

17

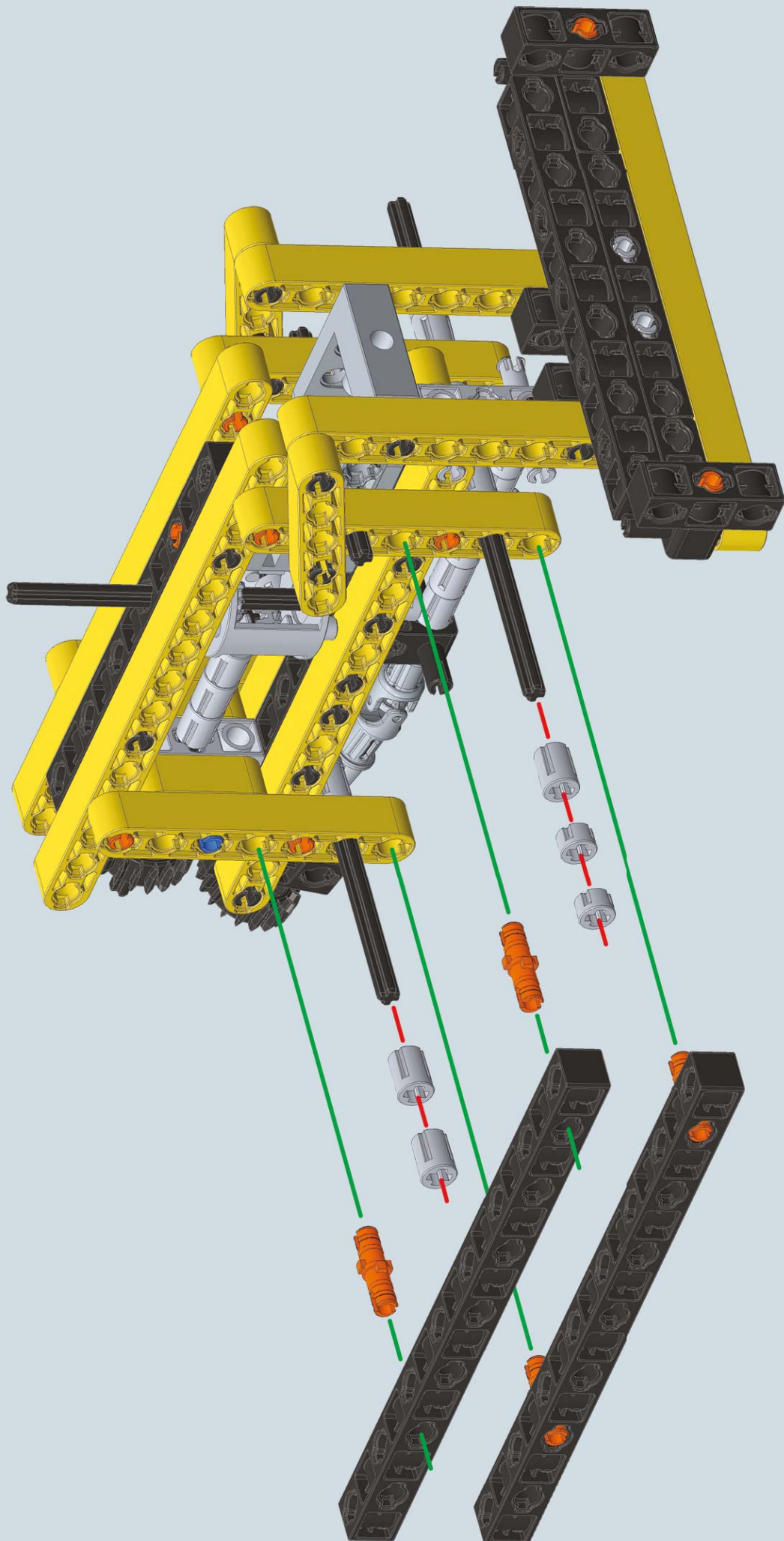


Fissiamo la lama al carro.

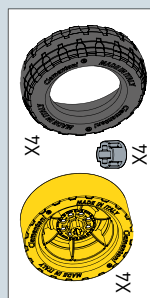
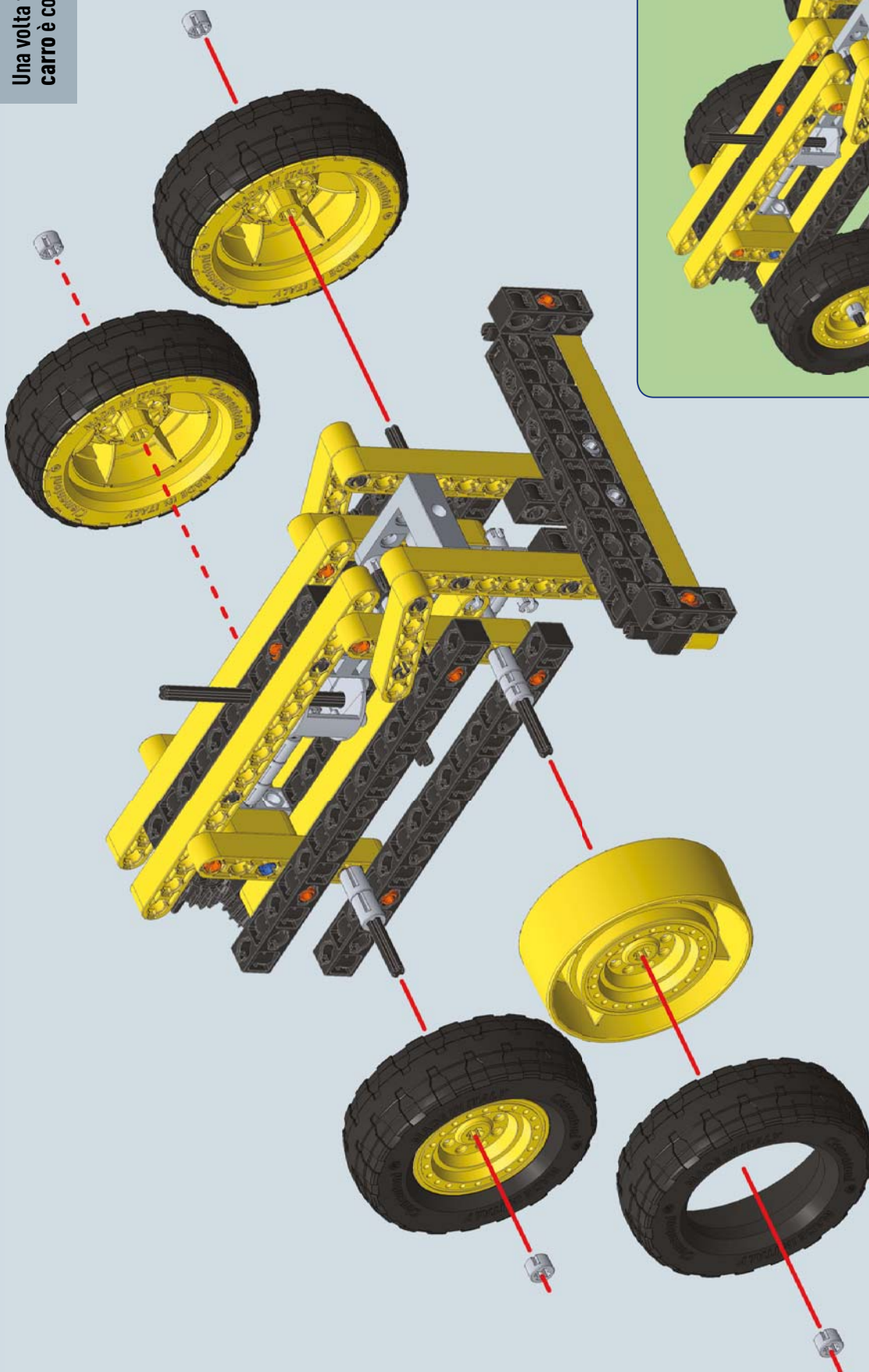




18



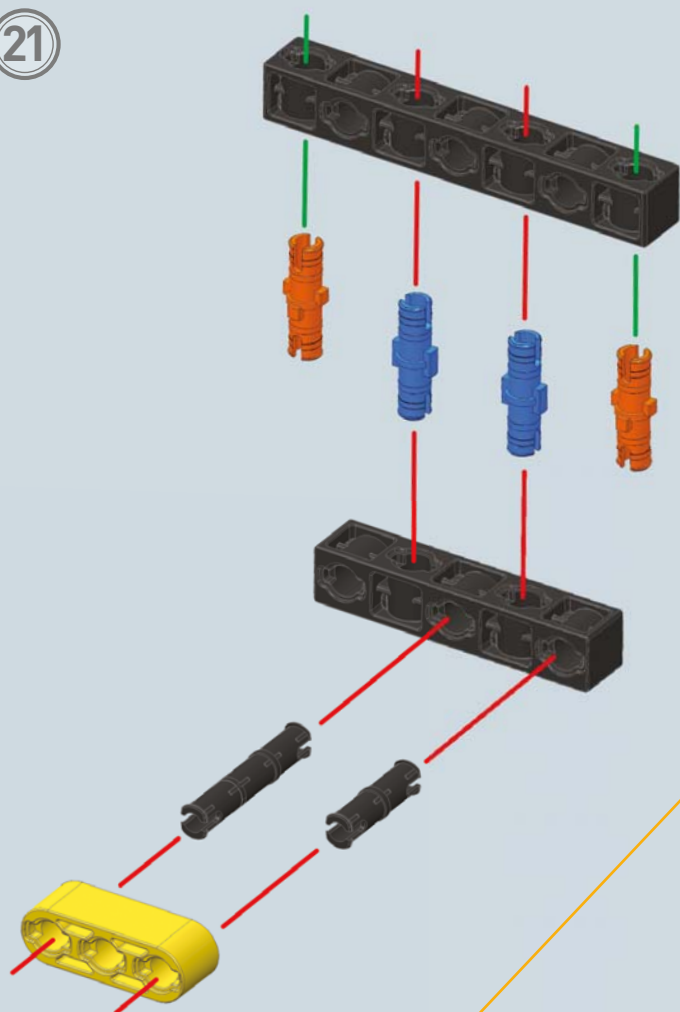
Una volta fissate le ruote il
carro è completo.



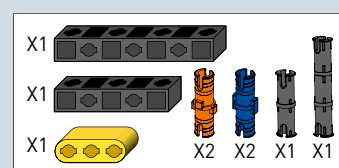


Passiamo ora a costruire la **torretta** con tutti i suoi componenti.

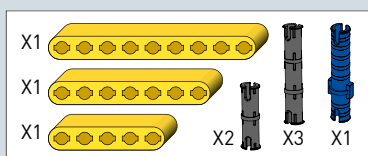
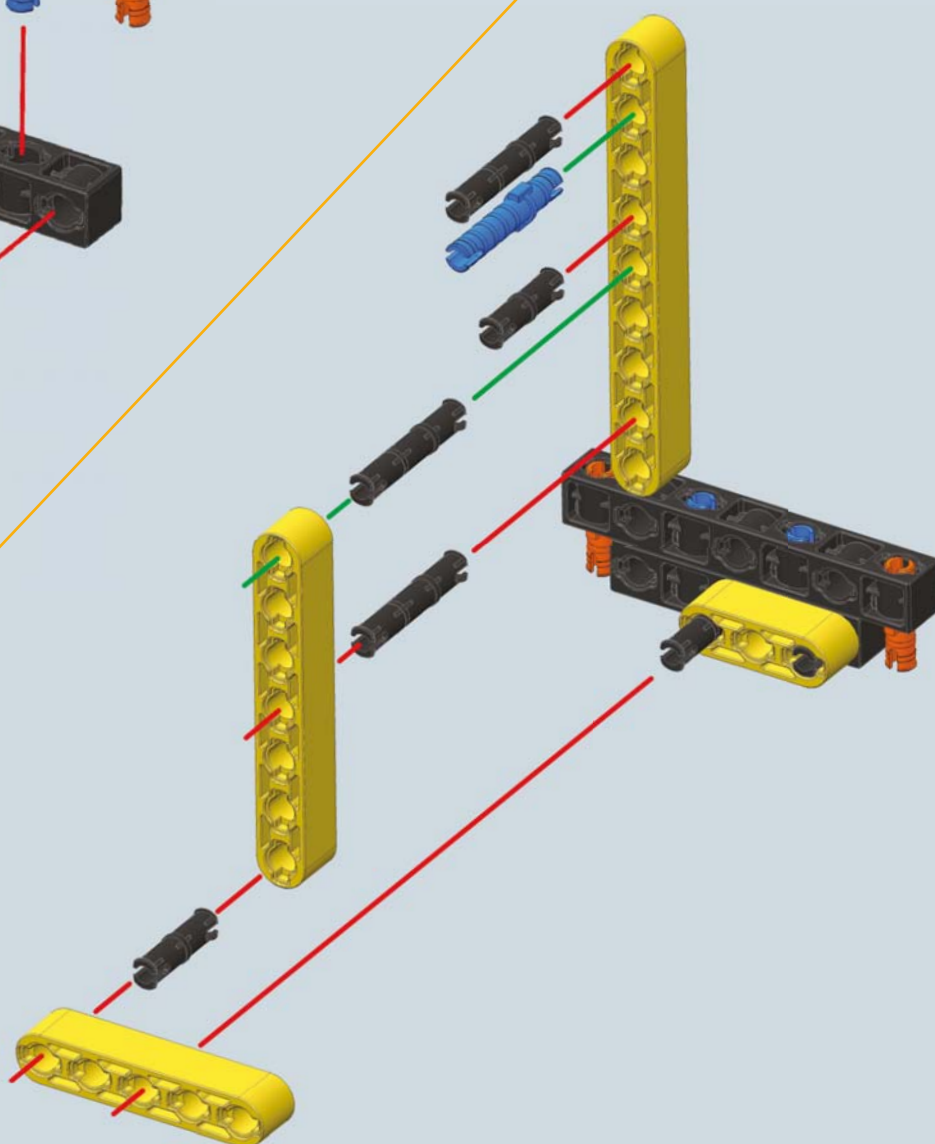
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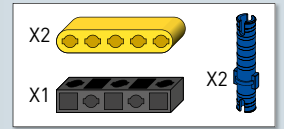
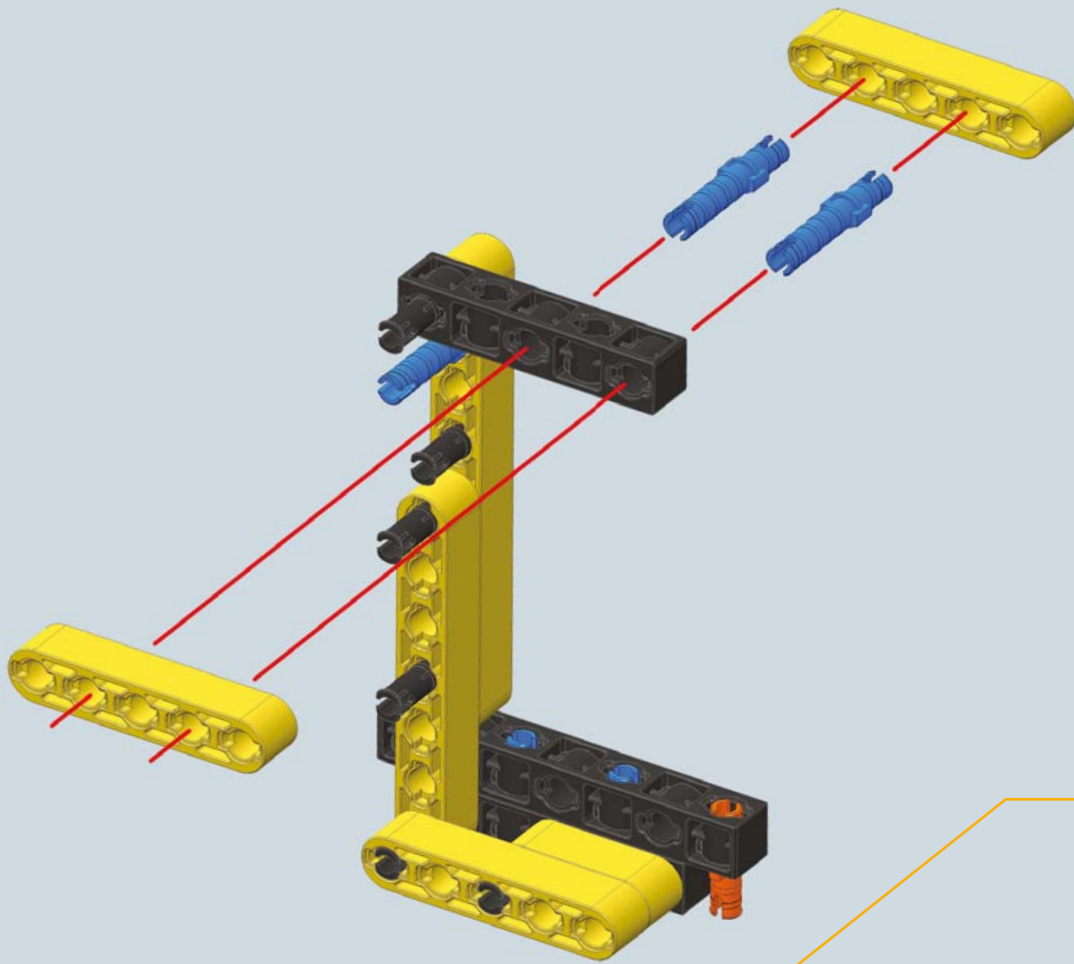
Iniziamo dalla **cabina di pilotaggio**.



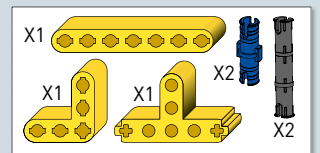
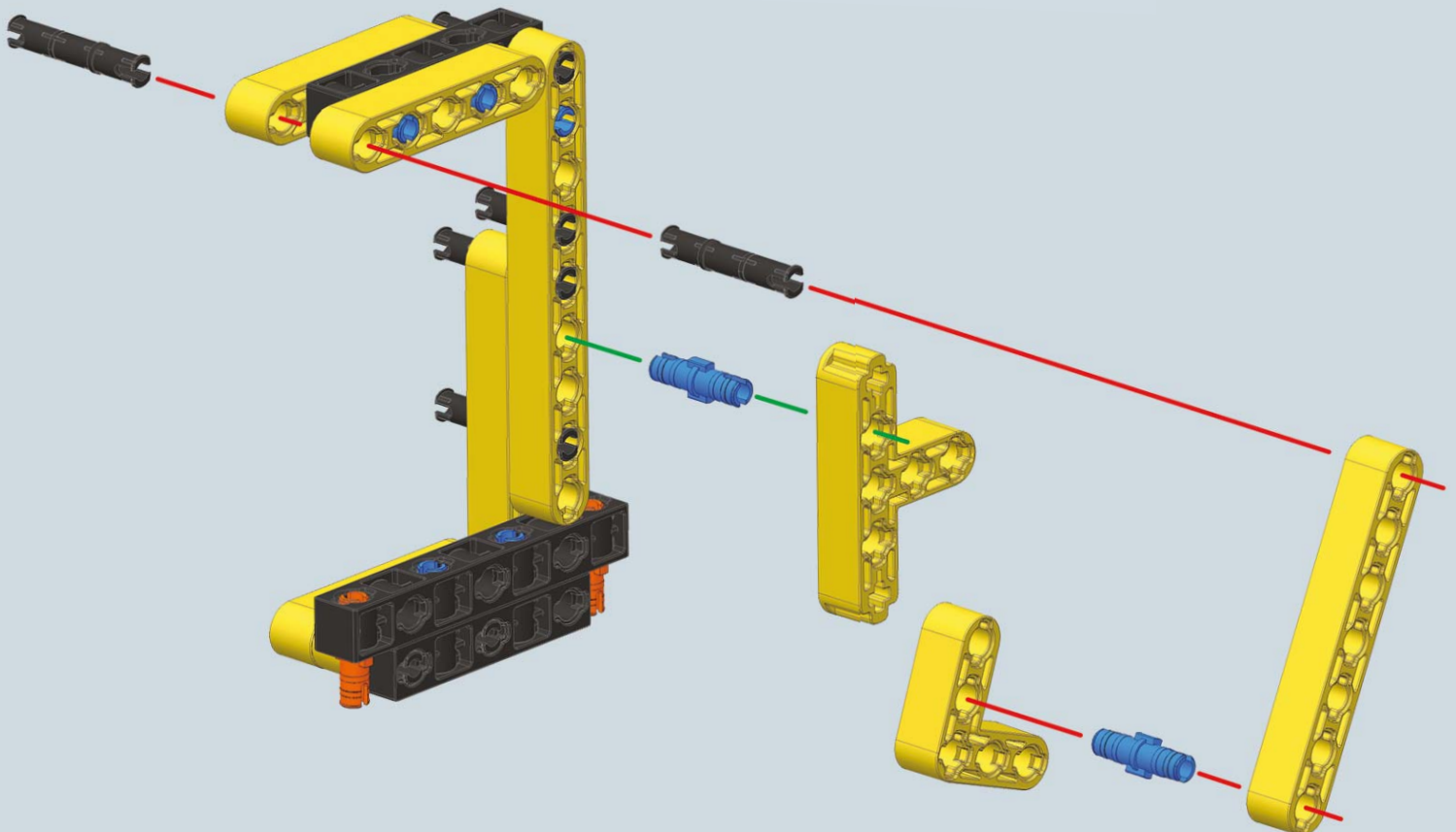
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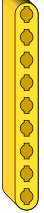


23

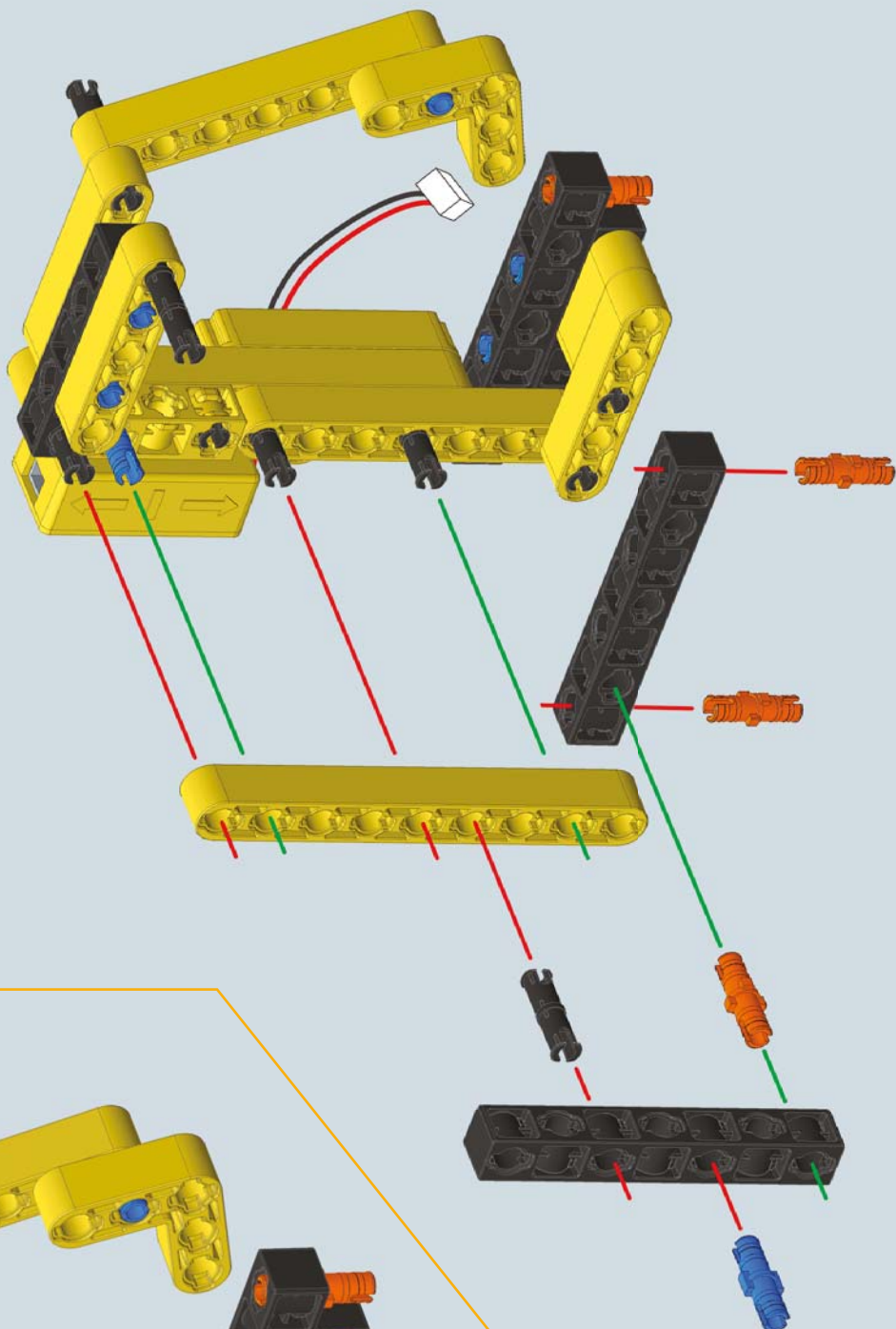


24

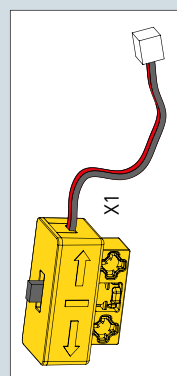
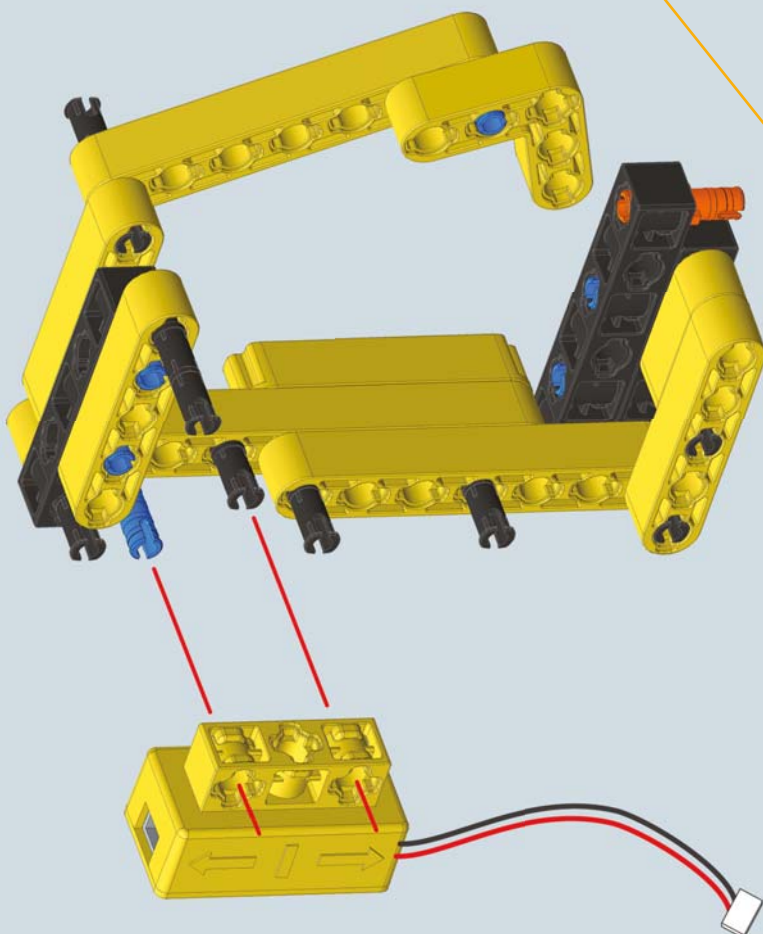


-  X1
-  X1
-  X3
-  X1
-  X2

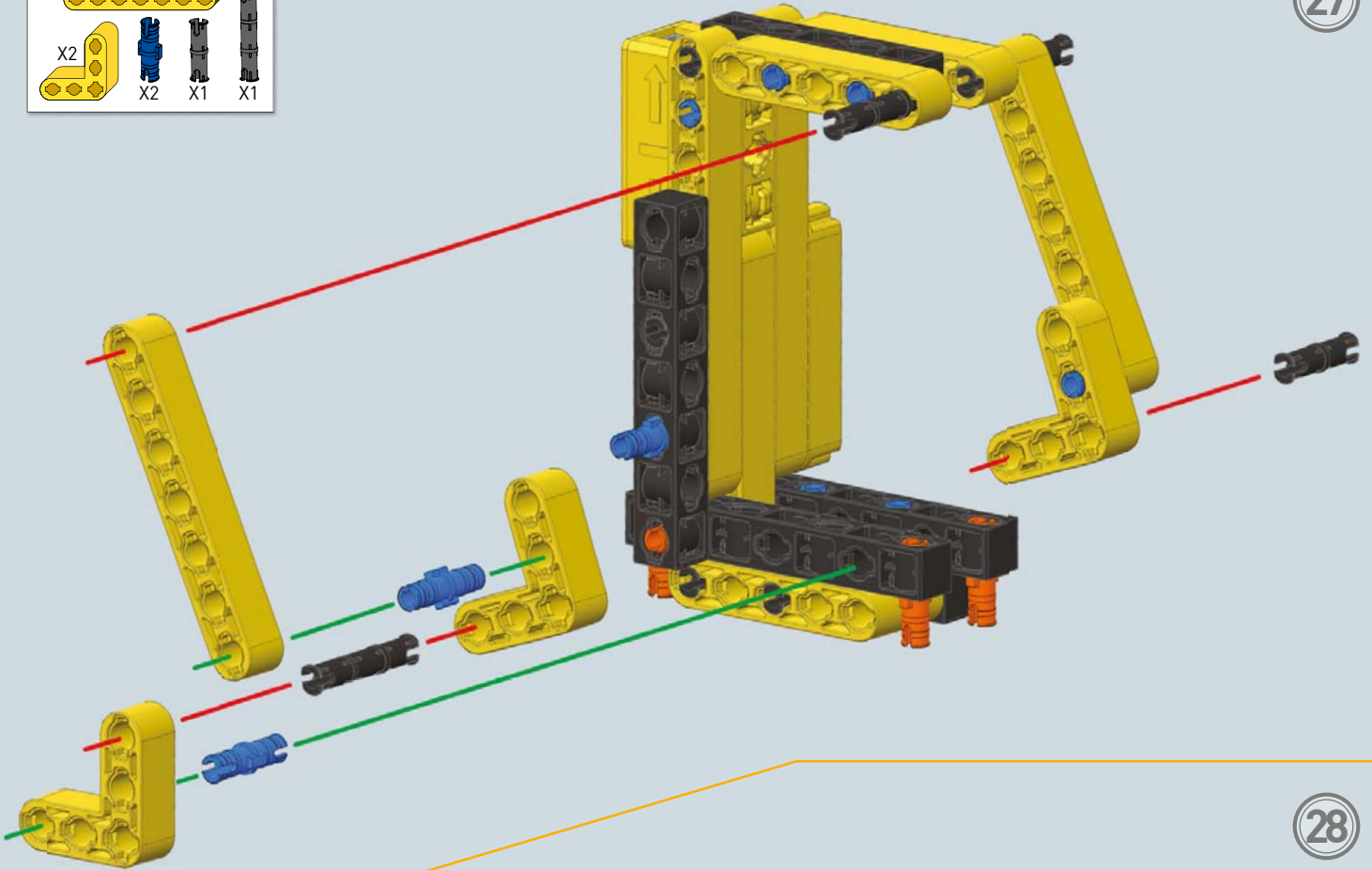
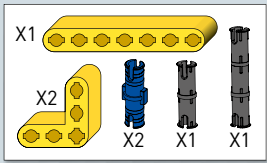
26



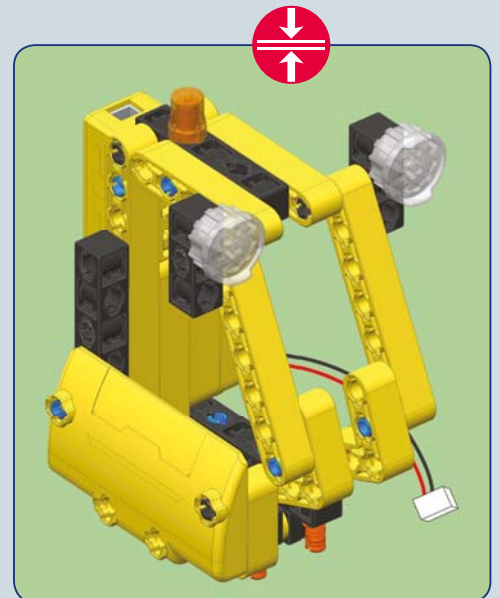
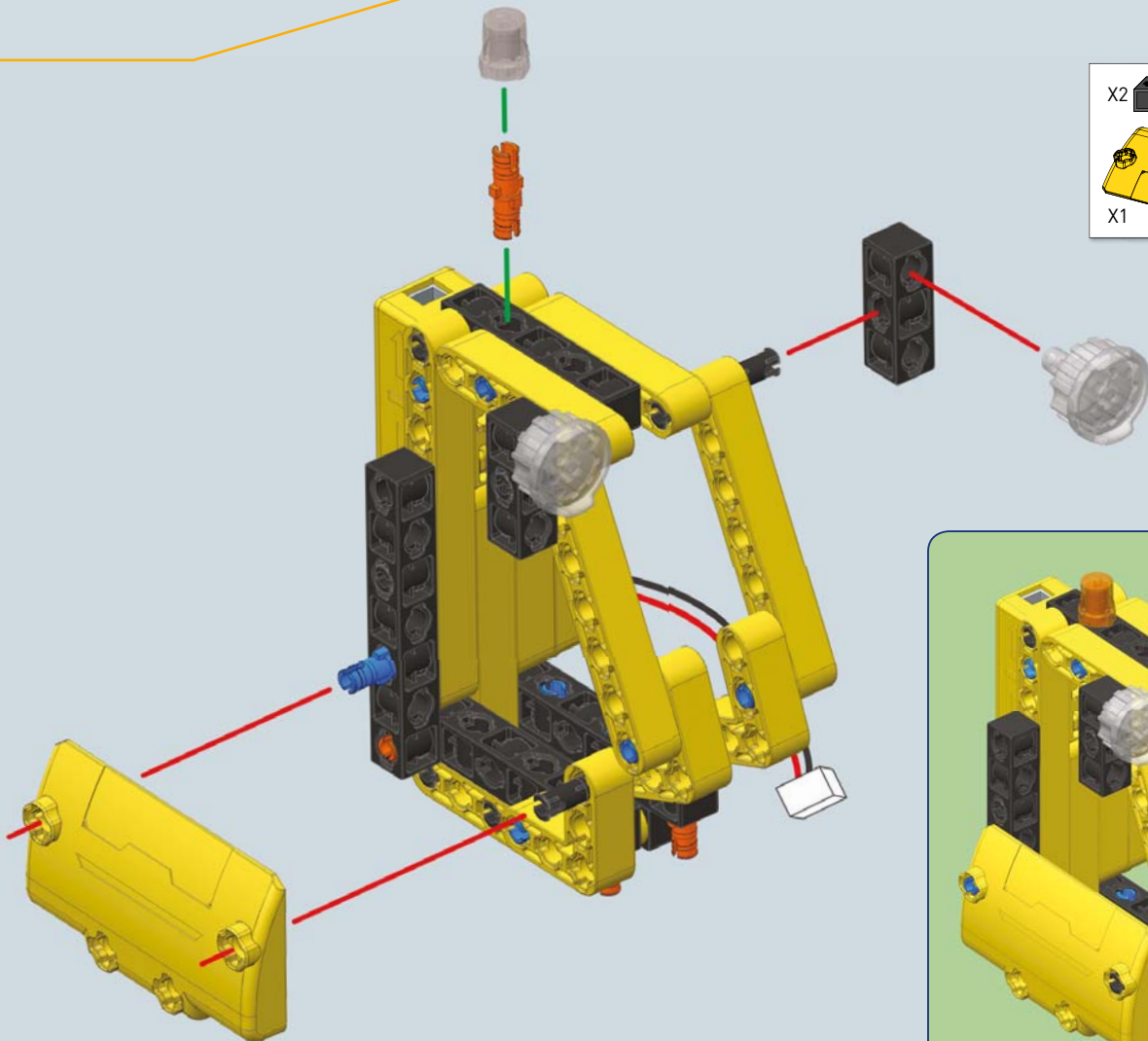
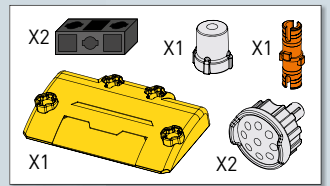
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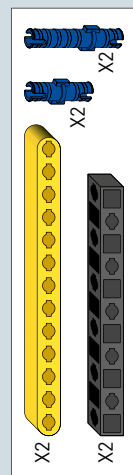
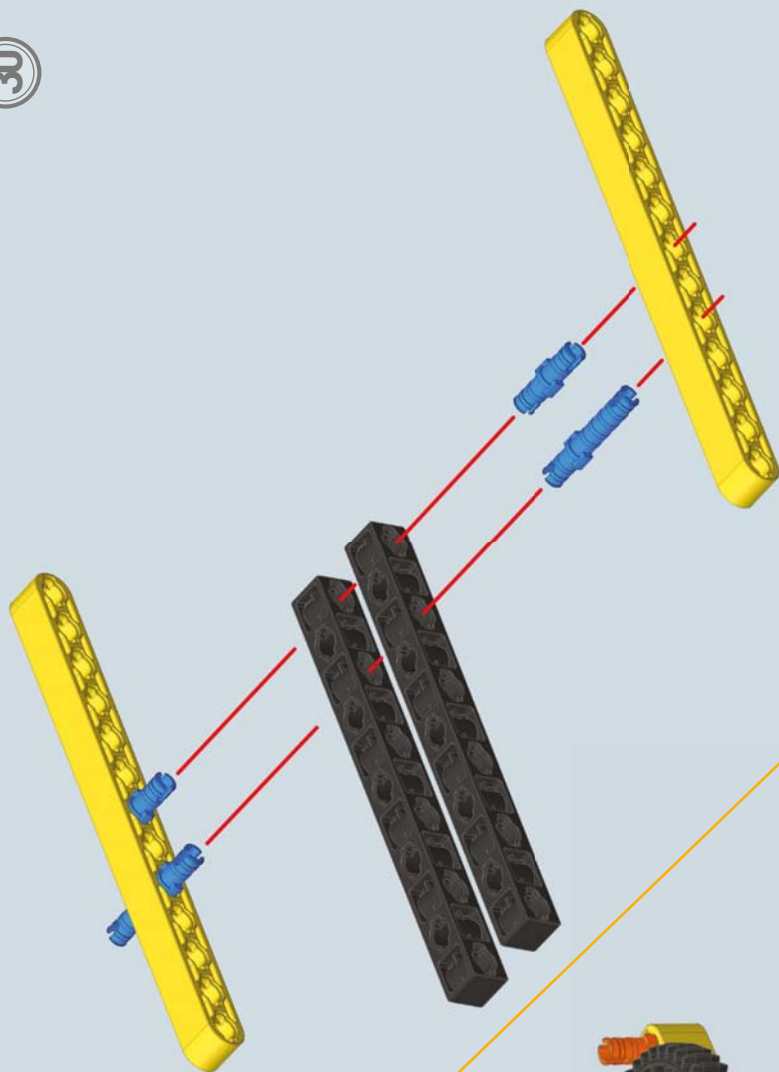
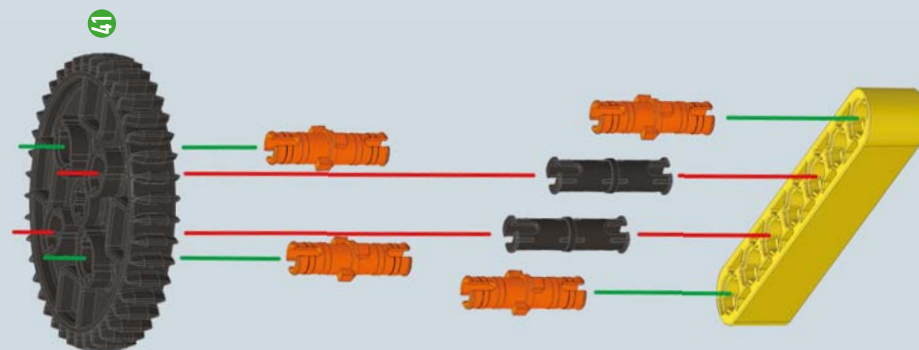
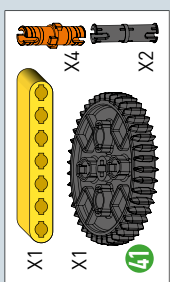


27

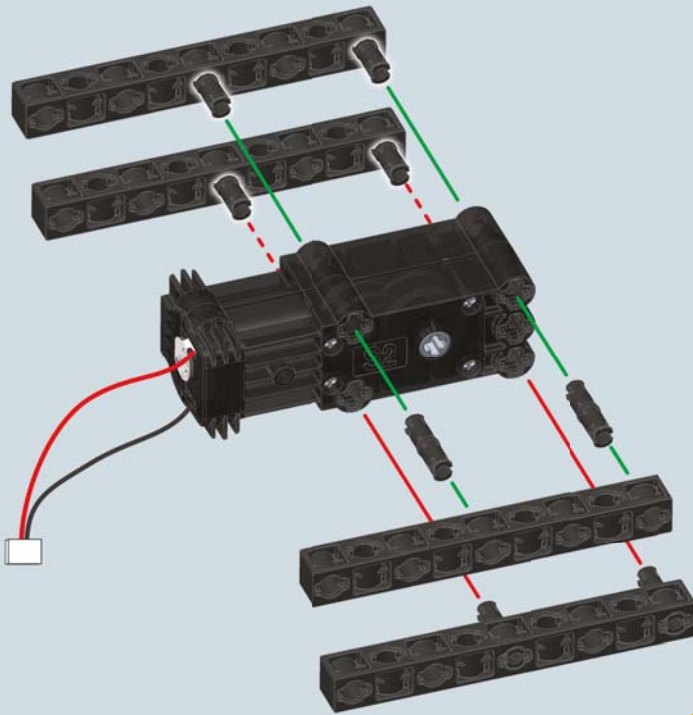
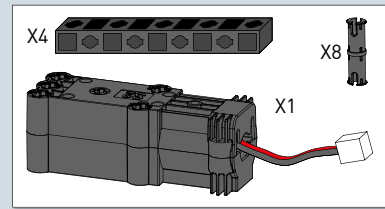


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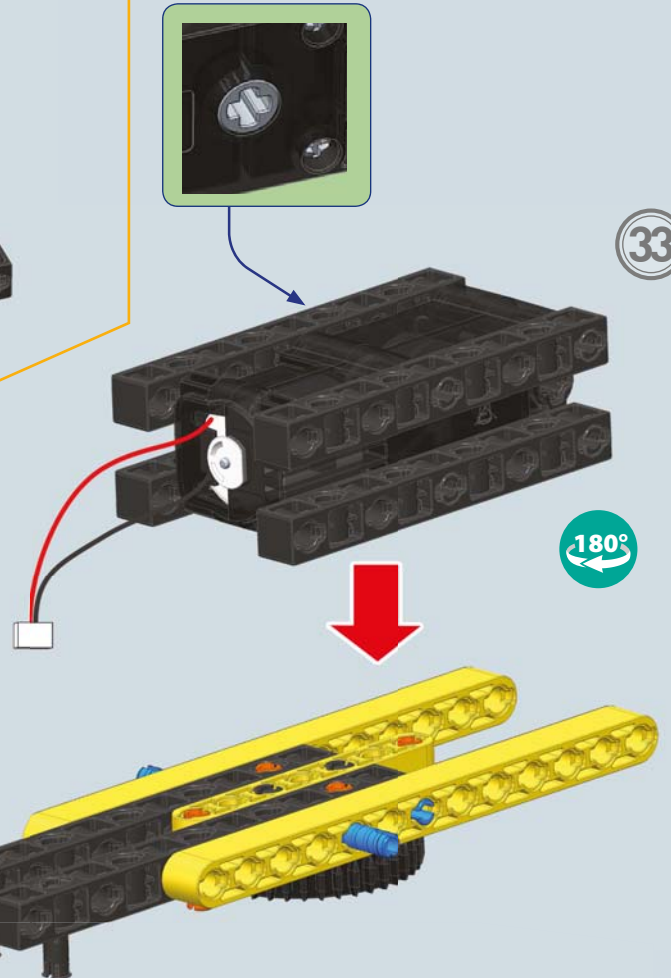


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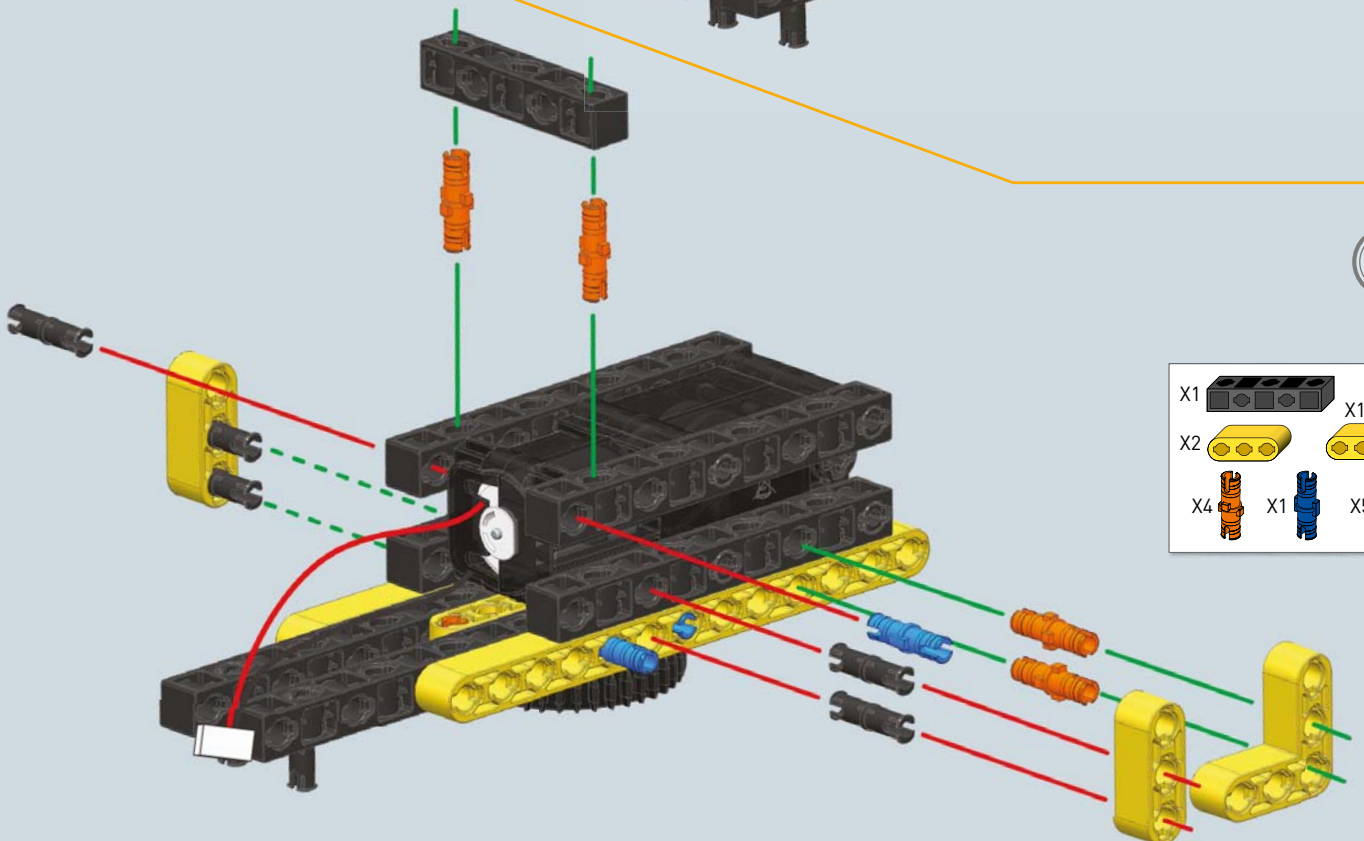
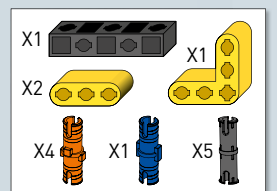


Appoggia il blocco motore alla base del telaio costruito in precedenza. Controlla l'allineamento nello step successivo.

33

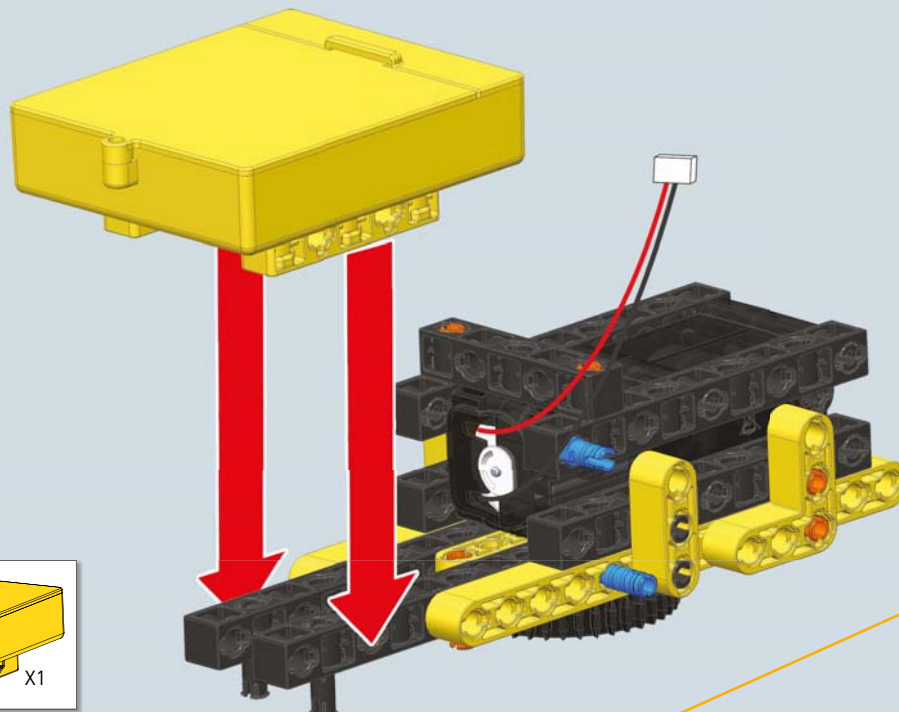
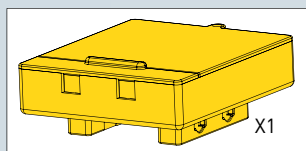


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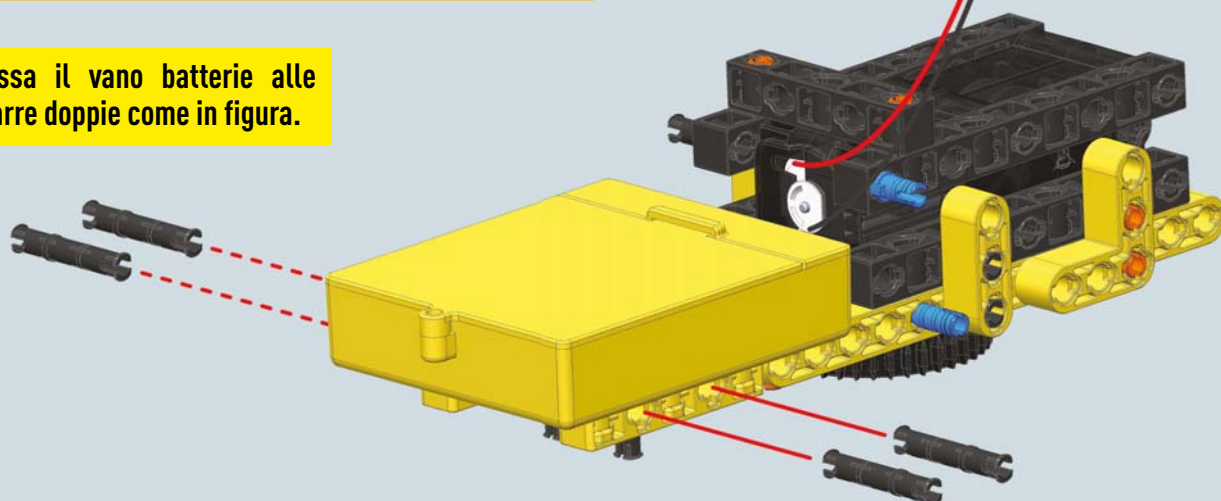
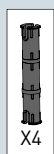
35

Sistema il vano sulle due barre doppie.



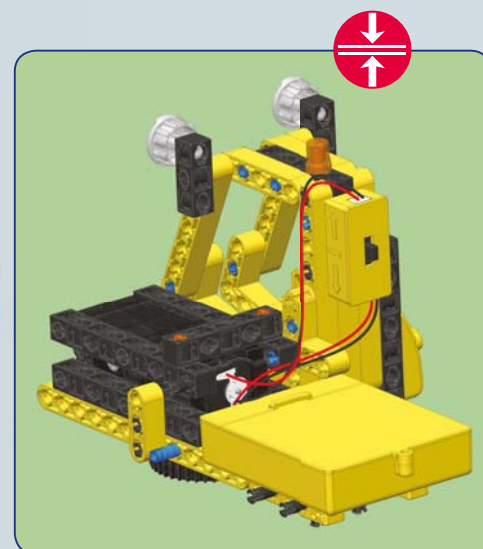
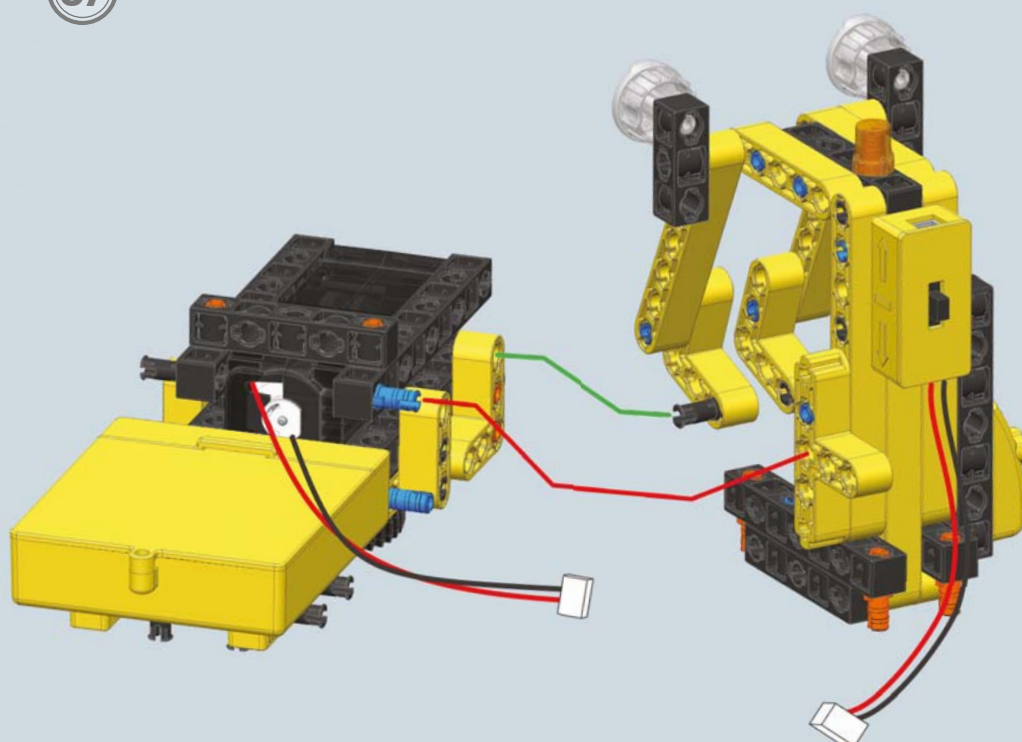
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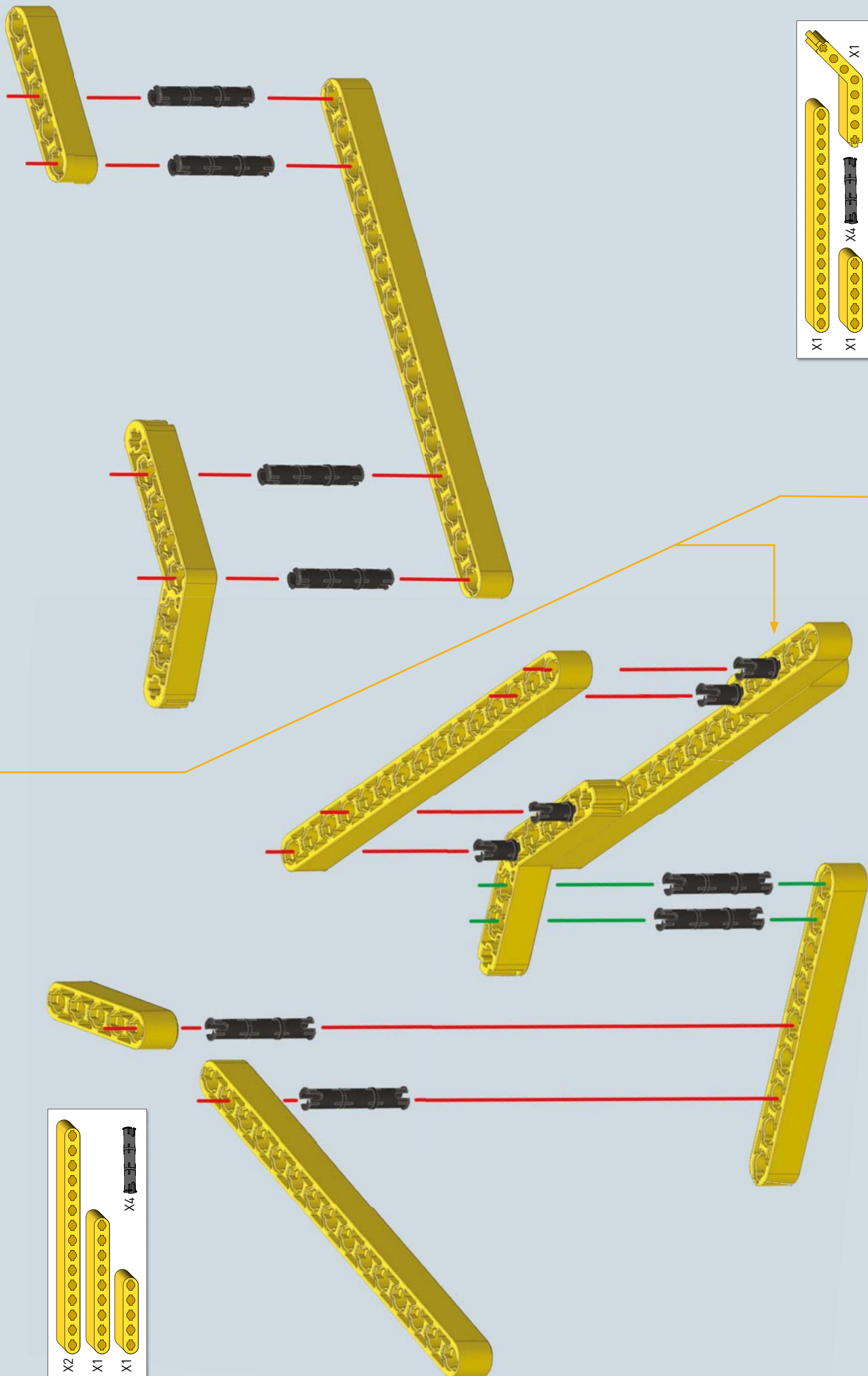
Fissa il vano batterie alle barre doppie come in figura.



37

Fissa la cabina al telaio e poi connetti il cavo dello switch al vano batterie e quello del motore allo switch.

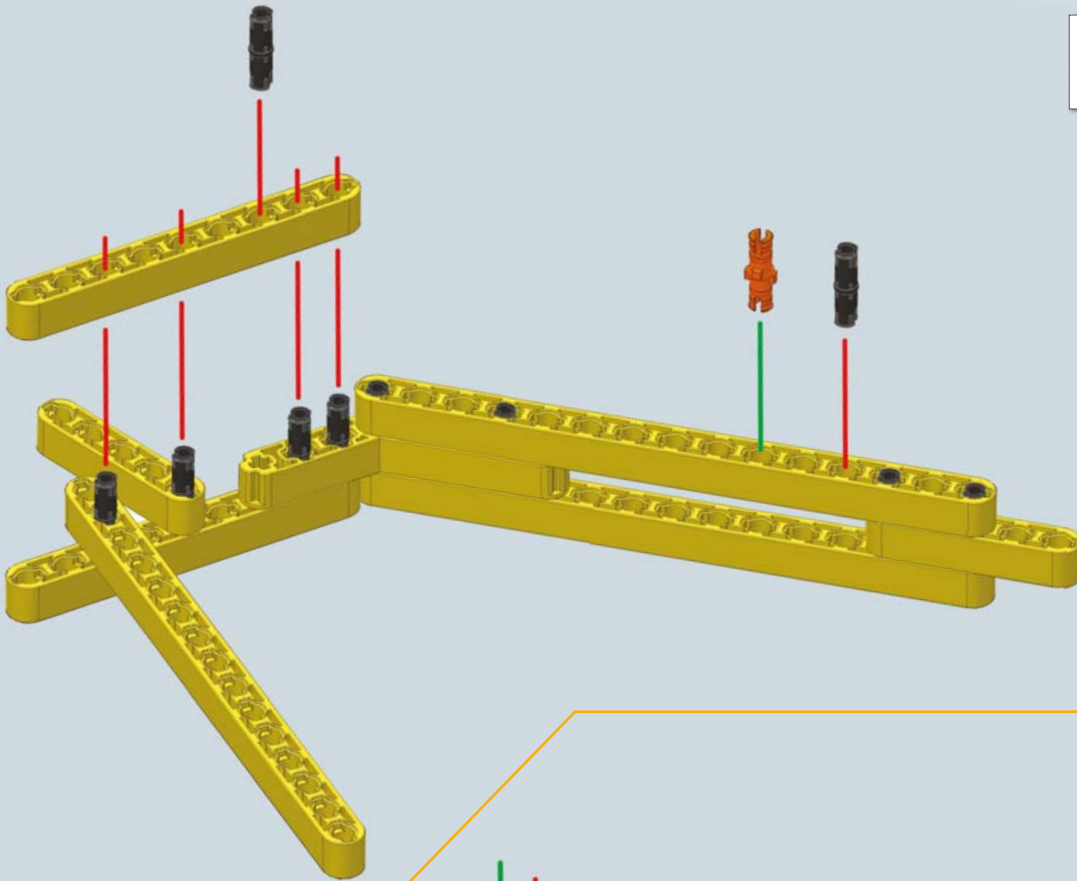




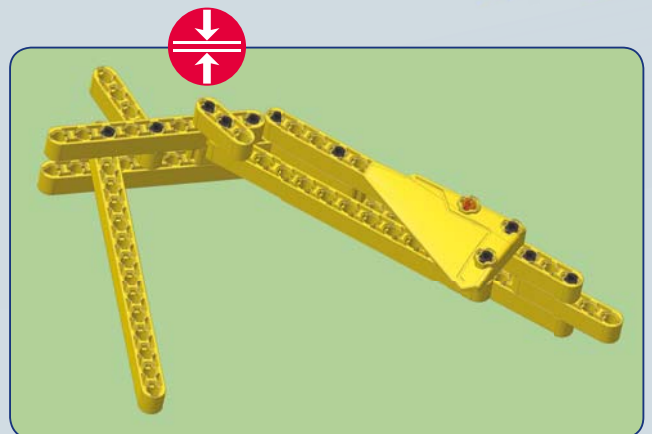
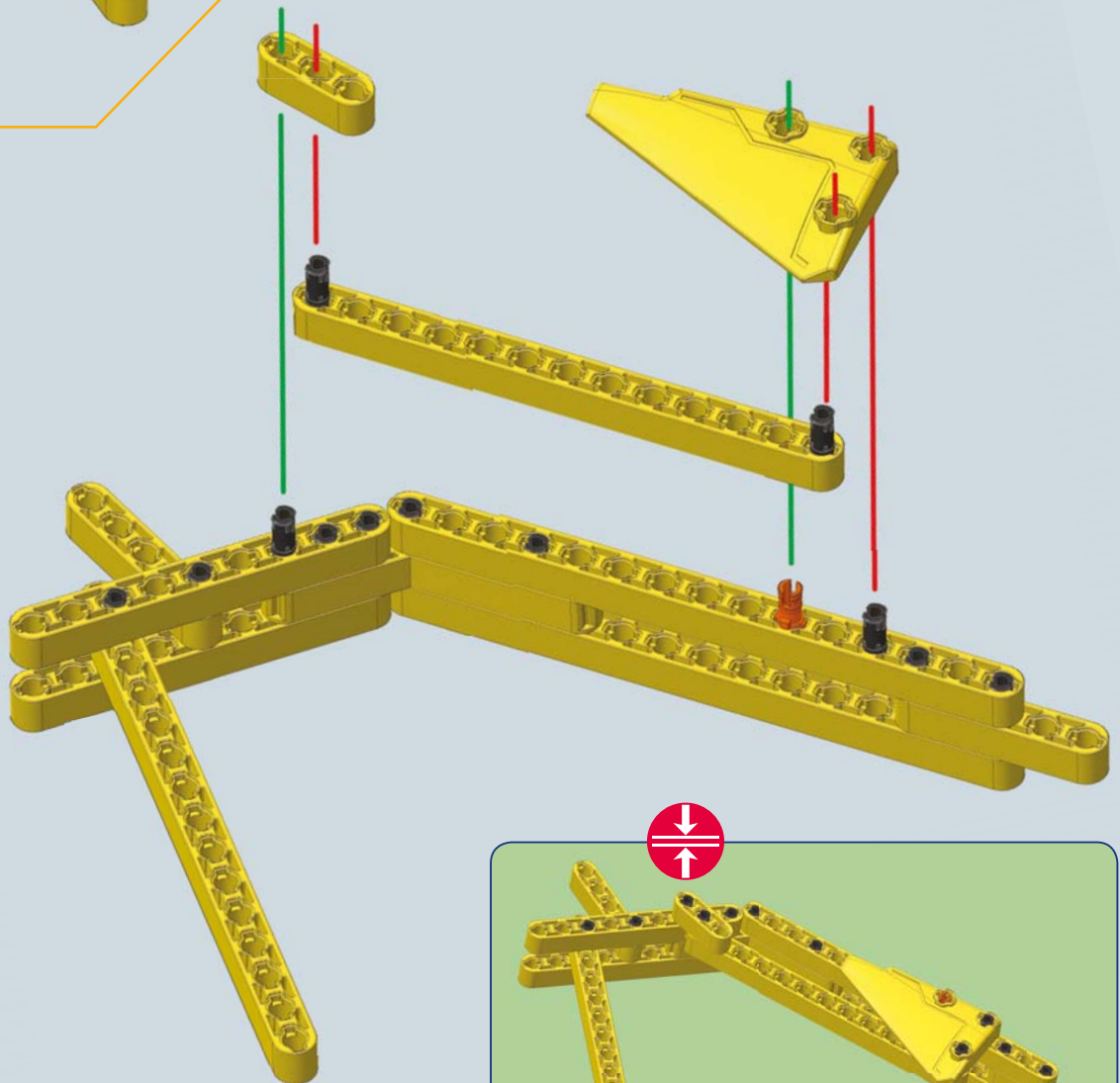
Iniziamo ora a costruire il braccio escavatore.

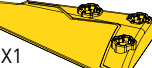
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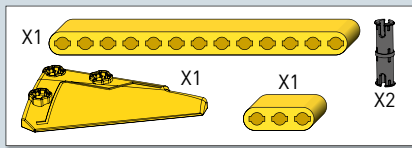
X1	
X2	
X1	



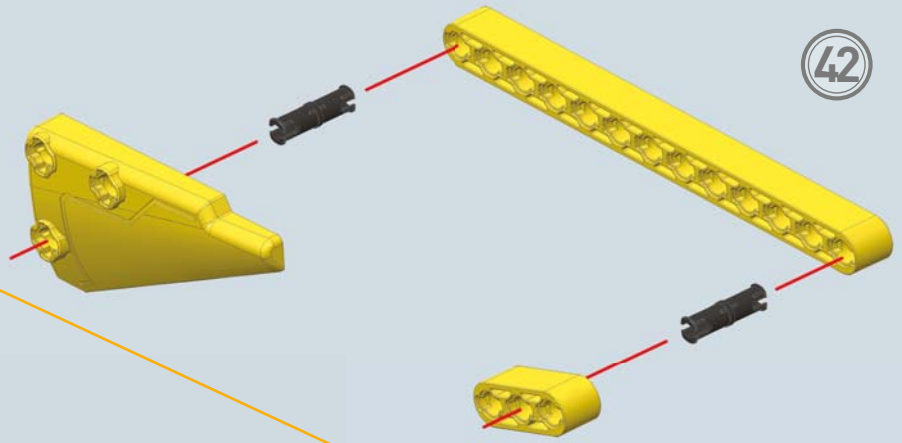
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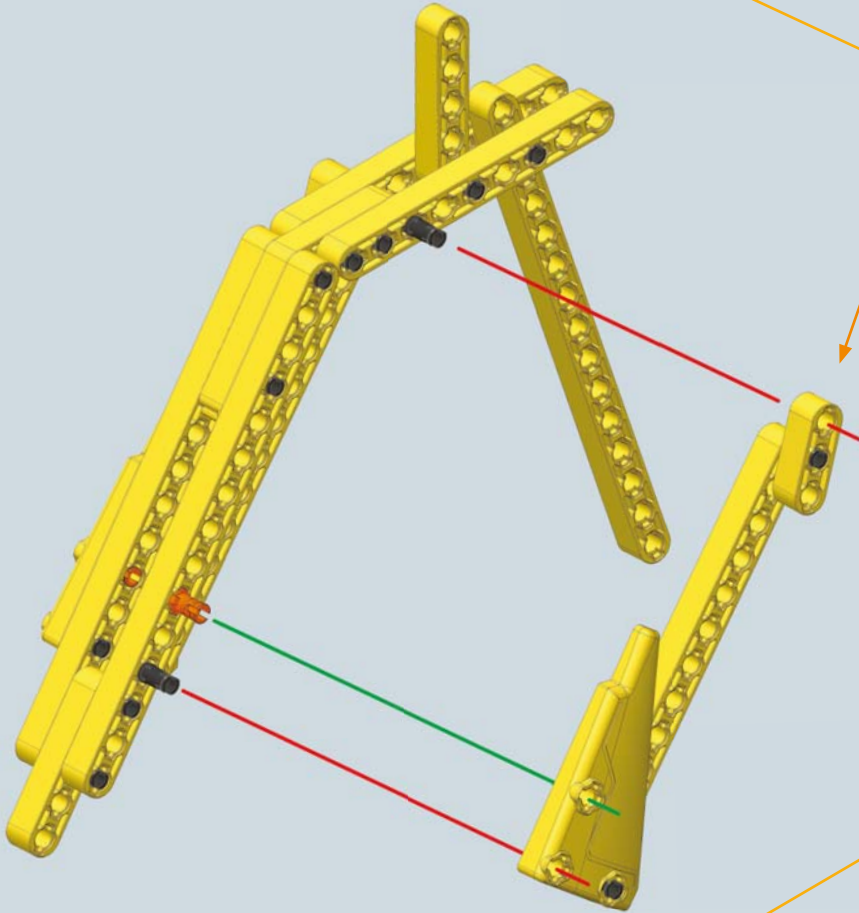
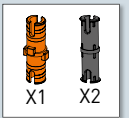
X1	
X1	
X2	



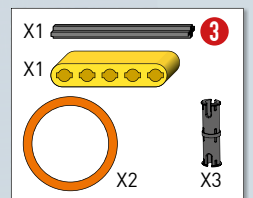
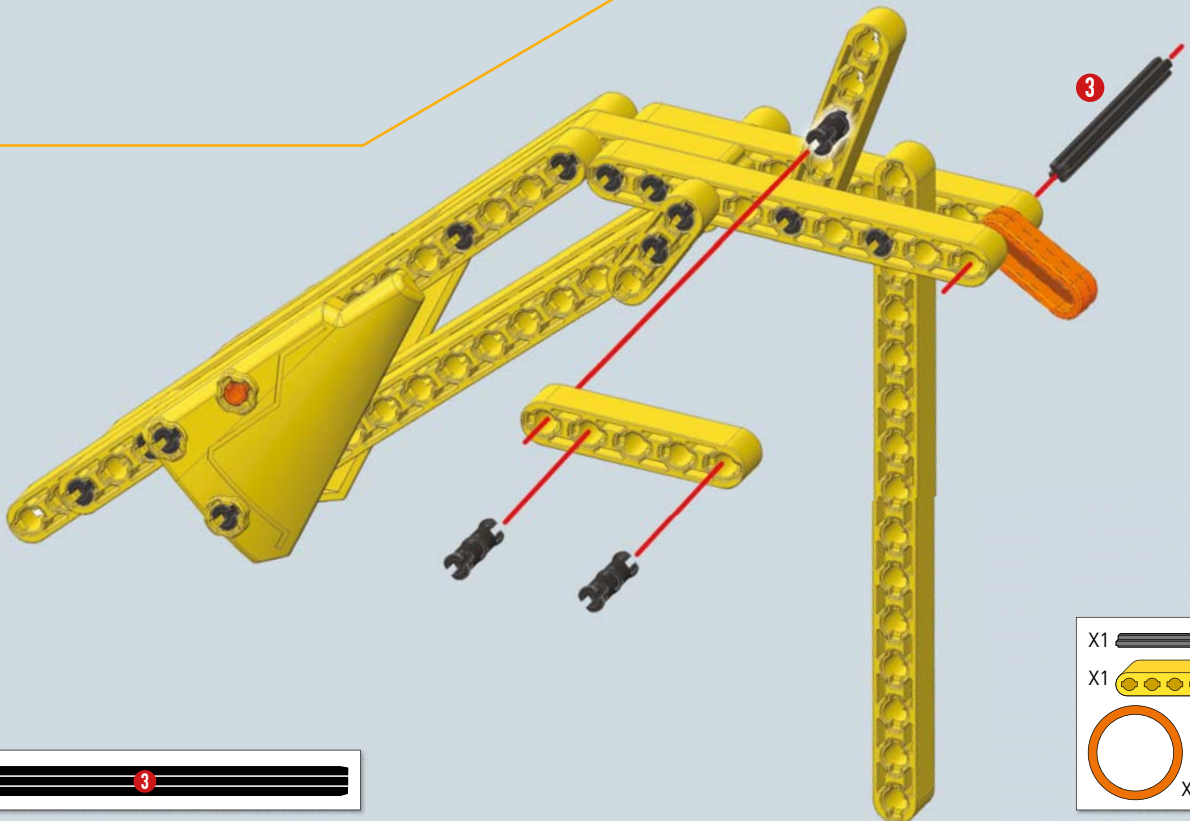
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43

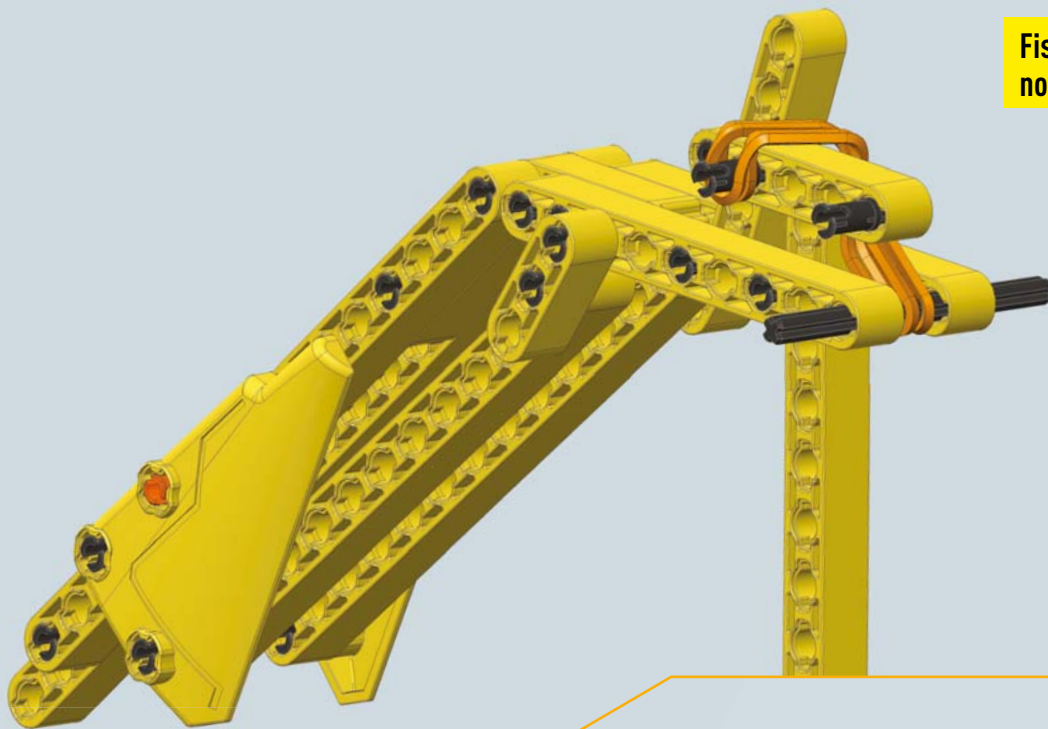


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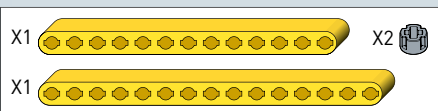
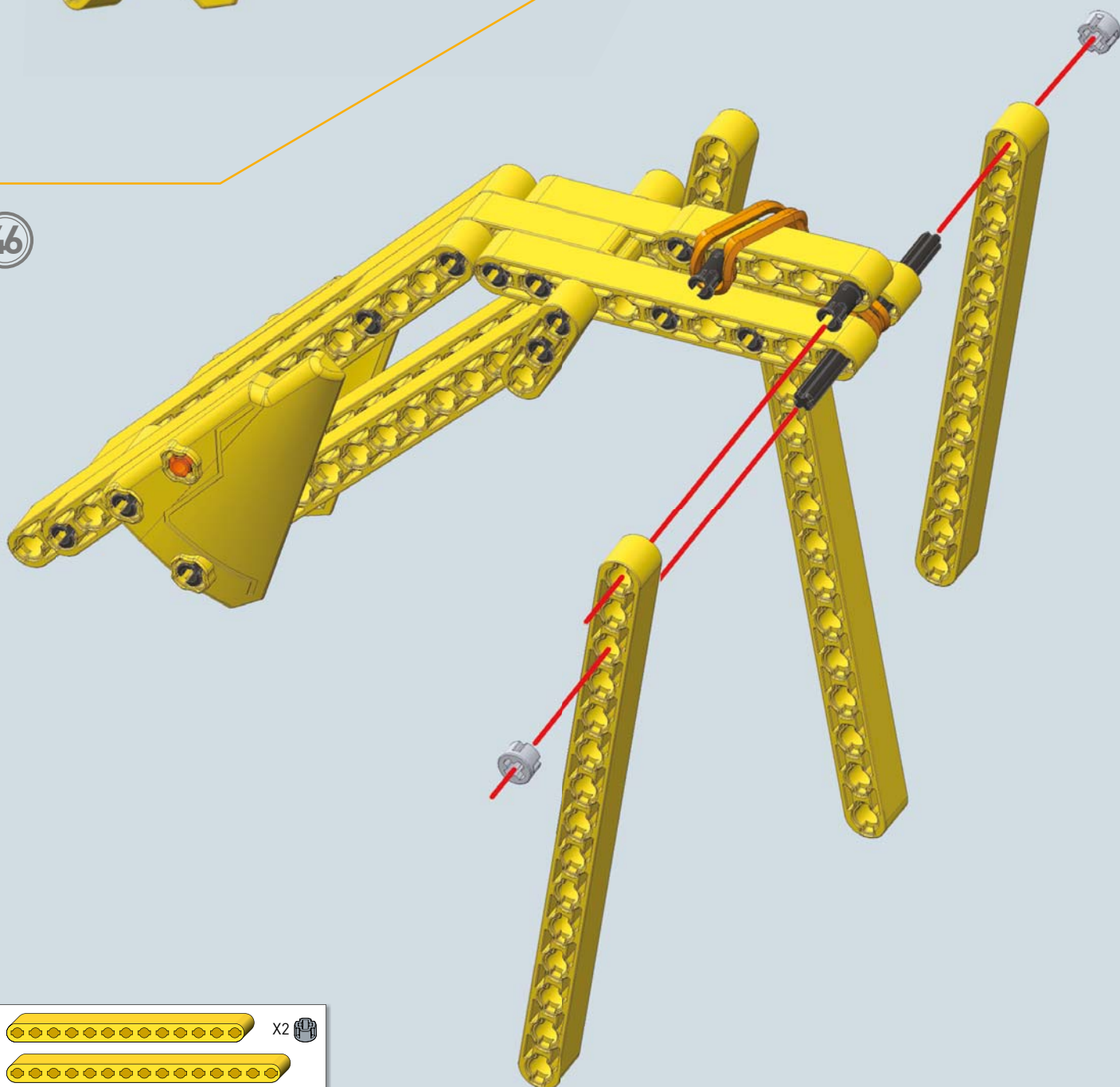


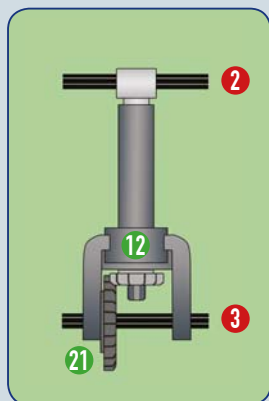
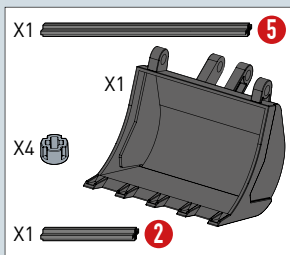
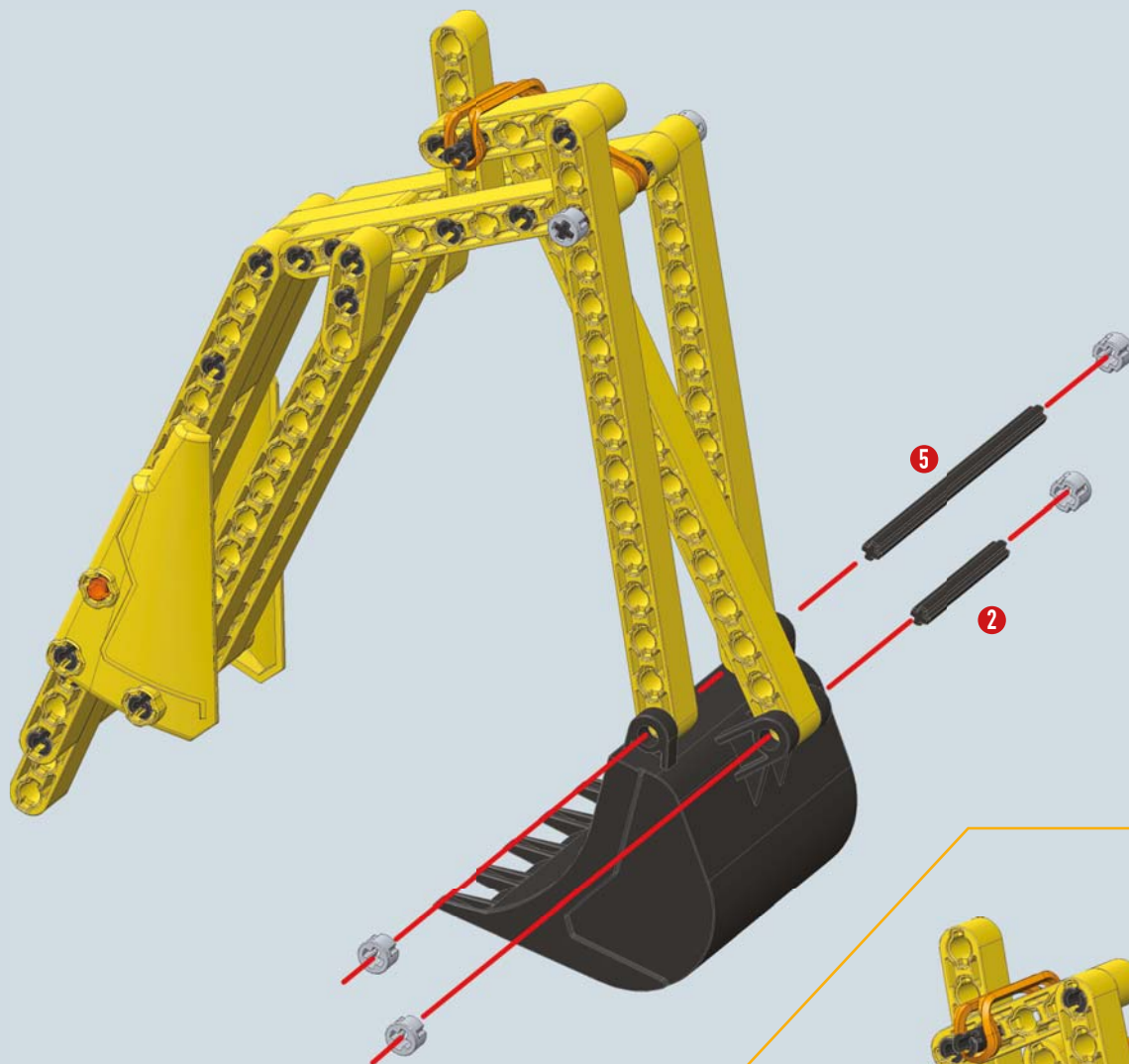
45

Fissa gli elastici al chiodo nero come in figura.

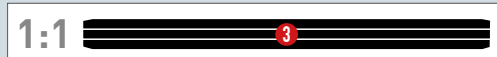
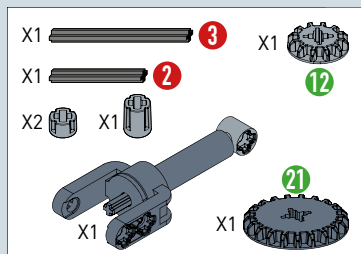
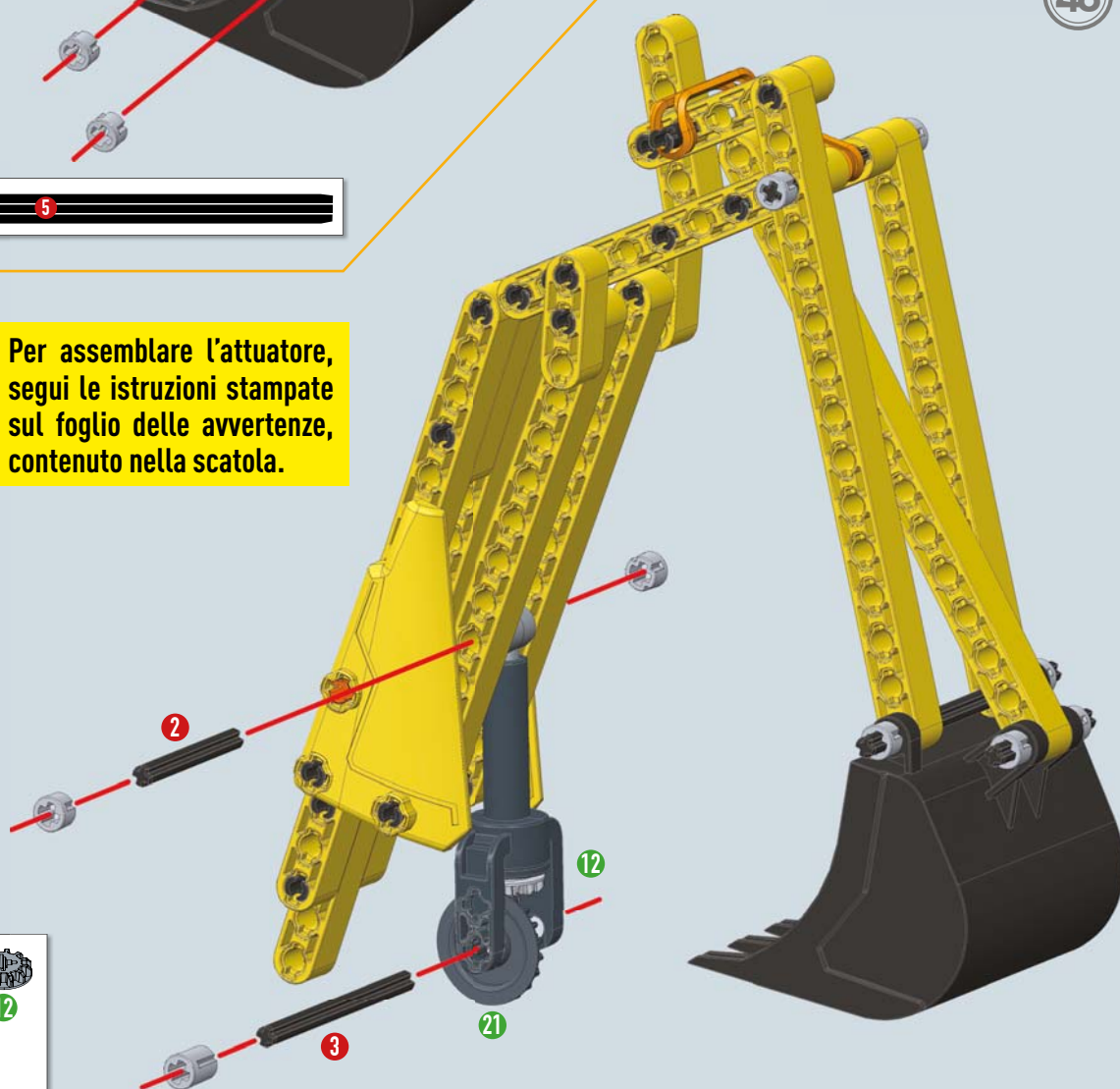


46

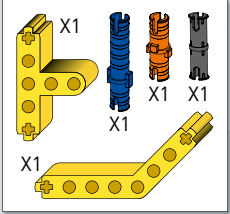
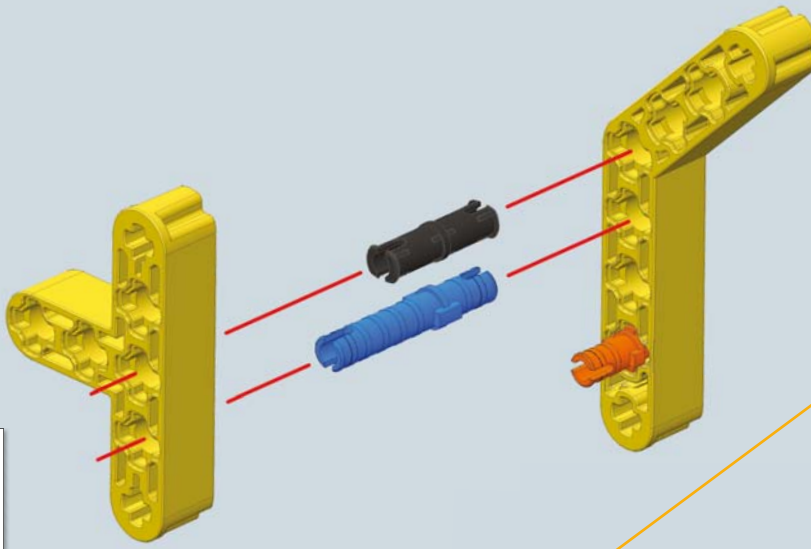




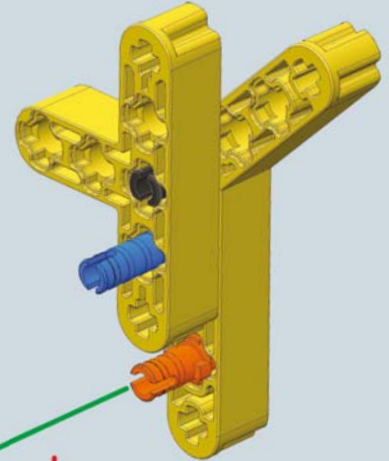
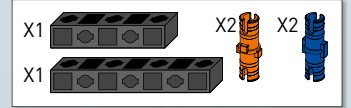
Per assemblare l'attuatore, segui le istruzioni stampate sul foglio delle avvertenze, contenuto nella scatola.



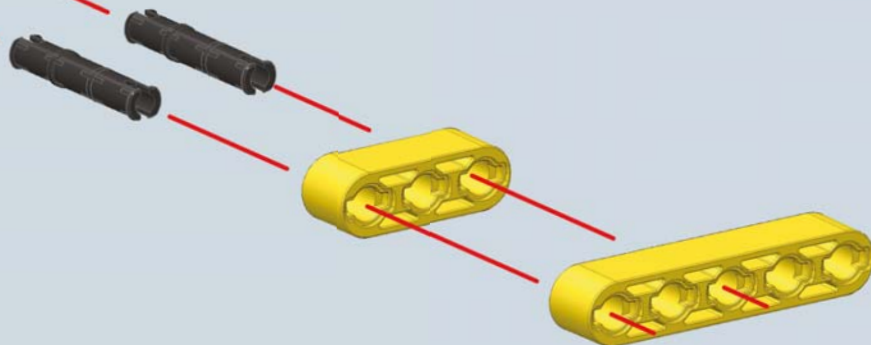
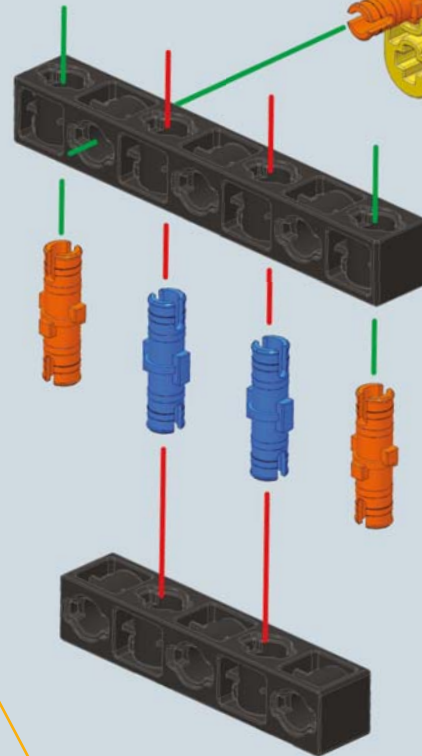
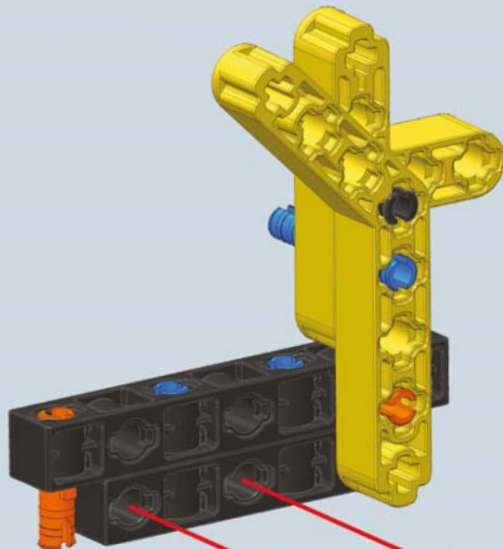
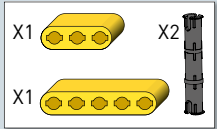
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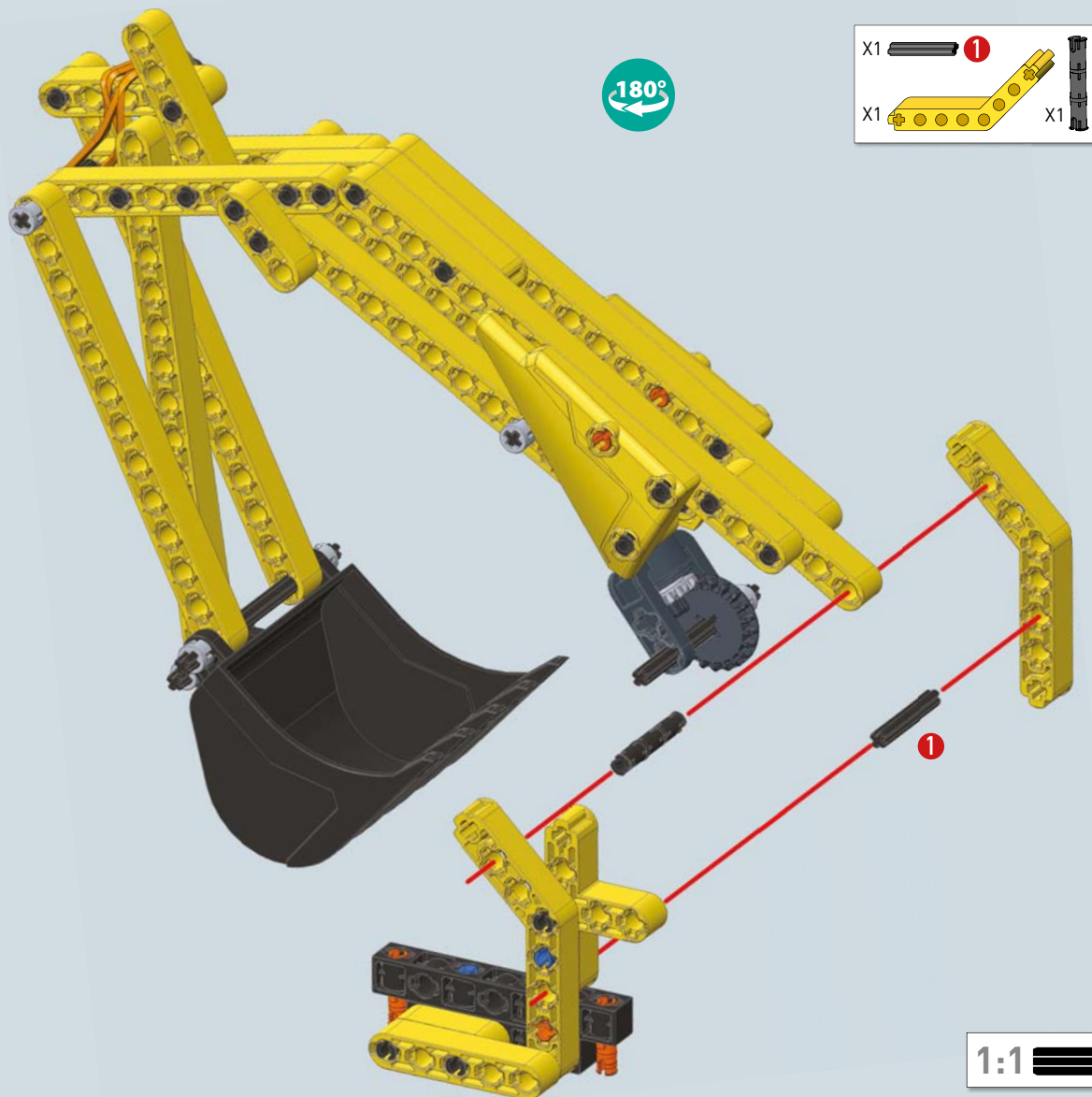


50



51





IL BRACCIO ESCAVATORE

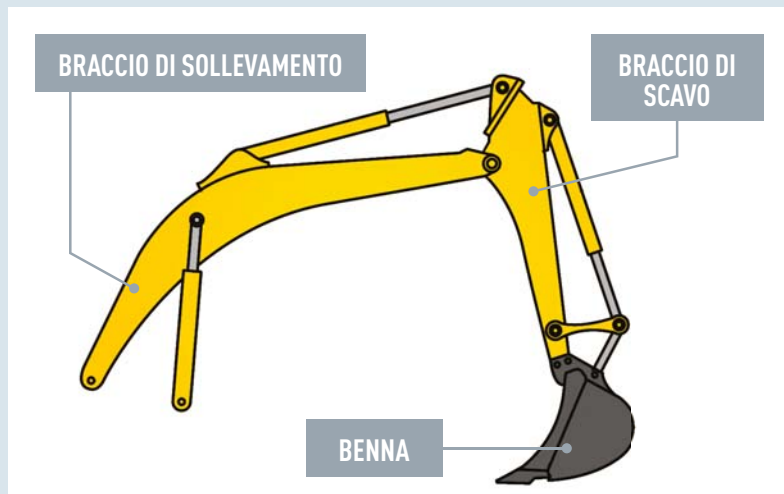


Il braccio escavatore compie le funzioni di scavo, sollevamento e spostamento del materiale terroso grazie alla benna.
 Il carico utile della benna indica la quantità di materiale che la benna è in grado di raccogliere in termini di peso.
 Il volume della benna ne determina invece la capacità.



E' formato da tre parti ben distinte, mosse ognuna da appositi cilindri idraulici:

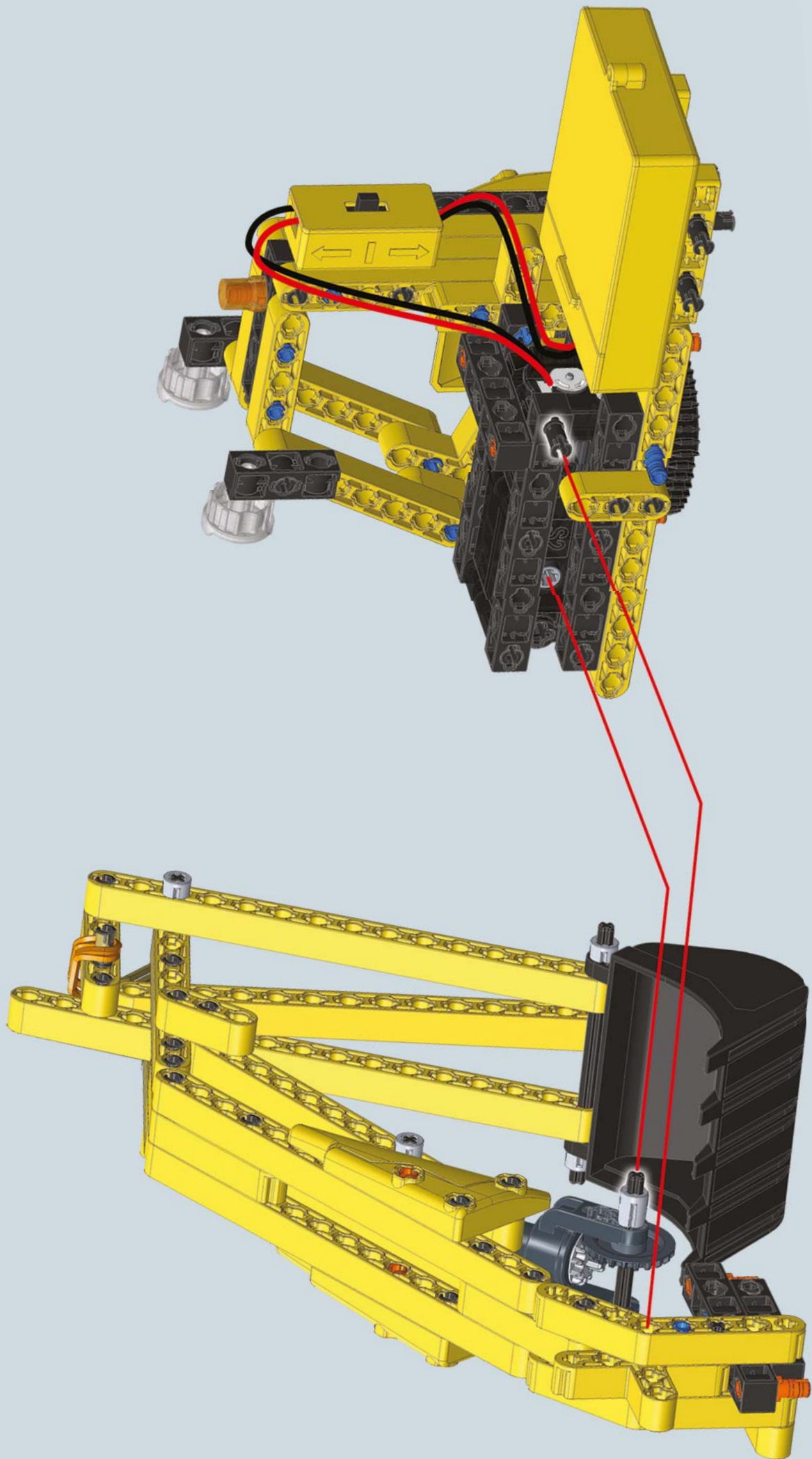
- Il braccio di sollevamento: nel nostro modello è di tipo "monoblocco" perché costituito da un unico elemento. Alcuni modelli montano bracci di sollevamento "articolati" costituiti da due parti mobili separate. E' mosso dal cilindro del braccio di sollevamento.
- Il braccio di scavo: chiamato anche "avambraccio". E' mosso dal cilindro del braccio di scavo.
- La benna: la pala terminale che scava e raccoglie il materiale terroso. E' mossa dal cilindro della benna.

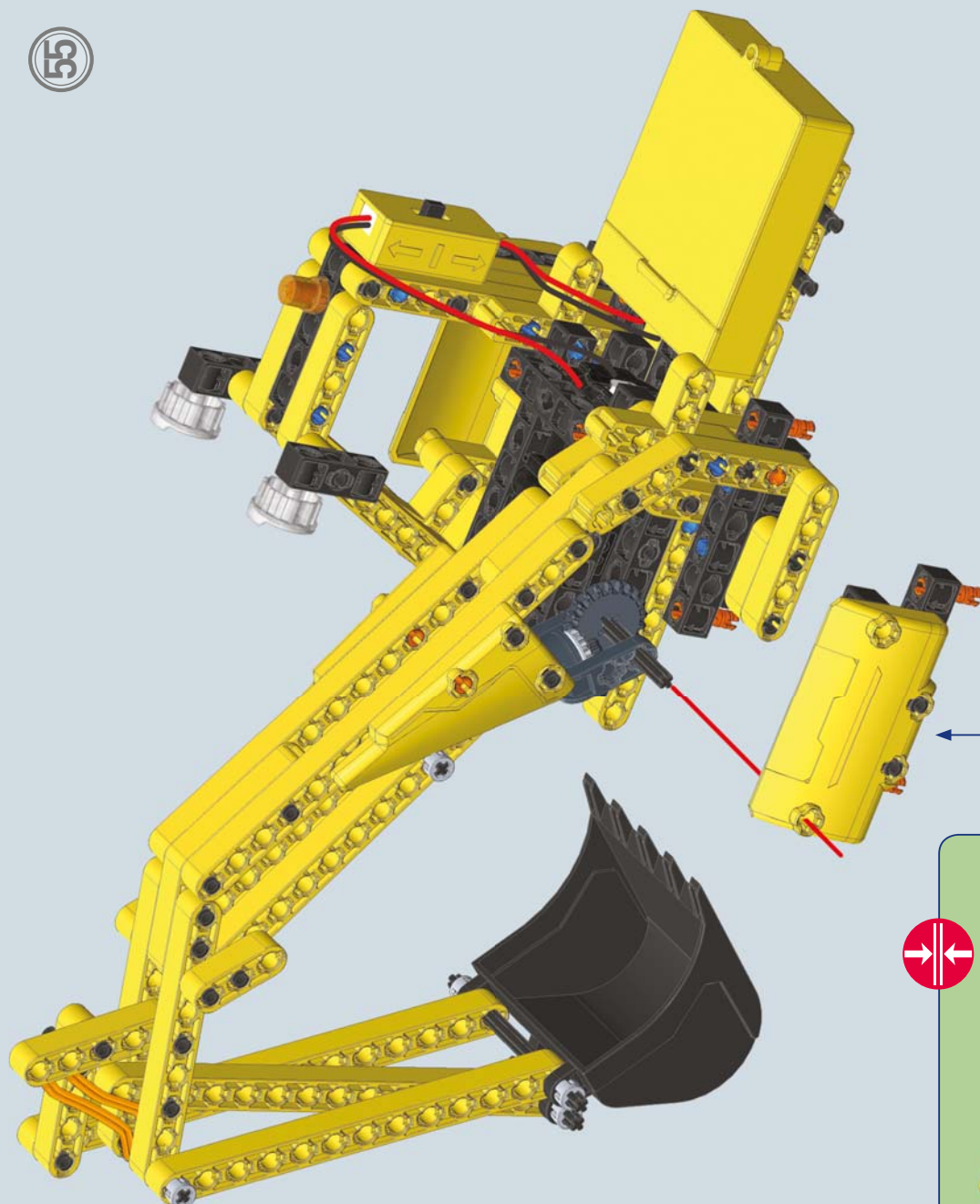


tre parti del braccio escavatore vanno a costituire altrettante leve:

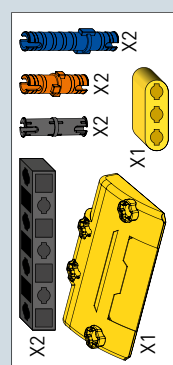
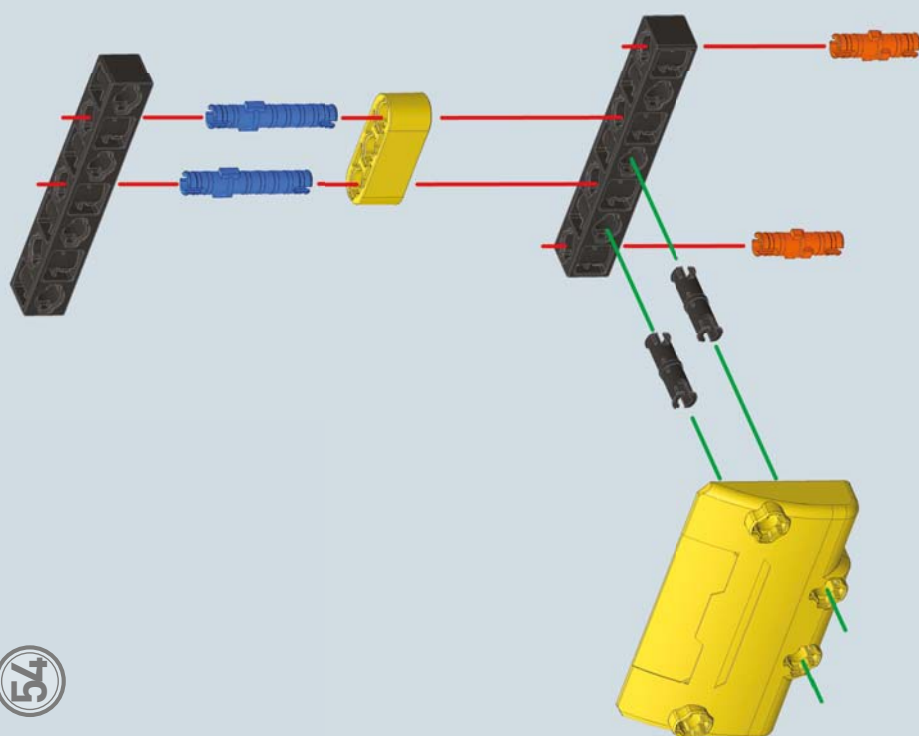
Il diagramma mostra il braccio escavatore con etichette: FULCRO (punto di pivotta tra il braccio di sollevamento e il braccio di scavo), POTENZA (cilindro idraulico sul braccio di sollevamento) e RESISTENZA (braccio di scavo e benna).	LEVA DI 3° GENERE: la potenza sta tra la resistenza e il fulcro. Il diagramma schematico mostra una leva con un fulcro (triangolo verde) a sinistra, una resistenza (pila di roccia) a destra e una potenza (freccia blu) in mezzo. Una mano indica la posizione della potenza. Il fulcro sta nella cerniera che unisce il braccio monoblocco alla torretta. Il cilindro esercita la forza, mentre l'avambraccio, la pala e l'eventuale materiale terroso costituiscono la resistenza.
Il diagramma mostra il braccio escavatore con etichette: POTENZA (cilindro idraulico sul braccio di scavo), FULCRO (punto di pivotta tra il braccio di scavo e la benna) e RESISTENZA (benna).	LEVA DI 1° GENERE: il fulcro sta tra la potenza e la resistenza. Il diagramma schematico mostra una leva con un fulcro (triangolo verde) in mezzo, una potenza (freccia blu) a sinistra e una resistenza (pila di roccia) a destra. Una mano indica la posizione della resistenza. Il fulcro sta nella cerniera che unisce l'avambraccio al braccio monoblocco. Il cilindro esercita la forza, mentre la pala e l'eventuale materiale terroso costituiscono la resistenza.
Il diagramma mostra il braccio escavatore con etichette: POTENZA (cilindro idraulico sulla benna), FULCRO (punto di pivotta tra la benna e l'avambraccio) e RESISTENZA (benna).	LEVA DI 1° GENERE: il fulcro sta tra la potenza e la resistenza. Il diagramma schematico mostra una leva con un fulcro (triangolo verde) in mezzo, una potenza (freccia blu) a sinistra e una resistenza (pila di roccia) a destra. Una mano indica la posizione della resistenza. Il fulcro sta nella cerniera che unisce la benna all'avambraccio. Il cilindro esercita la forza, mentre il materiale terroso costituisce la resistenza.

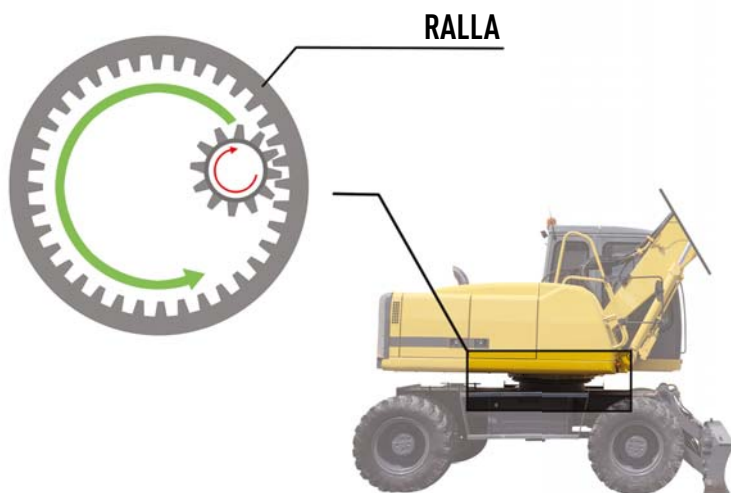
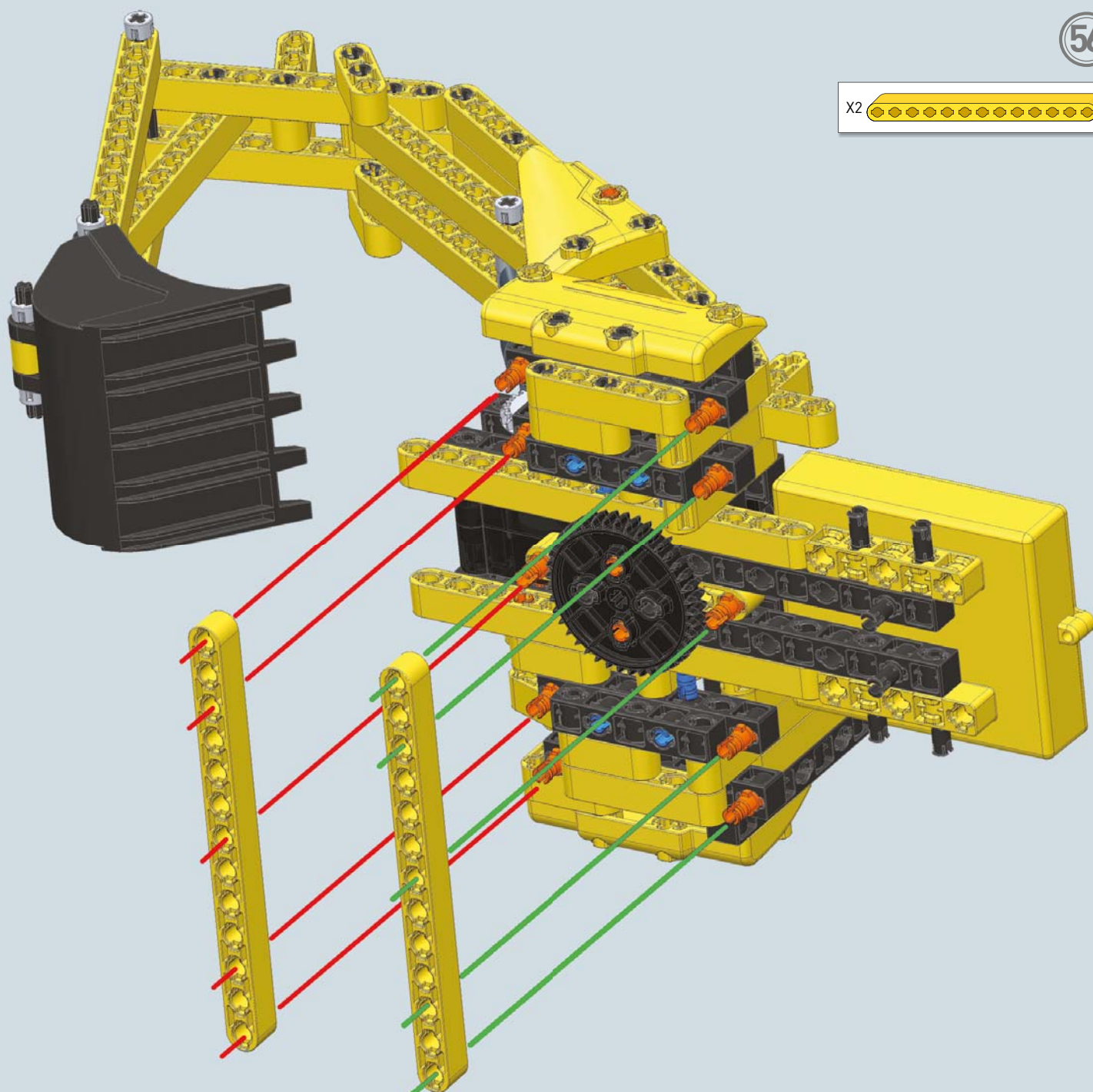
Uniamo le due metà della torretta.





Fai scorrere il blocco appena costruito lungo l'astina.
Fisserai il blocco al telaio nello step successivo.



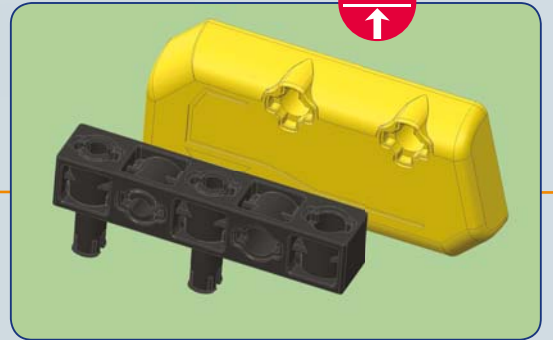
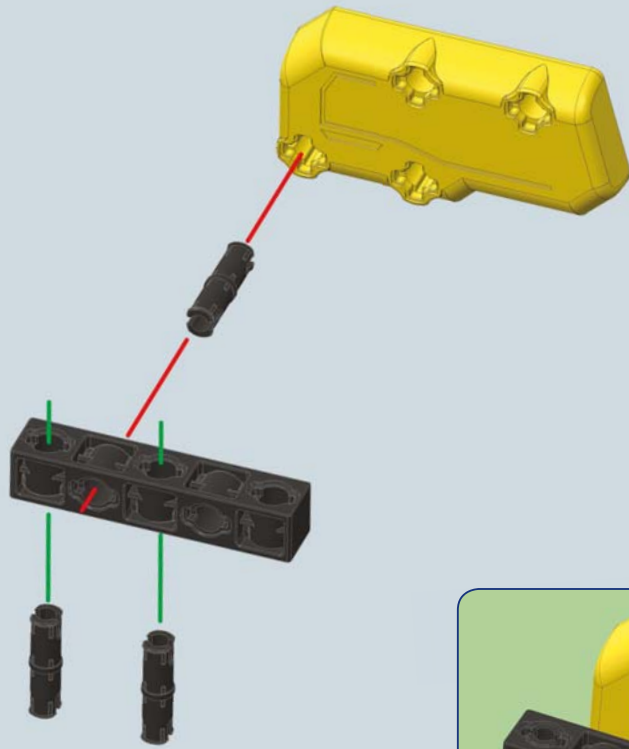
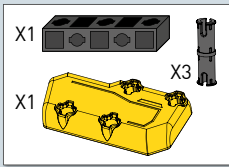


Notizie tecniche e curiosità

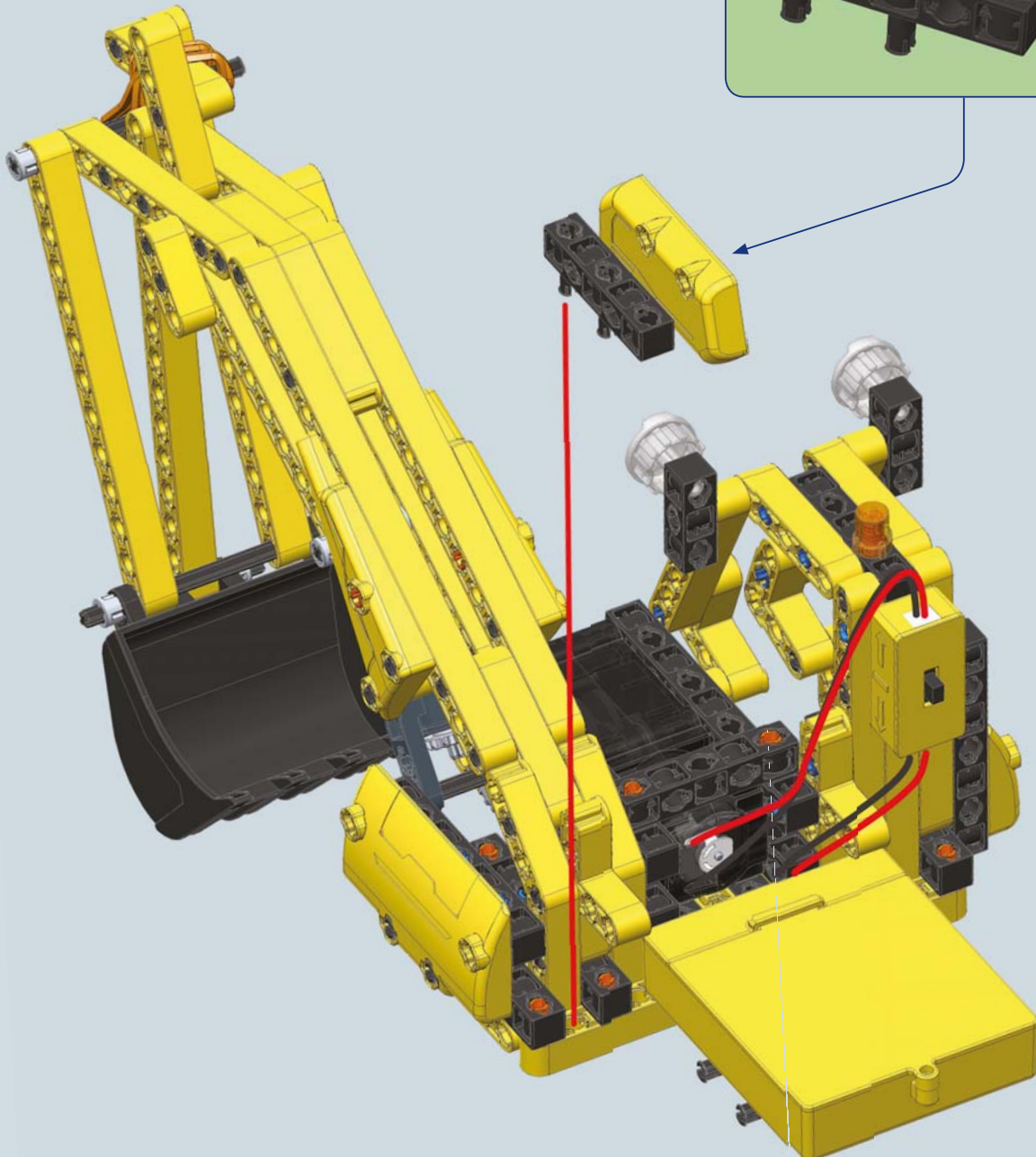
La torretta può ruotare liberamente di 360° rispetto al carro grazie alla ralla. Si tratta di una ruota dentata di grandi dimensioni accoppiata ad un pignone (la ruota dentata di dimensioni inferiori). Il pignone è solitamente solidale con la torretta, mentre la ralla è fissa sul carro. Alla rotazione del pignone segue uno spostamento del pignone stesso (e quindi la rotazione di tutta la torretta) lungo la circonferenza della ralla.

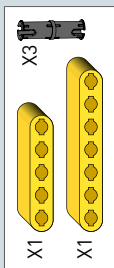
Il meccanismo di rotazione della torretta è attivato anch'esso da un apposito sistema idraulico.

57



58





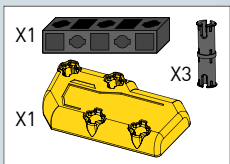
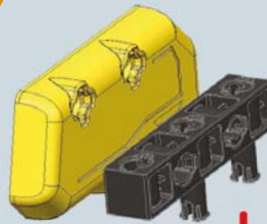
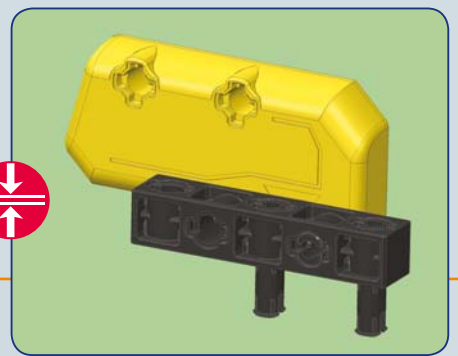
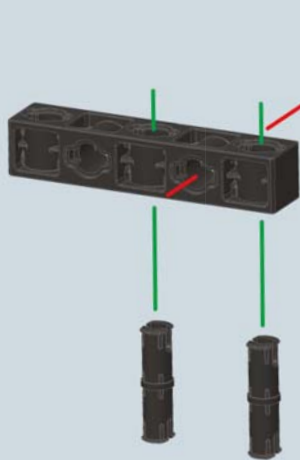
Notizie tecniche e curiosità

La caratteristica che identifica una macchina come l'escavatore è la massa operativa o peso operativo, che corrisponde al peso dell'escavatore.

Nelle fasi di lavoro, infatti, è il peso stesso del mezzo che va a bilanciare il peso del materiale scavato e sollevato. Esiste di conseguenza un limite di capacità della benna, che è legato al peso operativo della macchina.

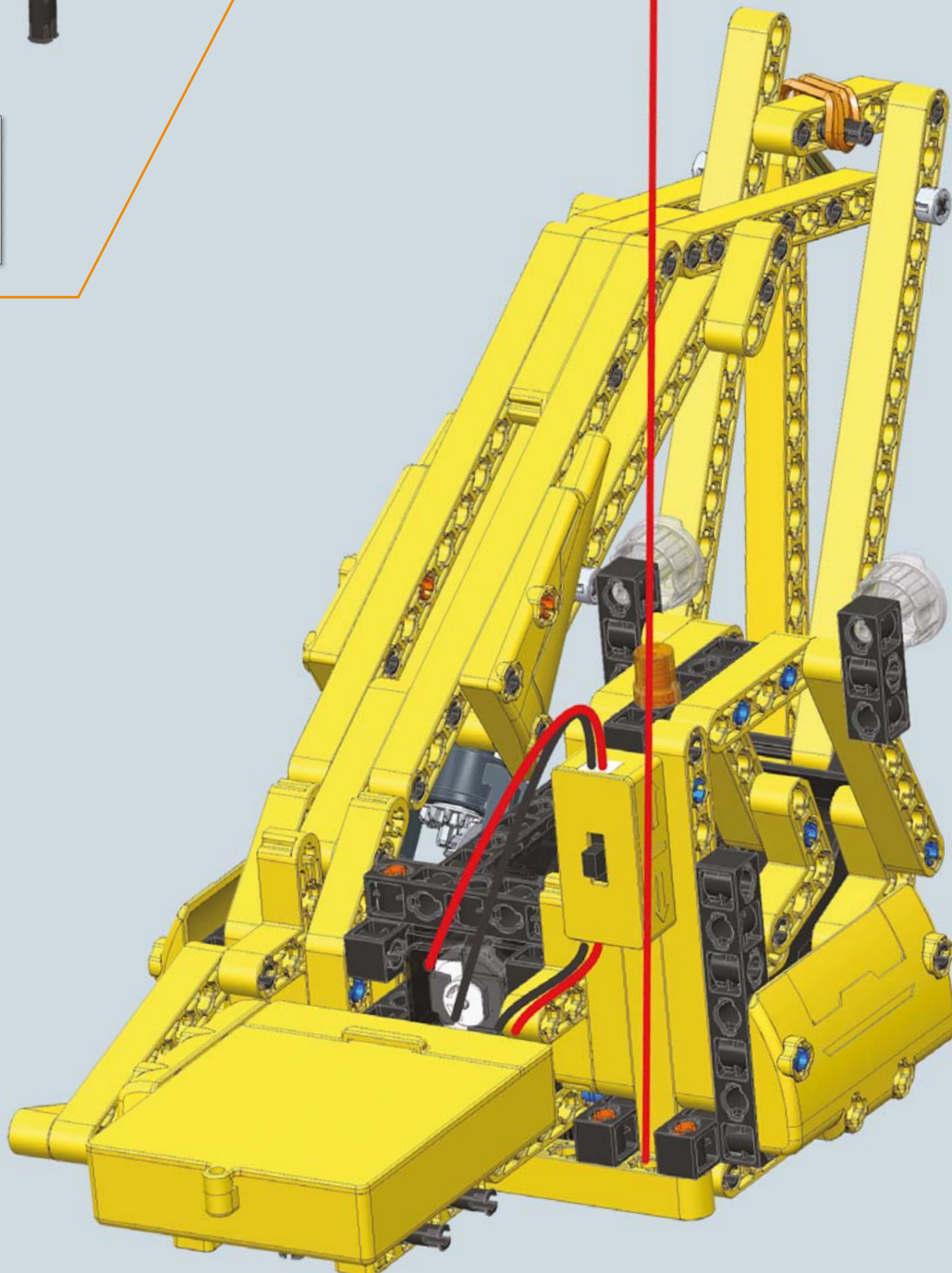
Per aumentare la capacità di carico, la torretta è di solito munita di un contrappeso posteriore (nel nostro modello viene simulato dal vano batterie), mascherato come parte della carrozzeria, che ha l'unico scopo di bilanciare lo sforzo operato dal braccio durante il lavoro.

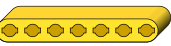
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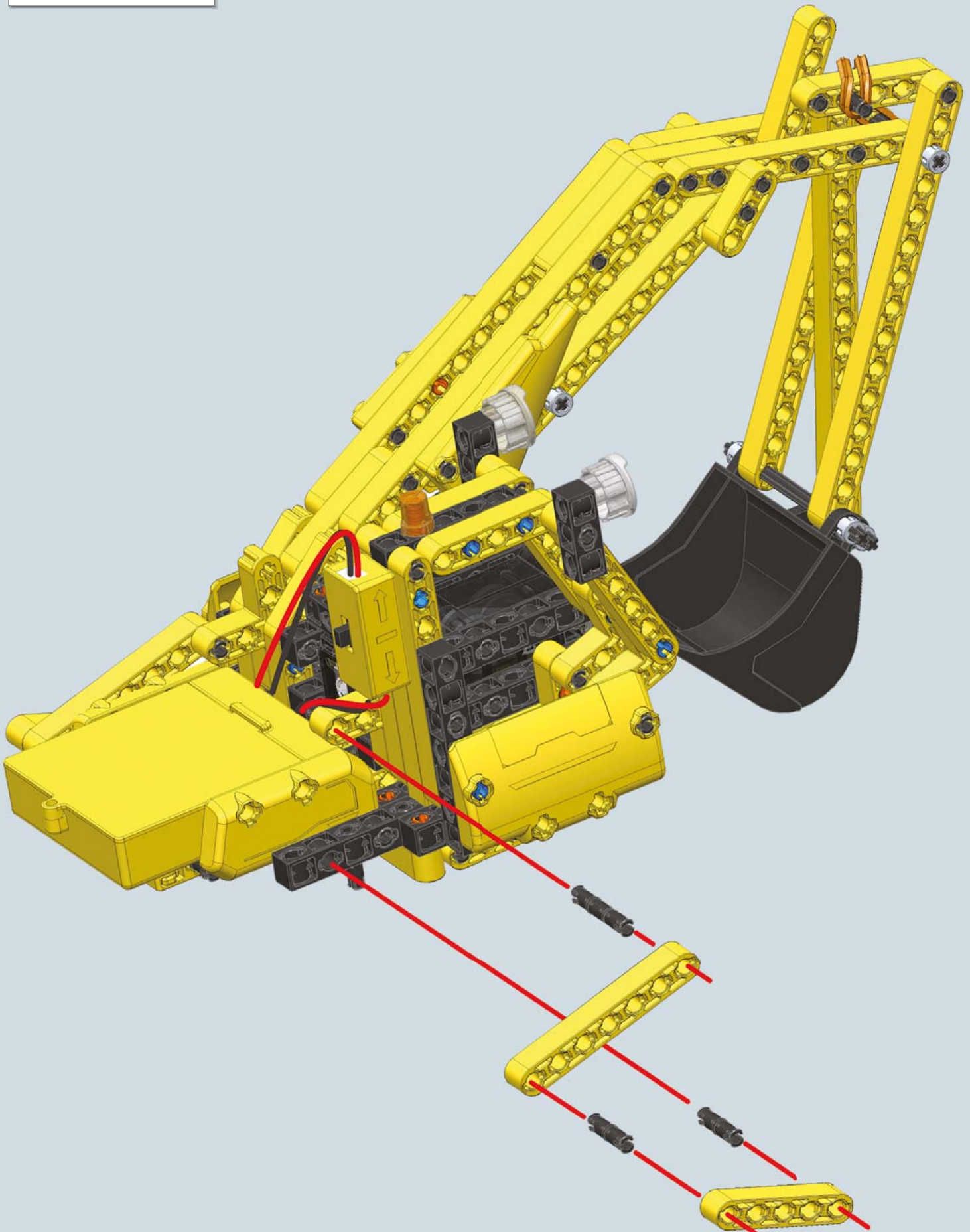


61

180°

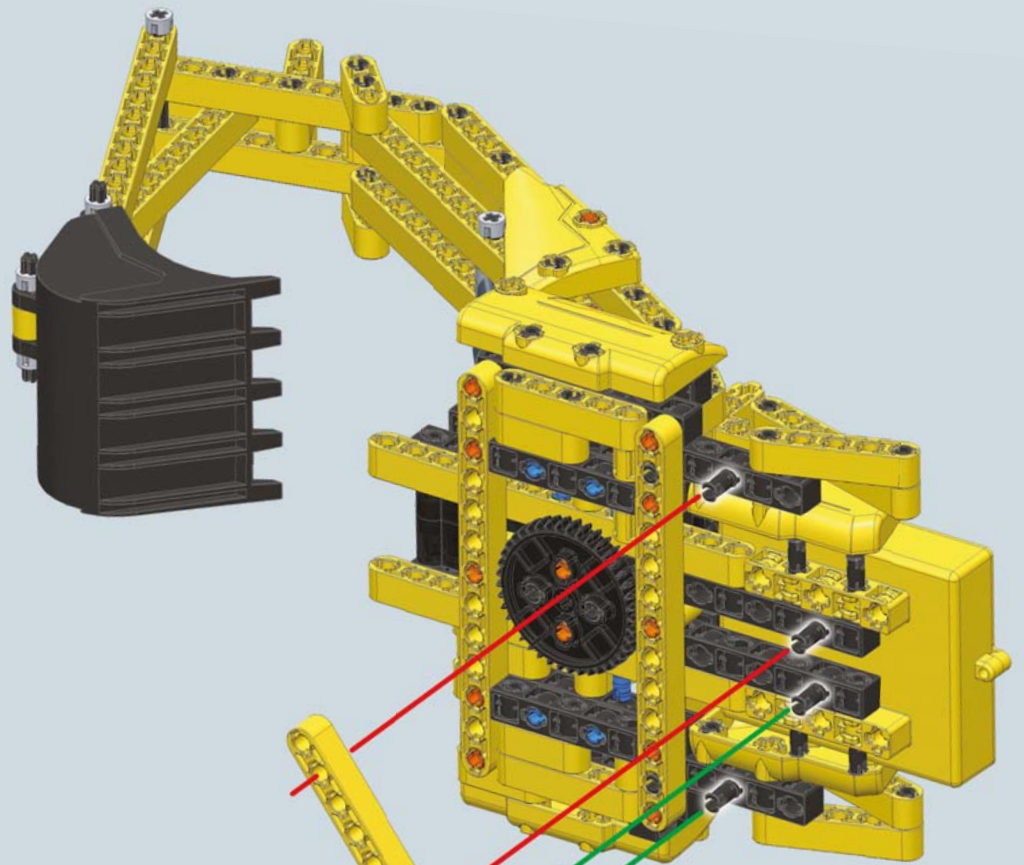
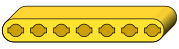


- | | | | |
|----|---|----|---|
| X1 |  | X1 |  |
| X1 |  | X2 |  |

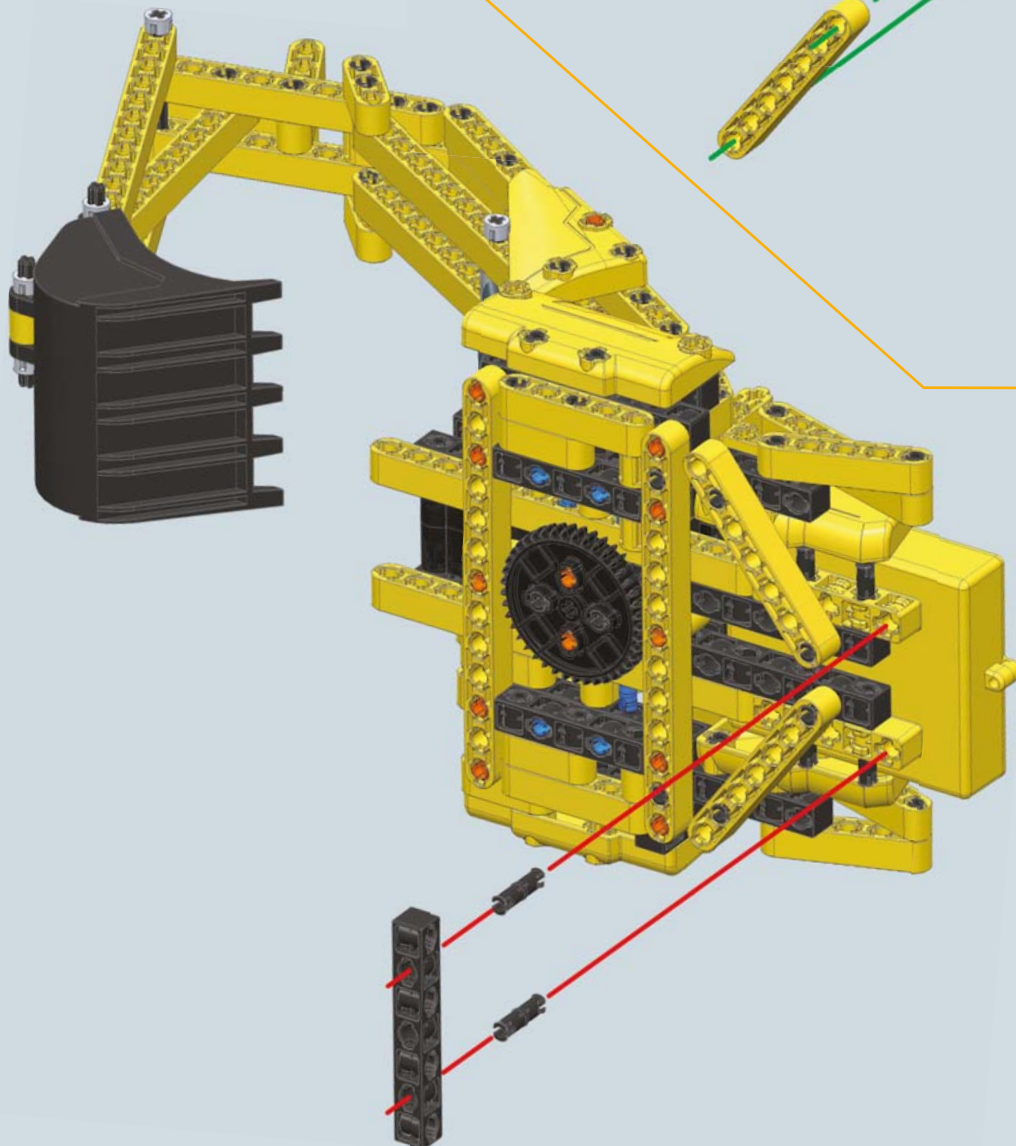


63

X2



64

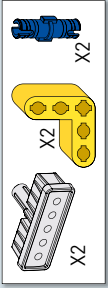


X1



X2

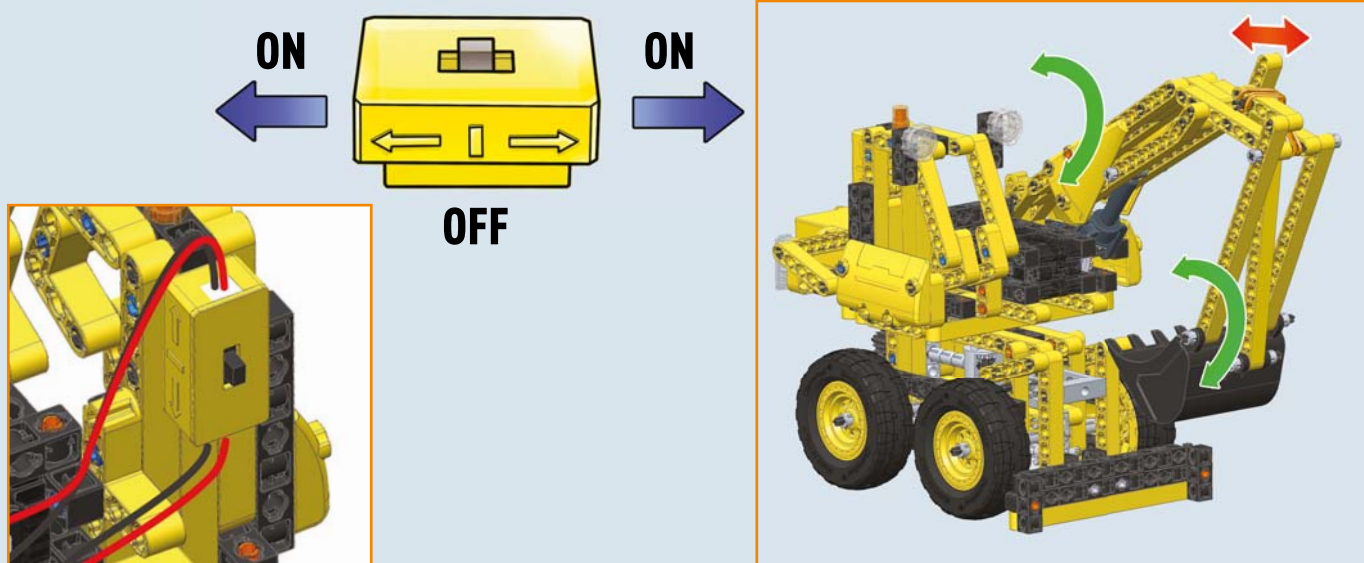




Uniamo la torretta al carro
per completare l'escavatore.



Attivazione del braccio escavatore: puoi attivare il braccio di sollevamento tramite lo switch, spostando il tasto a destra o a sinistra per alzarlo o abbassarlo. Muovi manualmente la leva indicata dalla freccia rossa per attivare contemporaneamente il braccio di scavo e lo scarico della benna.



Rotazione della torretta: nella parte posteriore del mezzo, usa la ruota dentata superiore per attivare la rotazione dell'intera torretta.



Attivazione della lama di rinterro: nella parte posteriore del mezzo, usa la ruota dentata inferiore per sollevare o abbassare la lama di rinterro frontale.



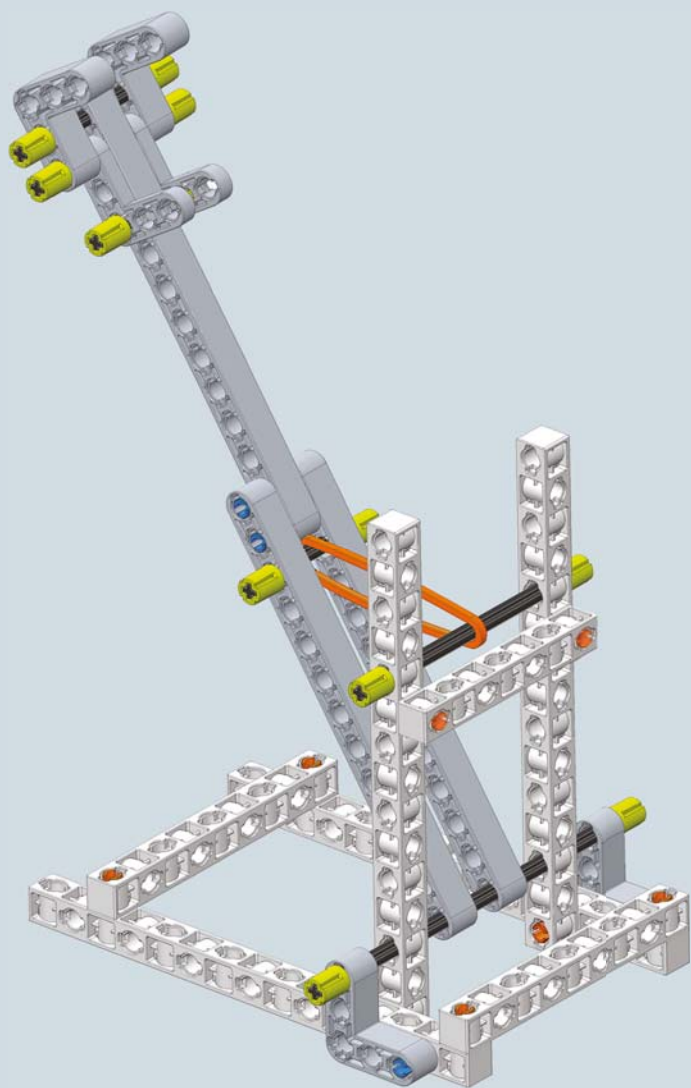
IL DIVERTIMENTO CONTINUA CON ALTRE 35 ATTIVITA' DA SCARICARE ONLINE SUL SITO

Tutte le istruzioni per realizzare tanti esperimenti e approfondire i principi di fisica e meccanica.

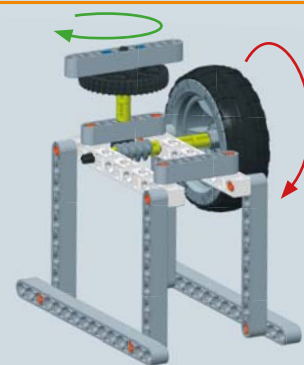
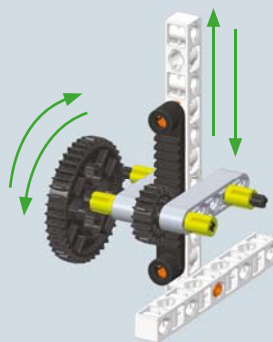
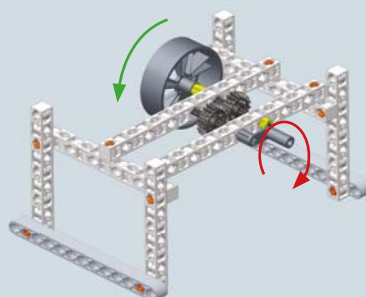
www.laboratoriodimeccanica.clementoni.com

ATTENZIONE: I COLORI DI ALCUNI PEZZI POSSONO VARIARE!

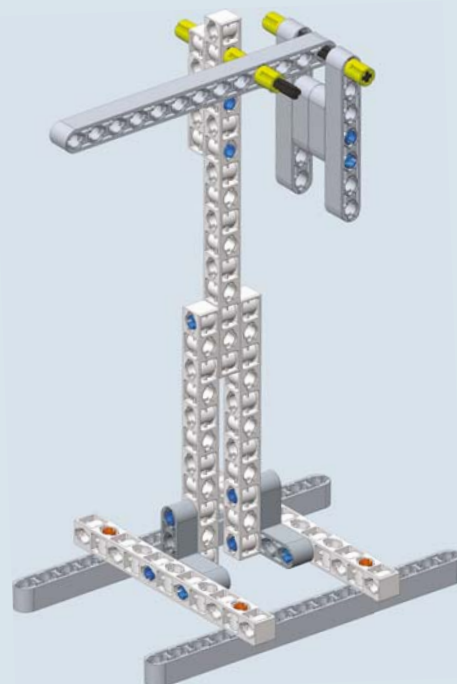
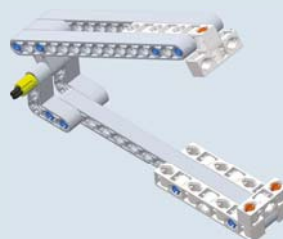
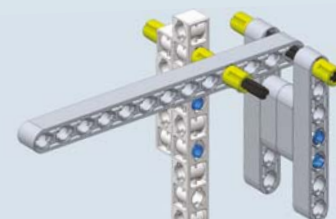
LA CATAPULTA



INGRANAGGI E TRASMISSIONI



LE LEVE



ATTREZZI DA PALESTRA

