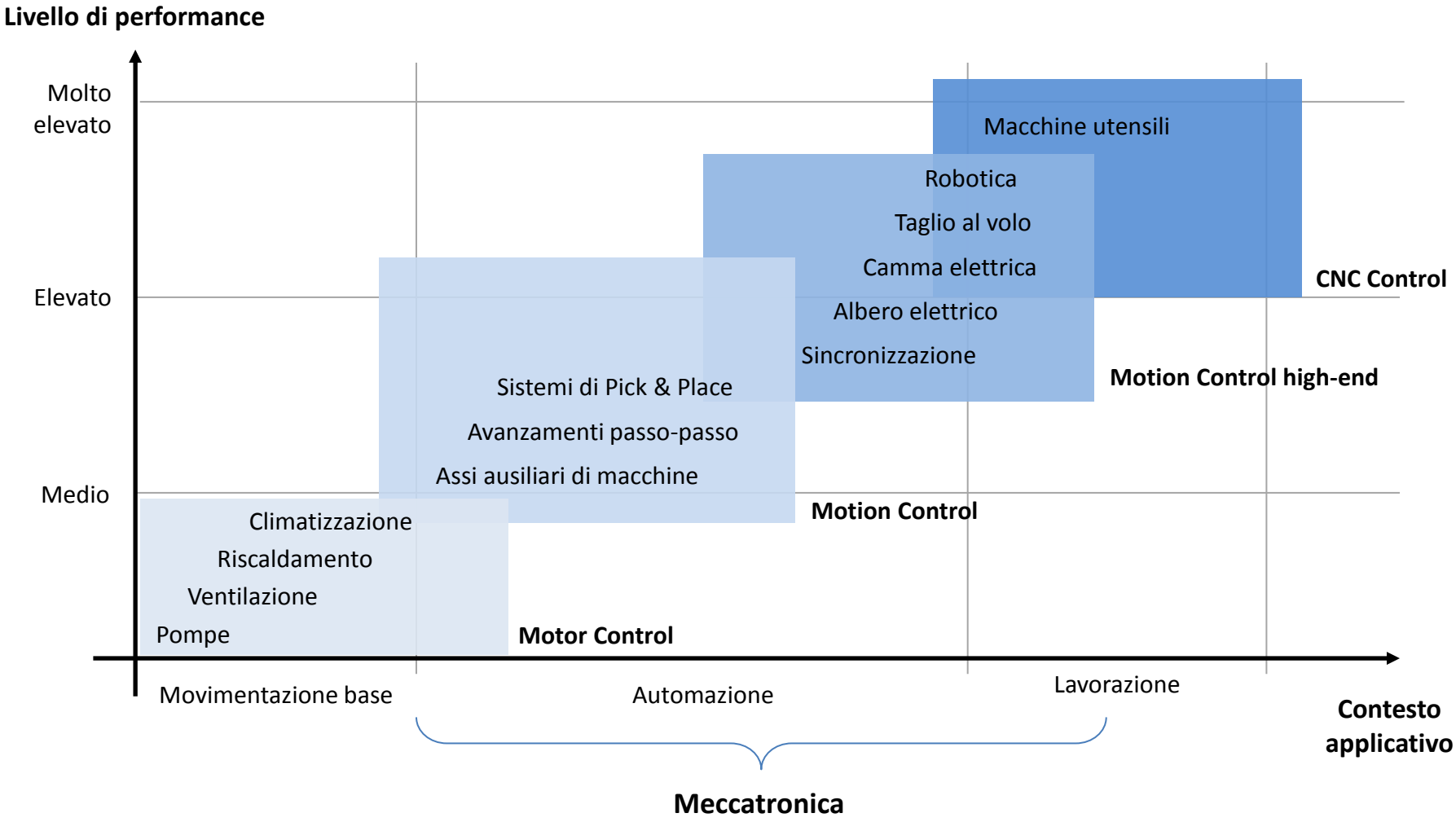
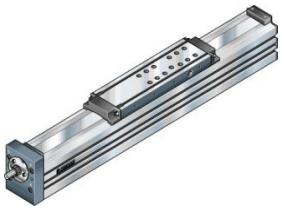
Progettazione meccanica:
dalla scelta dei componenti di base alla realizzazione del sistema cartesiano completo

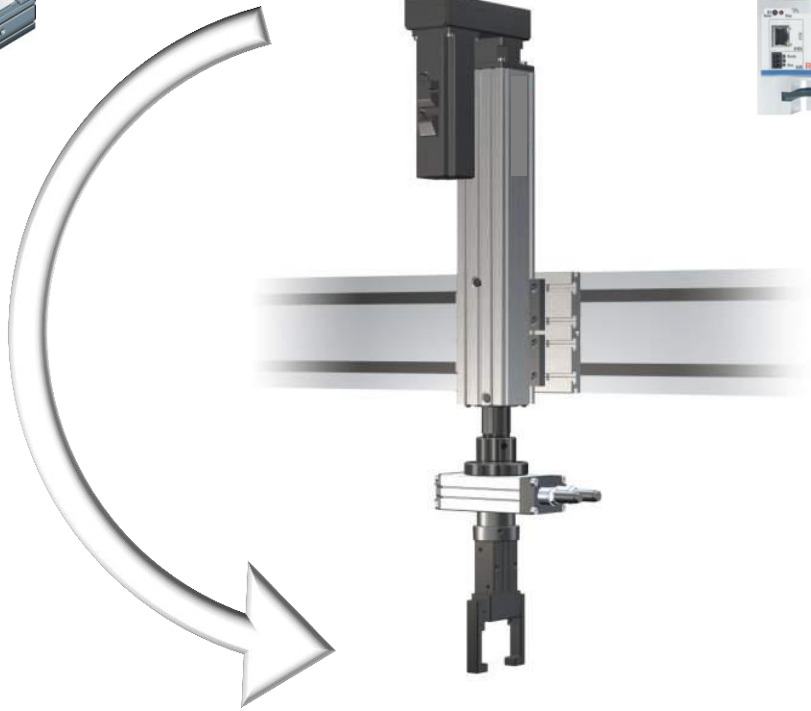
Andrea Piatti
Bosch Rexroth S.p.A.

Meccatronica

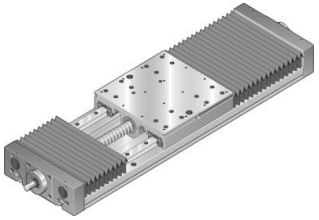


Sistemi Meccatronici

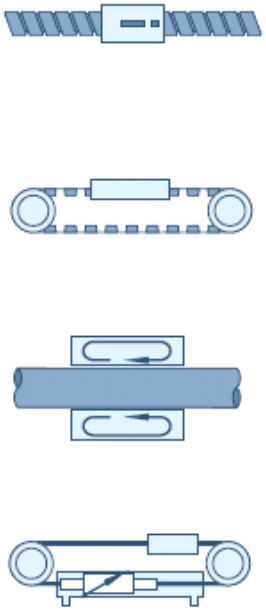


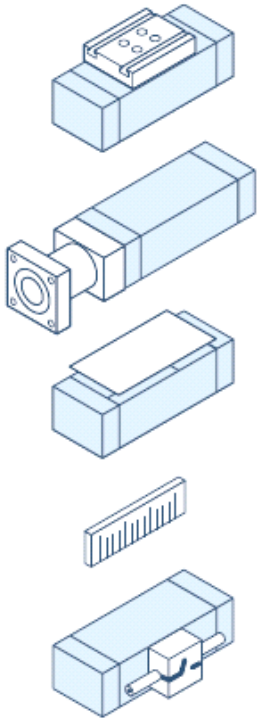
Costruzione dei Sistemi Meccatronici

Sistema di guida

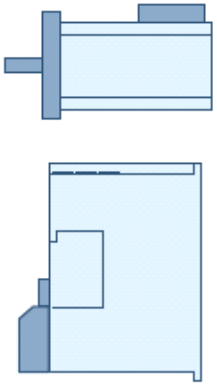
Sistema di azionamento



Struttura ed accessori

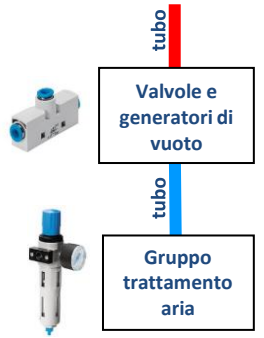


Motori ed azionamenti

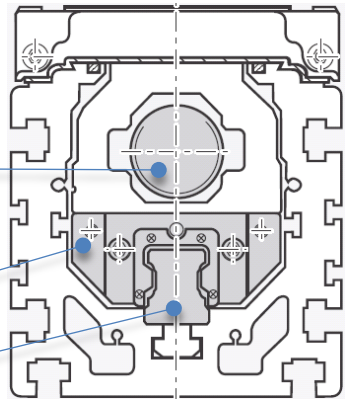
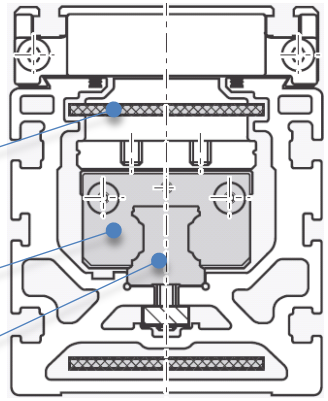
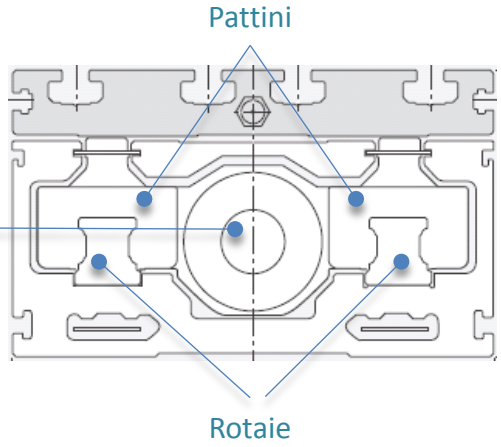
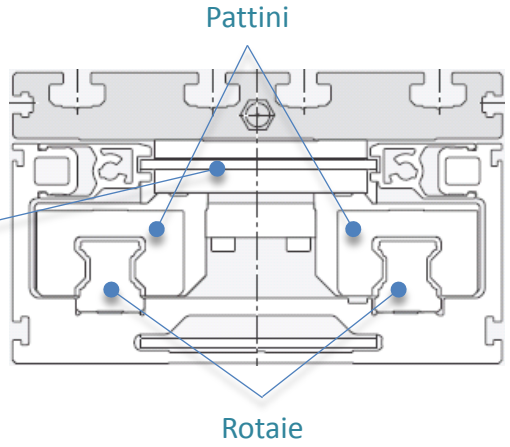


PLC/Motion

Sistema di presa



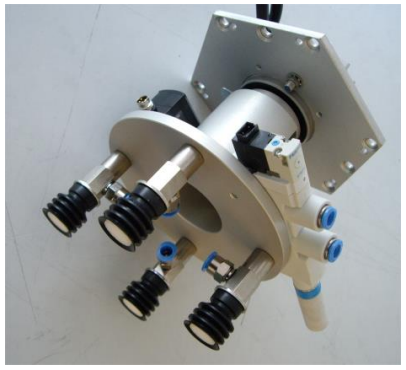
Sistemi Lineari: le principali differenze

	Azionamento a vite	Azionamento a cinghia
Monorotaia		
Birotaia		

Sistemi di presa: le principali tipologie

Presa pneumatica

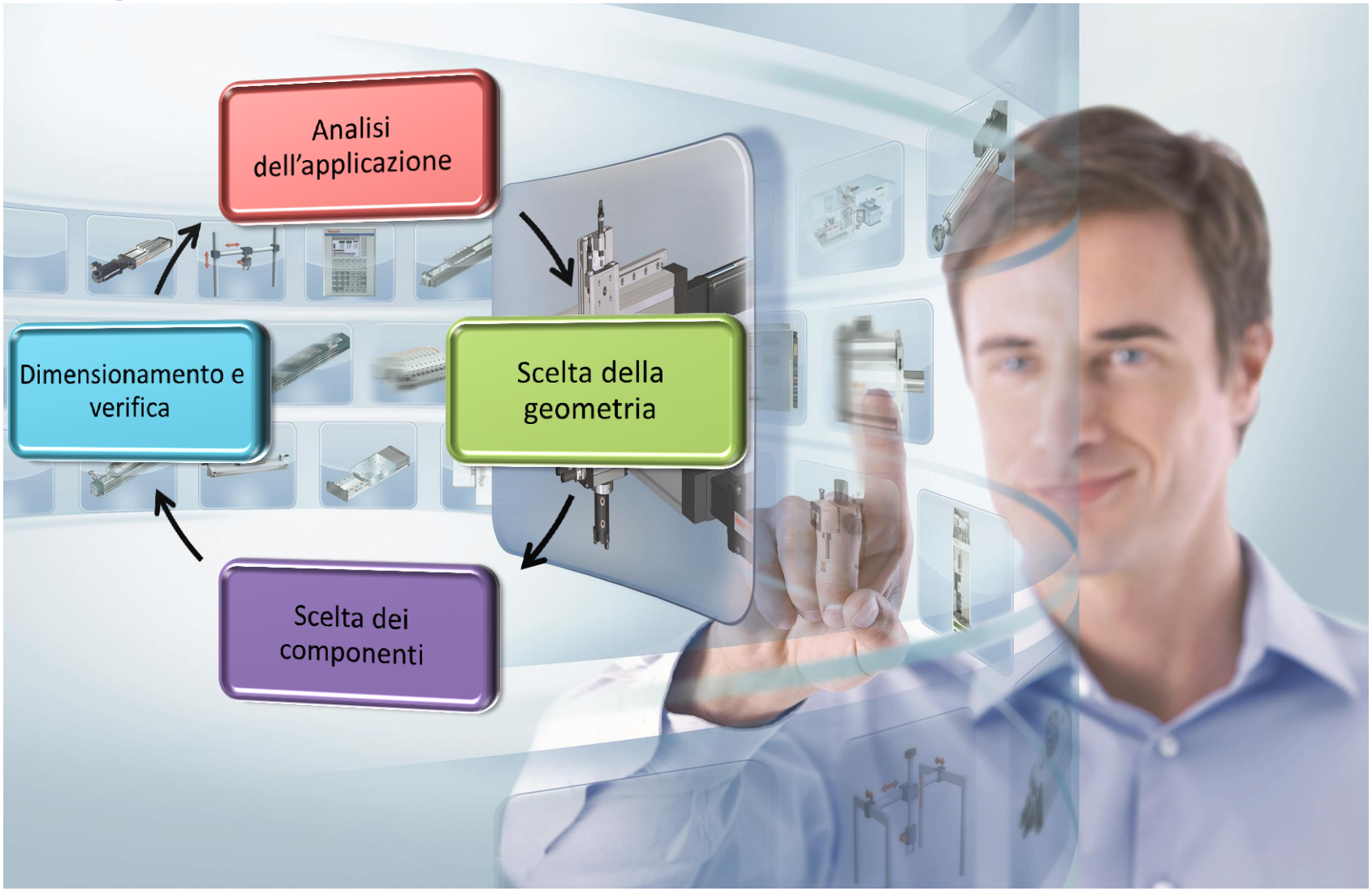
Presa meccanica



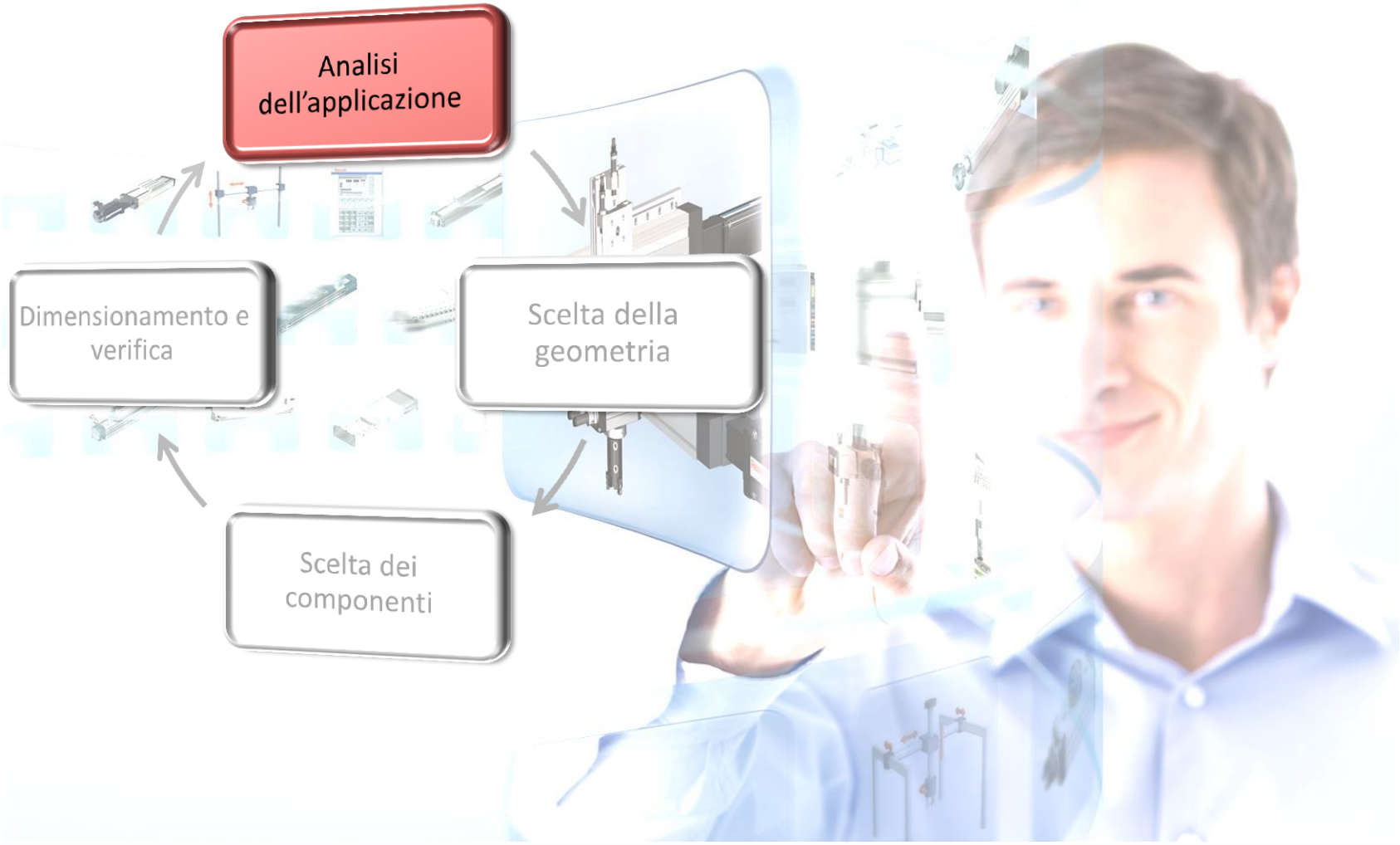
Sistemi combinati

Come si progetta
un Sistema Meccatronico

Progettazione di un Sistema Meccatronico



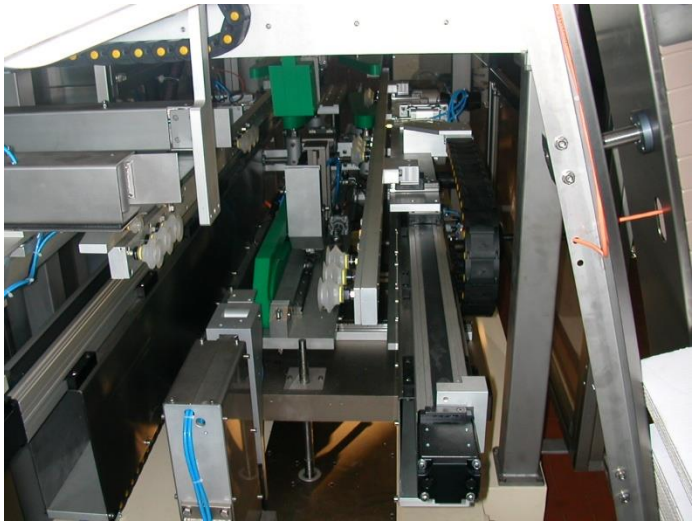
Progettazione di un Sistema Meccatronico



Industria farmaceutica ed assemblaggio

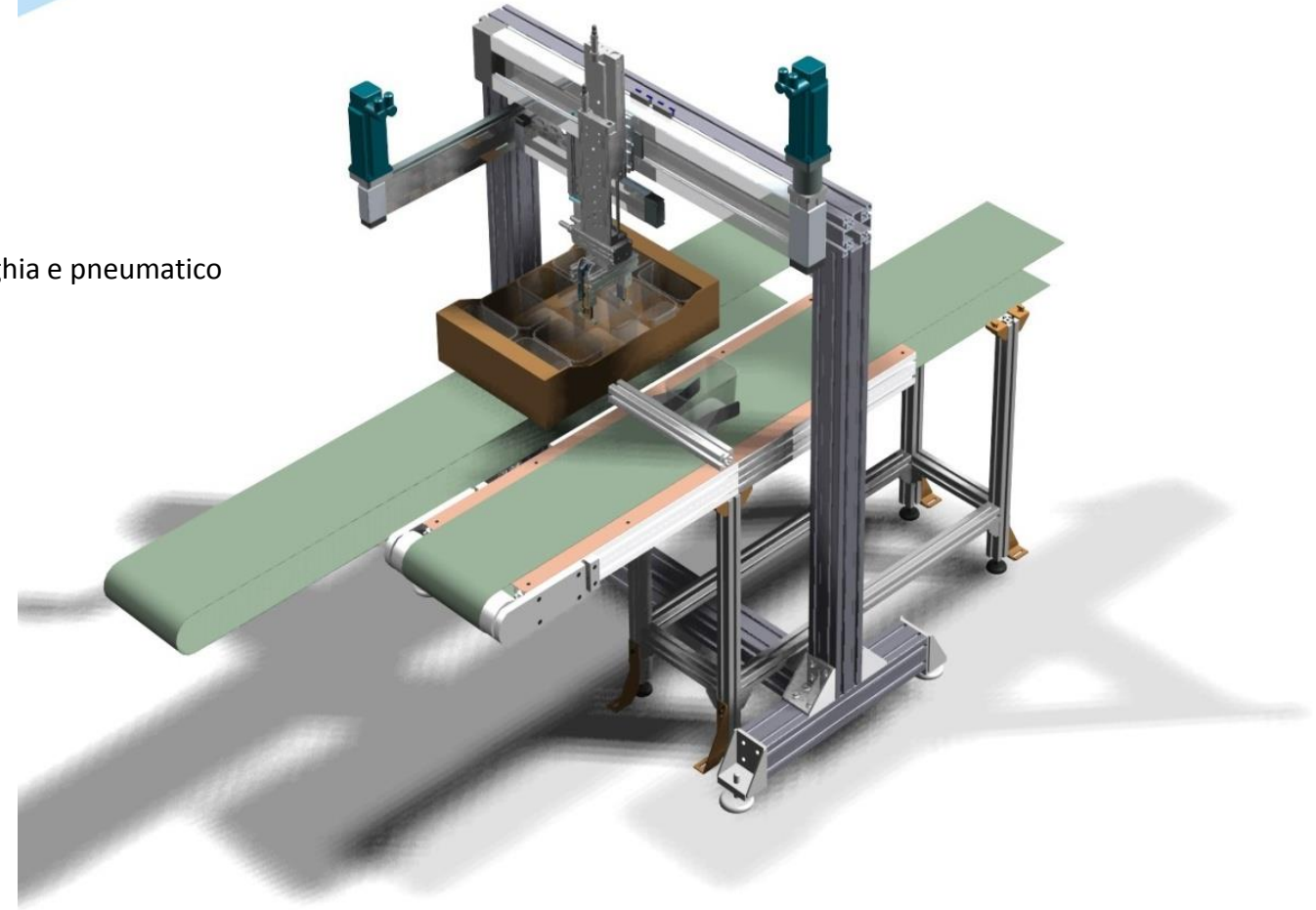
Incartonatrice panetti di burro

- Azionamento a cinghia
- Monorotaia
- Motori brushless



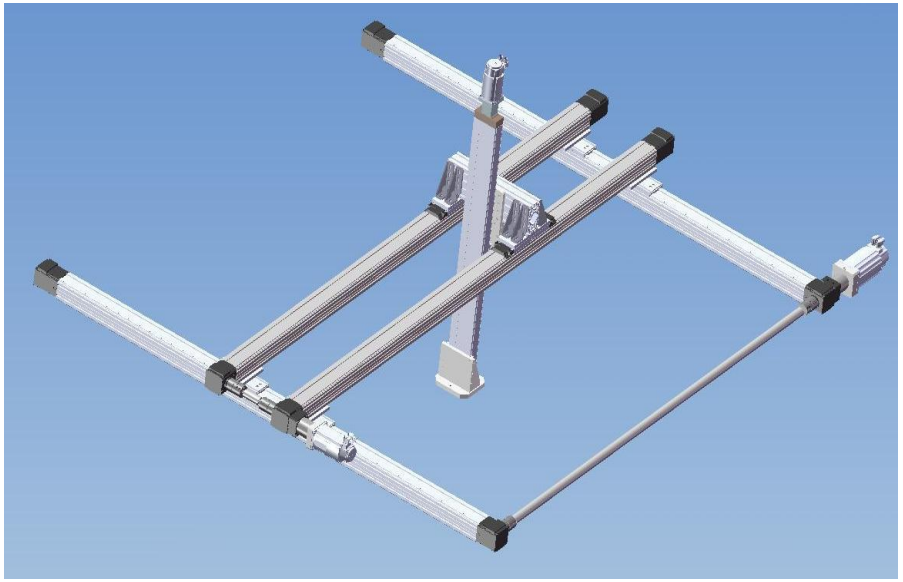
Movimentazione cassette di frutta

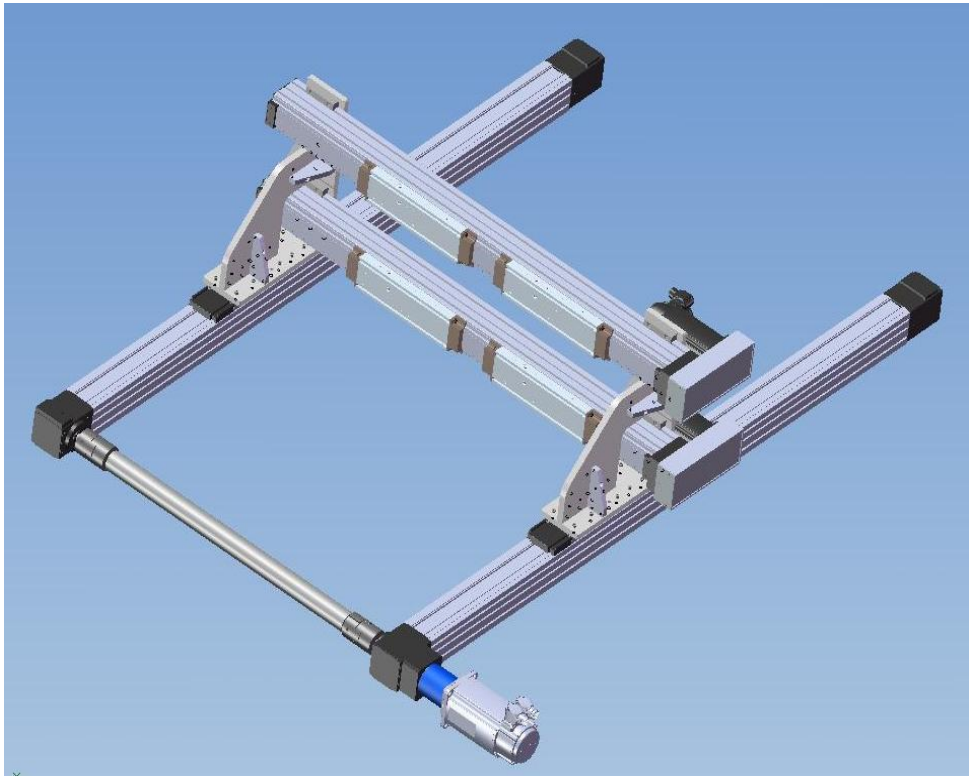
- Azionamento a cinghia e pneumatico
- Birotaia
- Motori brushless



Avvitatura e movimentazione testate

- Azionamento a vite e cinghia
- Monorotaia e birotaia
- Motori brushless



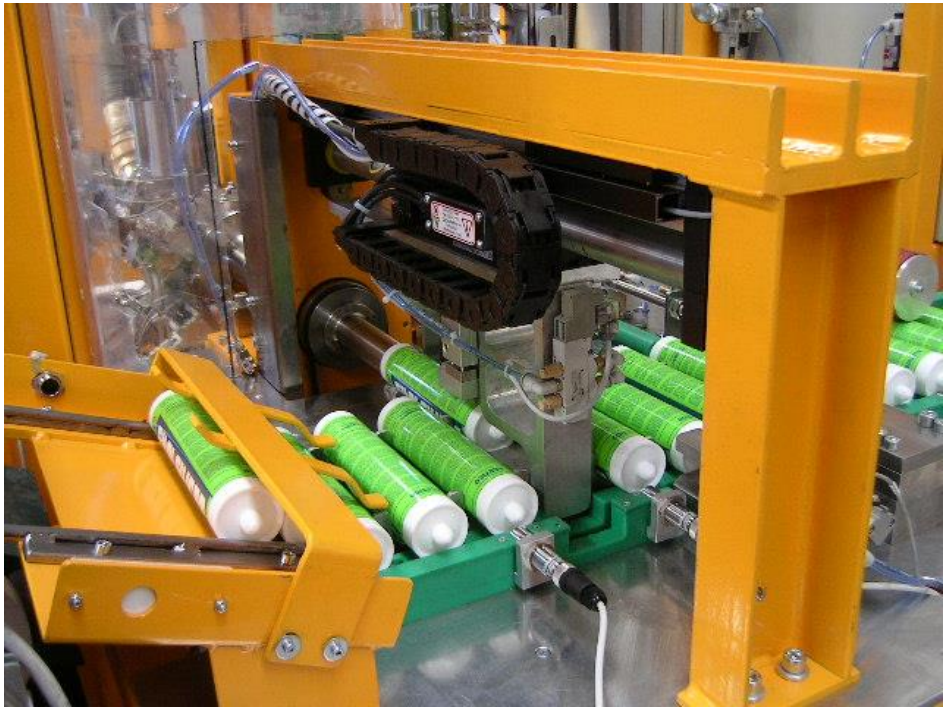


Centro di lavoro per pastiglie freno

- Azionamento a vite
- Birotaia
- Struttura massiccia e precisa

Macchina riempitrice tubi di silicone

- Azionamento con motore lineare
- Monorotaia



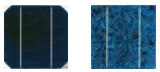
Magazzino vestiario per ospedale

- Azionamento a cinghia
- Monorotaia

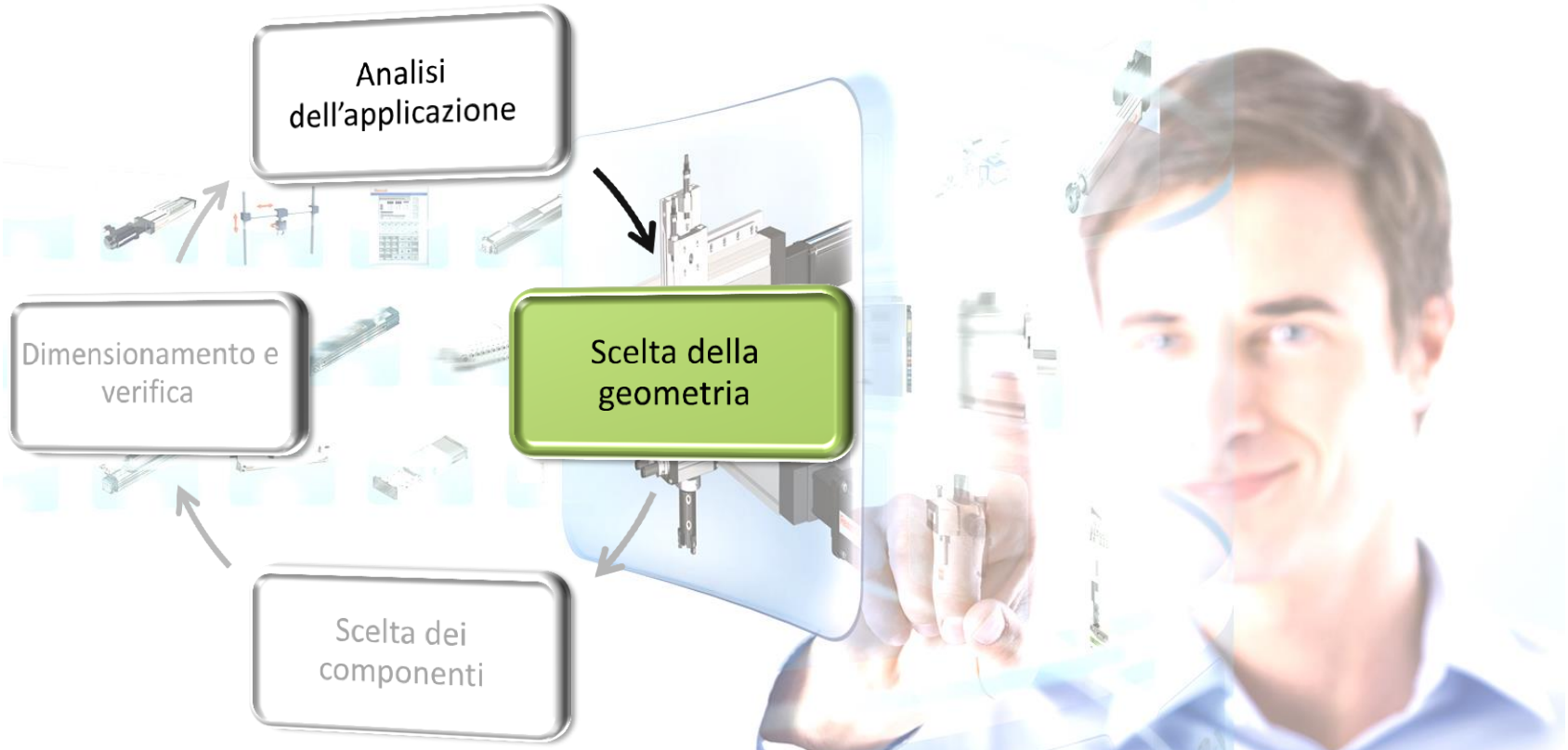
Sistemi di manipolazione completi

Prodotti da manipolare

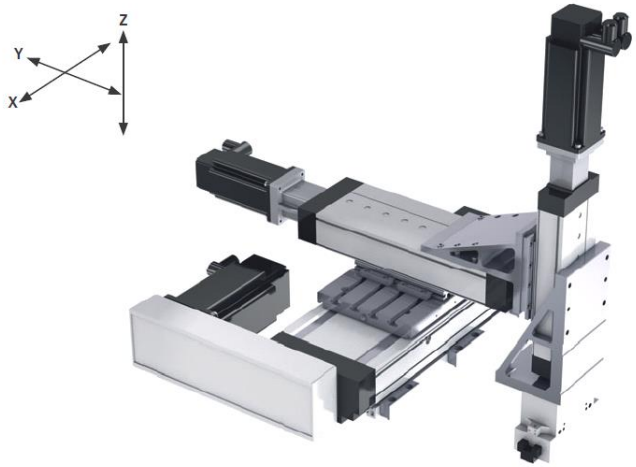
Qualsiasi prodotto o utensile tra 1 gr e 100kg da spostare

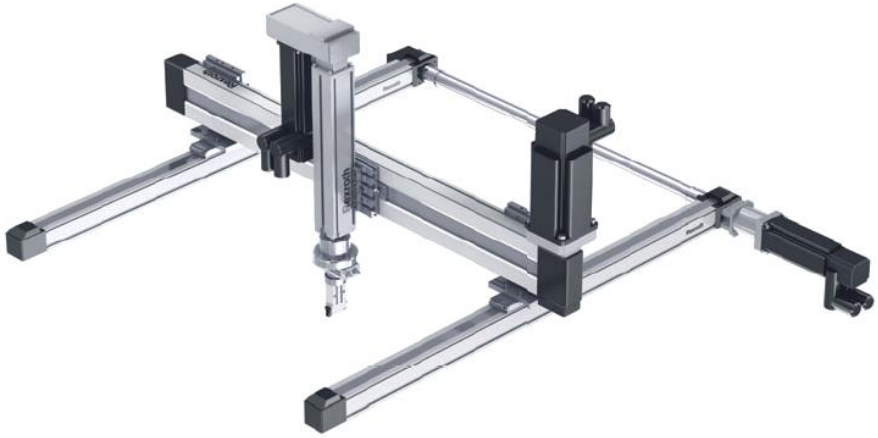


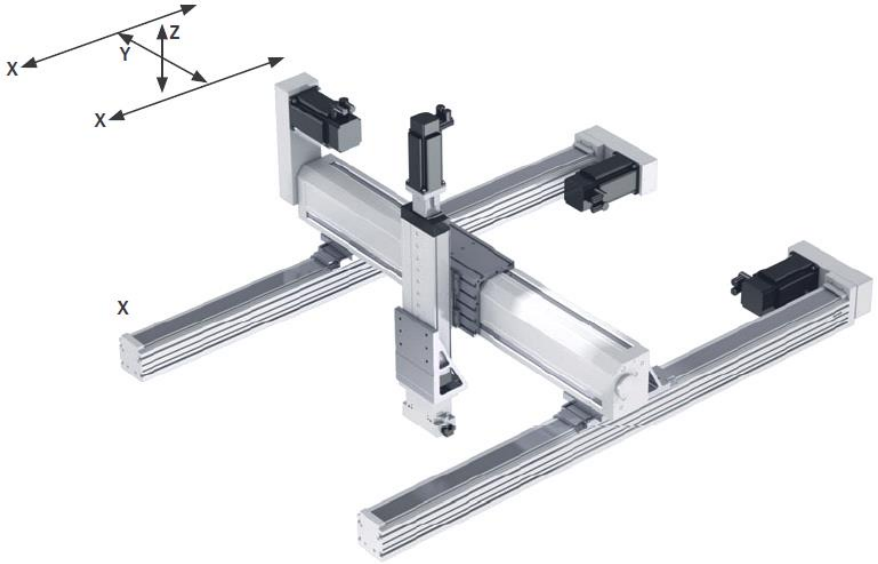
Progettazione di un Sistema Meccatronico



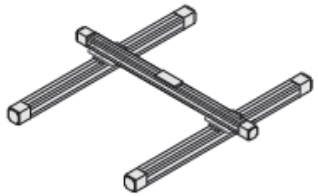
Esempi di geometrie



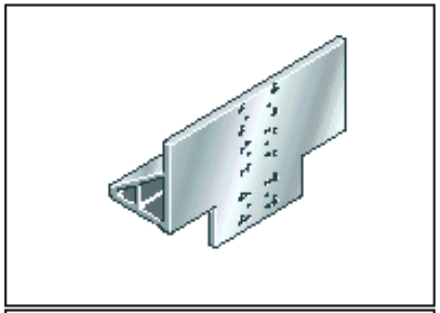
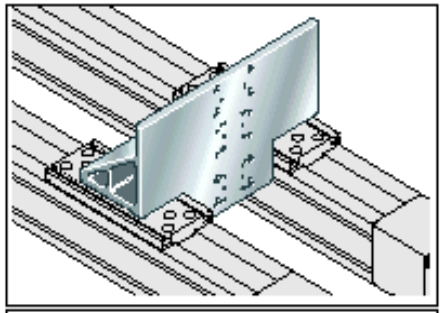
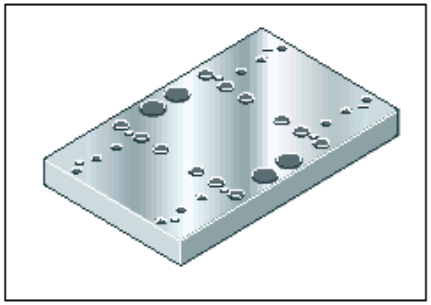
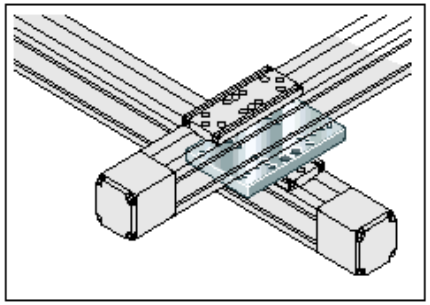
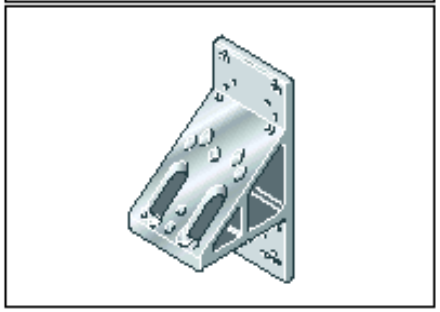
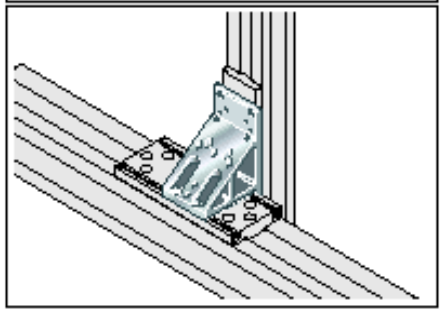
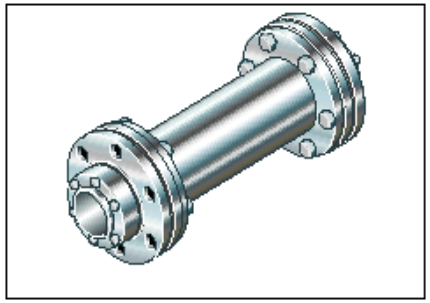
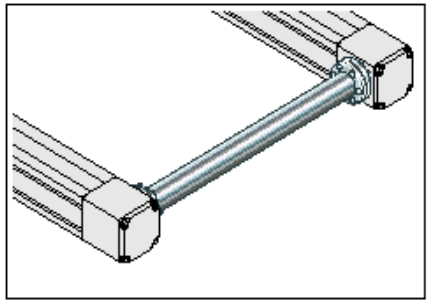
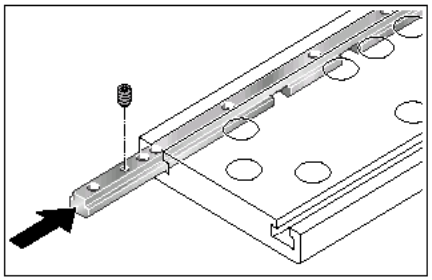
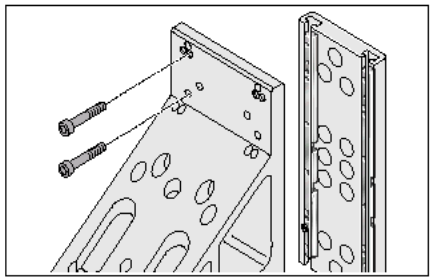
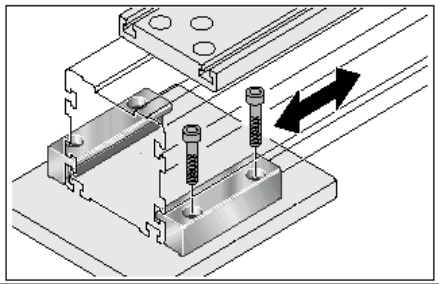
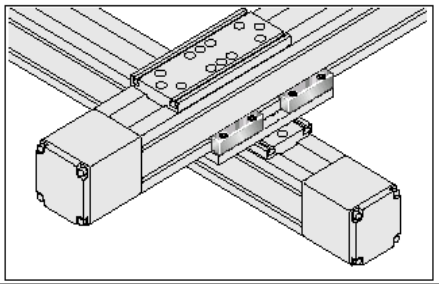




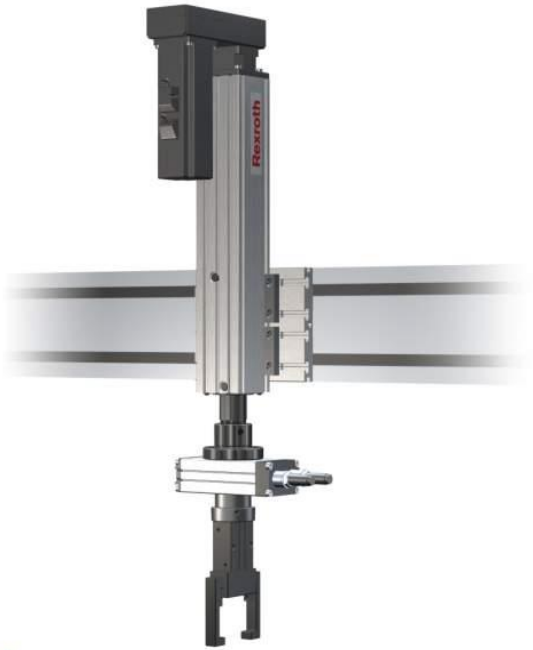
Scelta della geometria

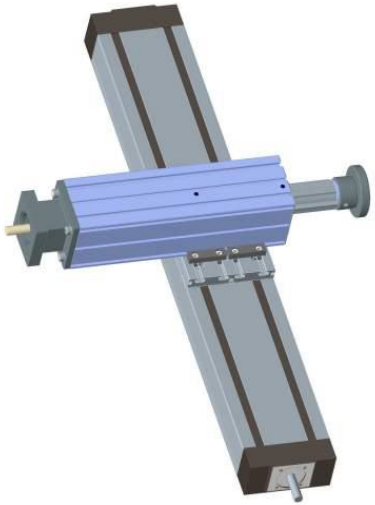
Compact Module CKx	Mini Slide MSC  ☛ 88	Compact Module CKx  ☛ 90	Compact Module CKx  ☛ 92
Linear Module MKx	Compact Module CKx (2X-Y)  ☛ 112	Bridge Module BKx  ☛ 114	Linear Module MKx (2X-Y)  ☛ 116
Bridge Module BKK	Compact Module CKx  ☛ 64	Feed Module VKK  ☛ 65	

Scelta dei sistemi di collegamento

Scelta della geometria di presa





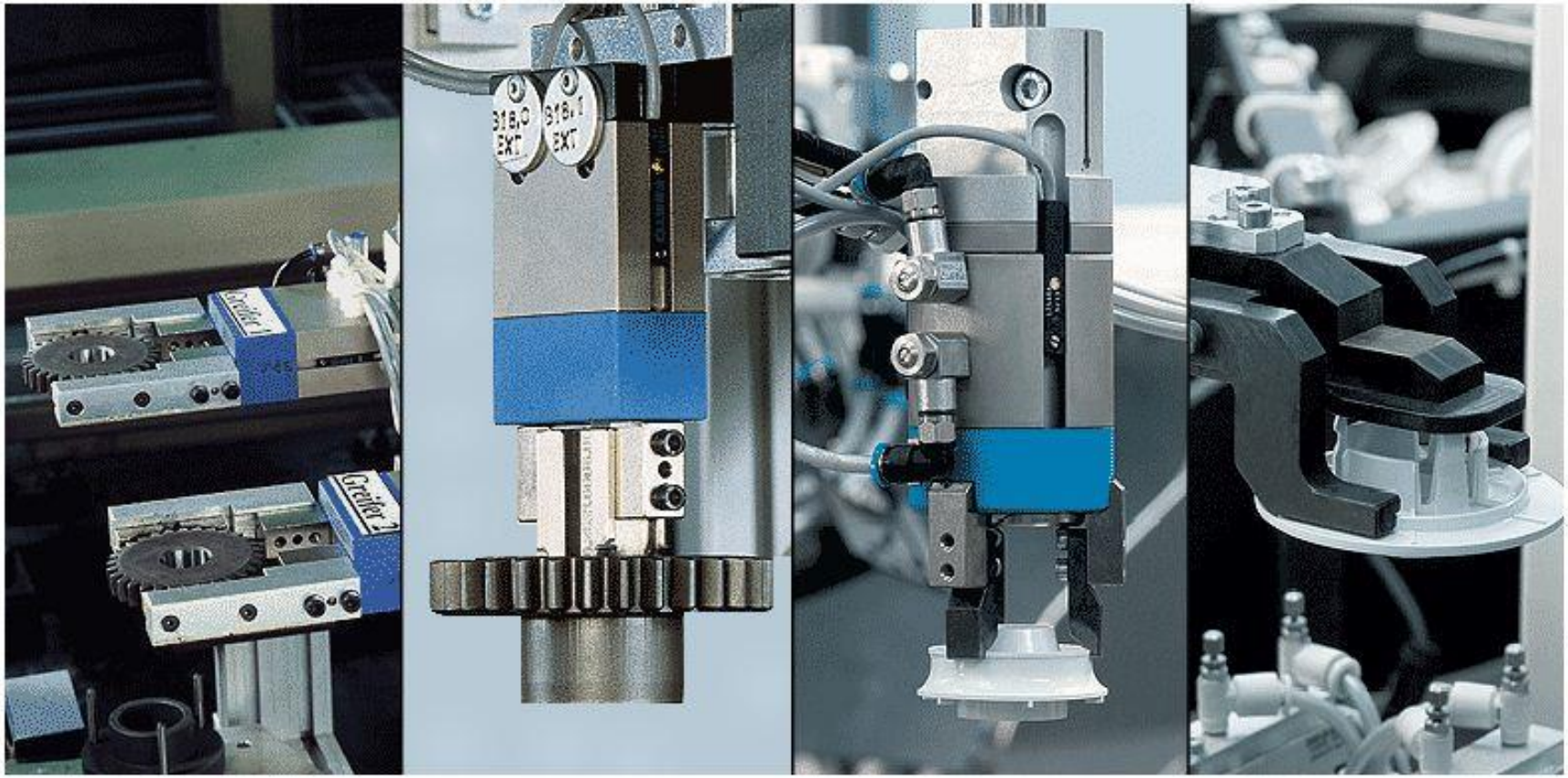
Montaggio diretto sul modulo di rotazione

Flangia standard

Piastra adattatrice

Montaggio a contatto con piastra adattatrice

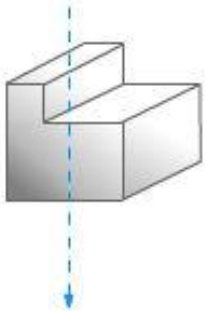
Geometrie di manipolazione



Analisi dell’oggetto da manipolare

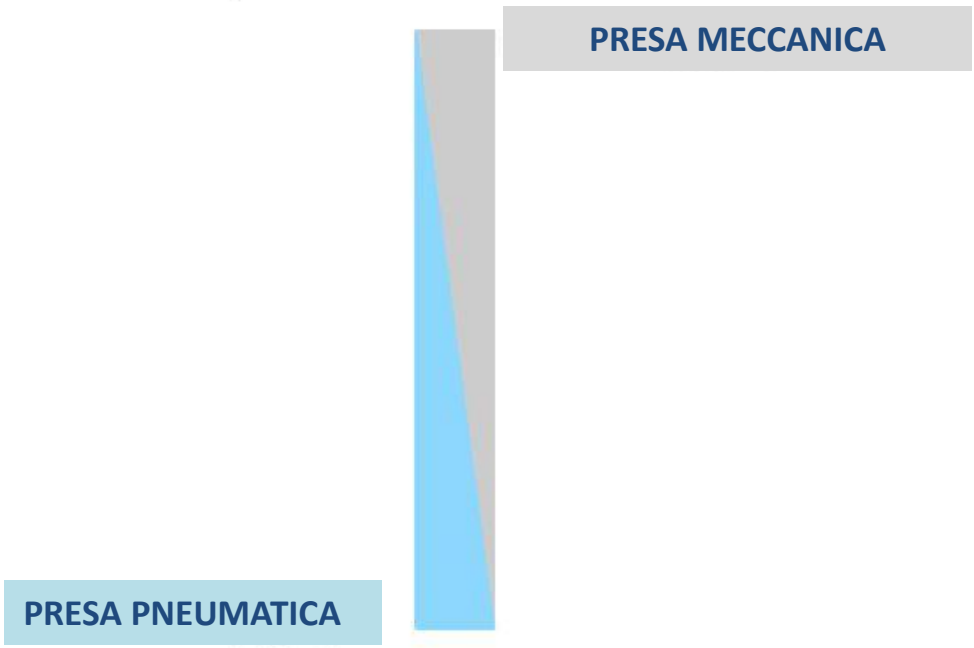
Caratteristiche dell’oggetto da considerare

Mass	Shape	Position of center of gravity	Surface properties	Material Strength	Temperature

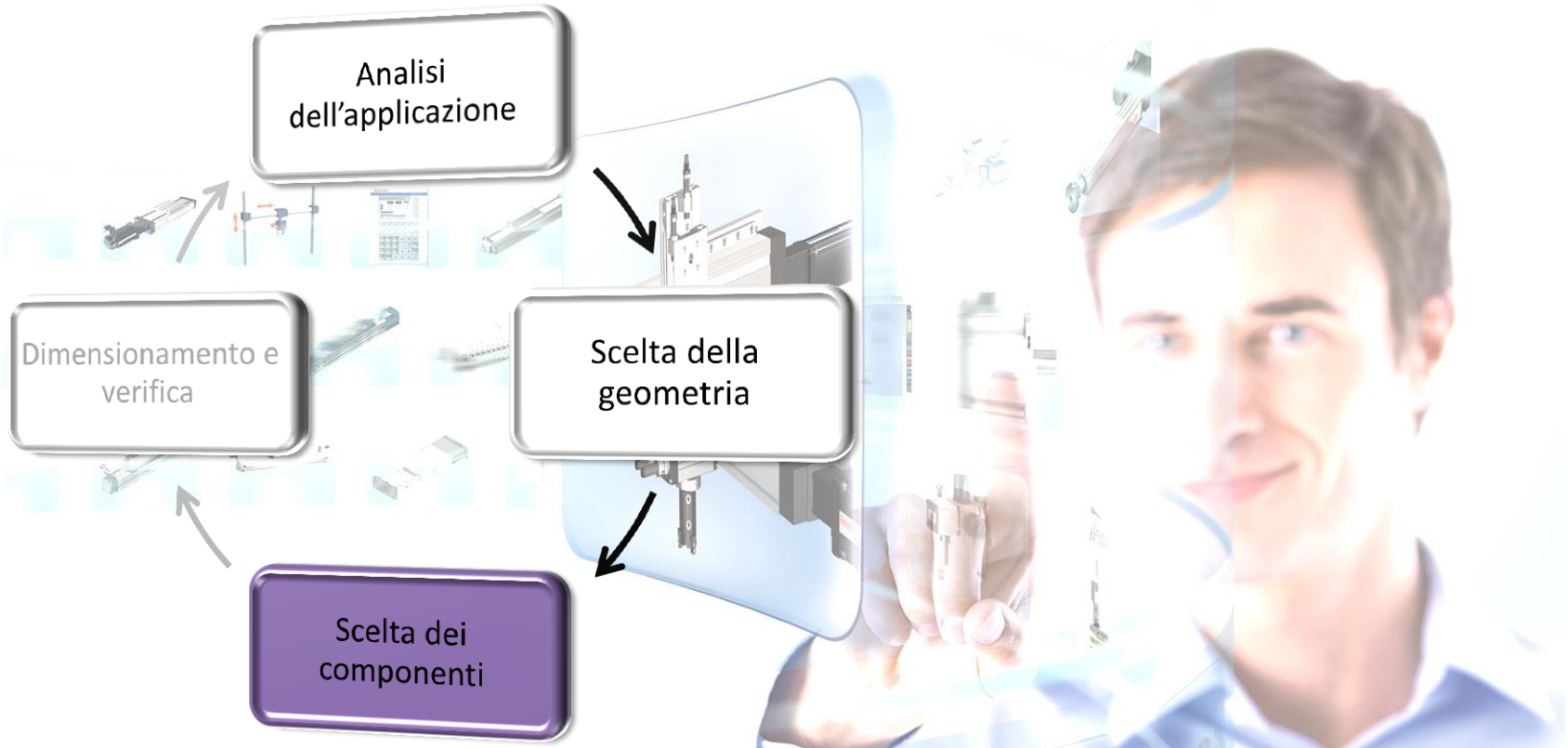


Scelta della tecnologia di presa

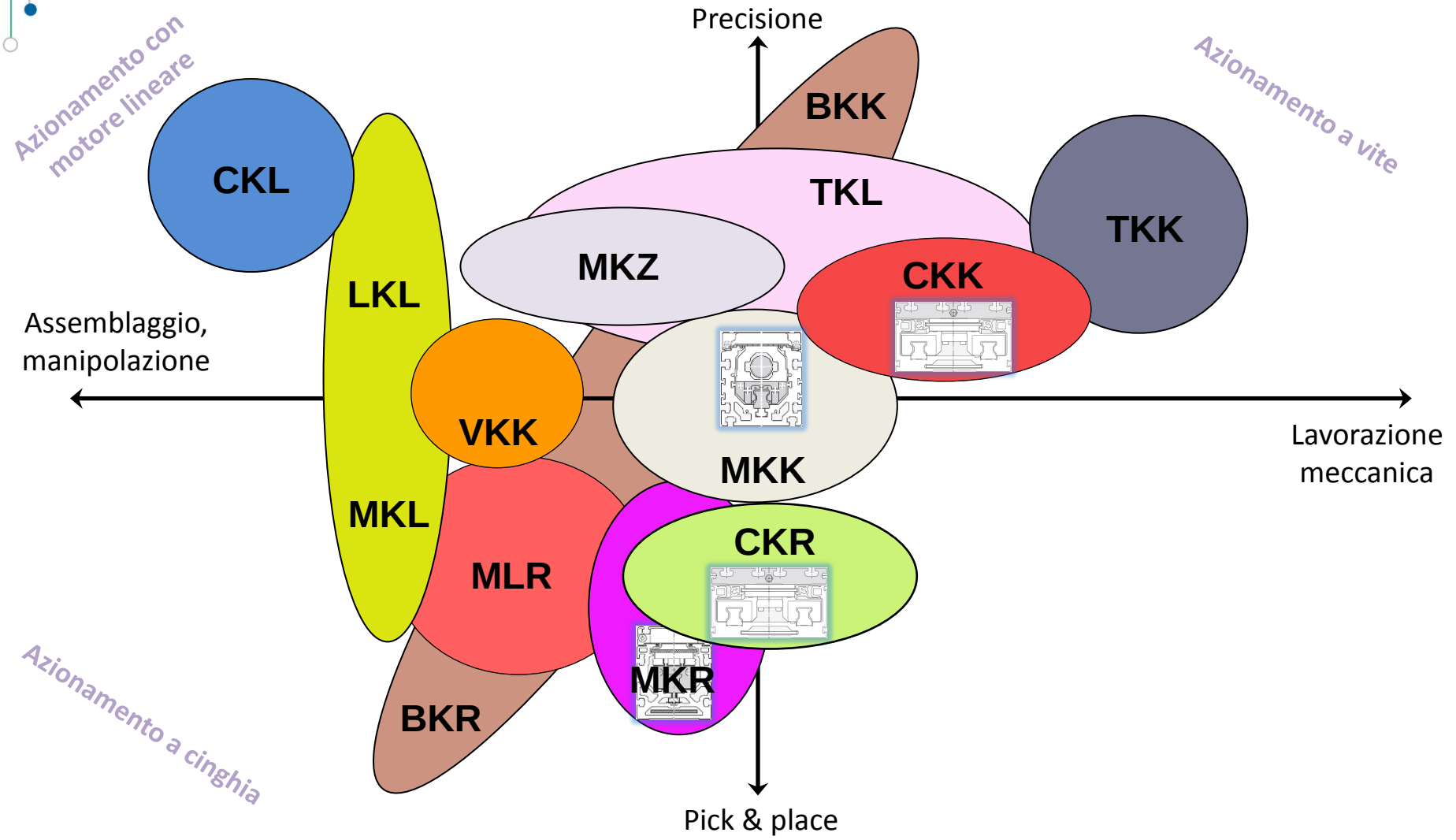
A seconda della categoria di oggetto da afferrare è *più o meno semplice* utilizzare la tecnologia di presa meccanica piuttosto che pneumatica.



Progettazione di un Sistema Meccatronico



Scelta dei componenti meccanici



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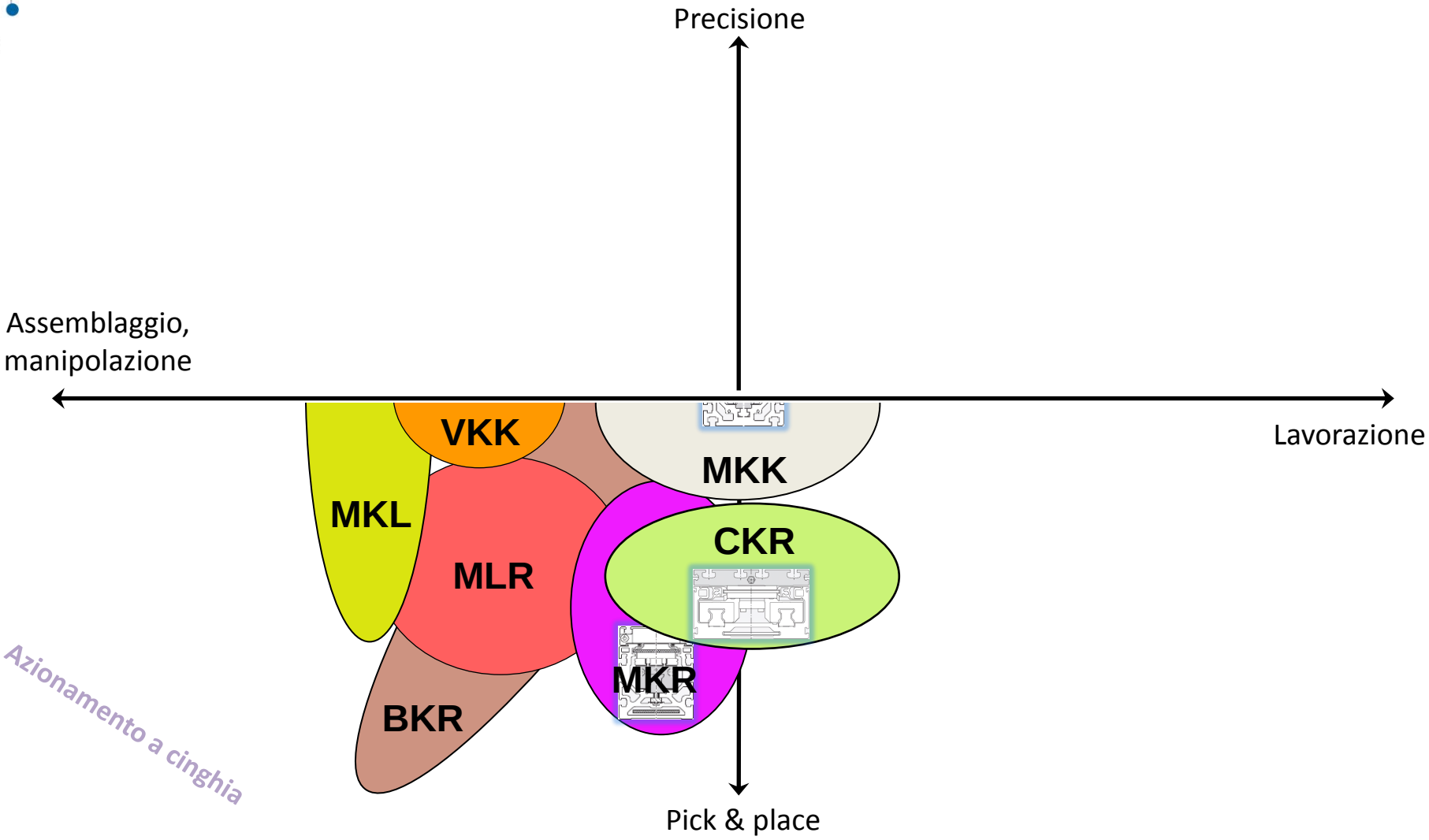
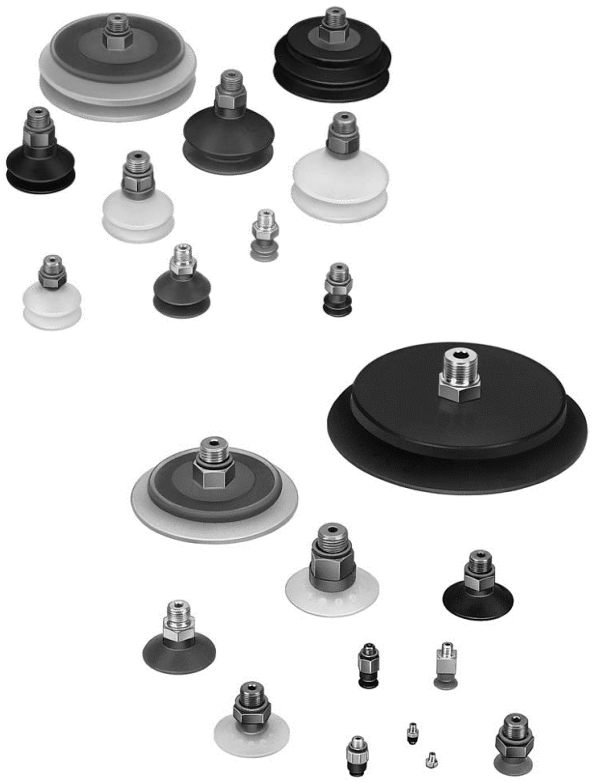


Scelta del tipo di presa pneumatica



- Aspirazione di pezzi con superfici lisce e non porose
- Le ventose a soffietto consentono di lavorare con superfici irregolari,bombate e inclinate
- In gomma naturale nitrilica (NBR) tollera il contatto con oli ed idrocarburi
- In poliuretano (PUR) ottima resistenza all’abrasione
- In silicone per l‘alimentare

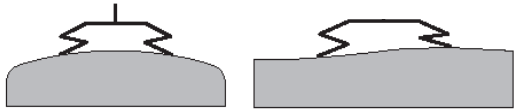
Scelta del tipo presa pneumatica

Forma e superfici

Standard

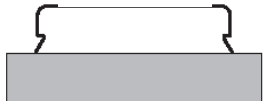
sup. piane o leggermente ondulate/curve

A soffietto



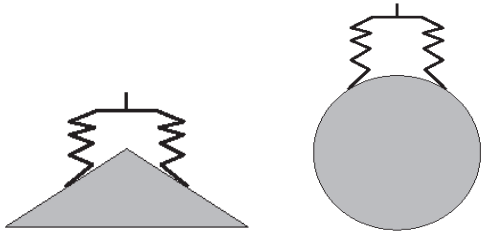
sup. smussate, curve, ampie o pieghevoli

Ovale



sup. rettangolari o snelle, come profilati o tubi

Extra profonda

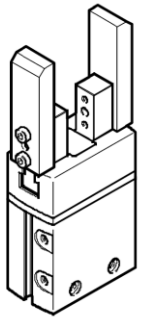


sup. delicate, come vetro o lampadine
compensatore di altezza

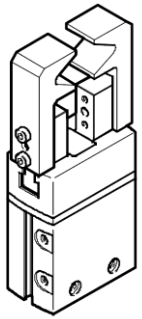
Scelta del tipo di presa meccanica

Pinze parallele

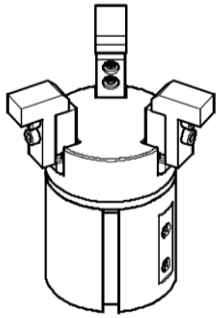
Con dita non sagomate



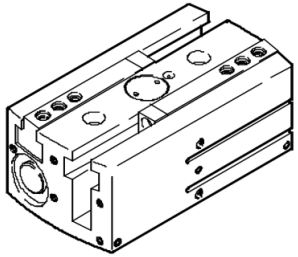
Con dita sagomate



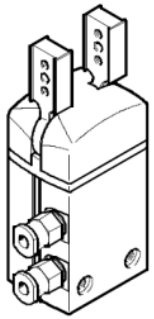
Pinze a tre griffe autocentranti

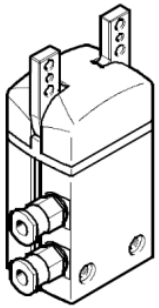


Pinze parallele a corsa lunga

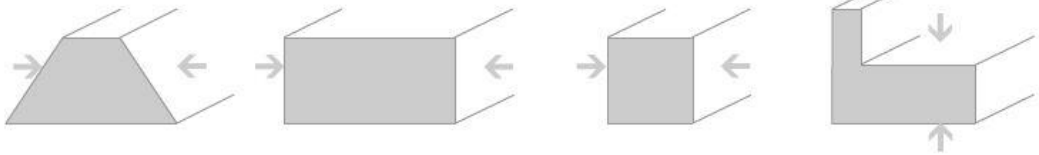


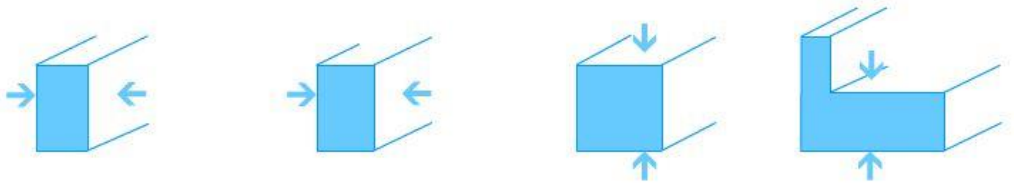
Pinze radiali/angolari





Scelta del tipo di presa meccanica





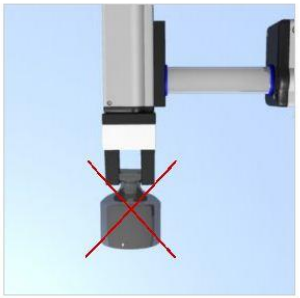
Afferrare sempre l'oggetto su superfici parallele

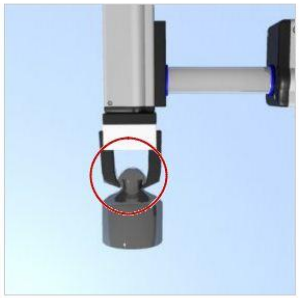
Ridurre al minimo la corsa di afferraggio

Dove possibile afferrare l'oggetto concordemente alla direzione del moto

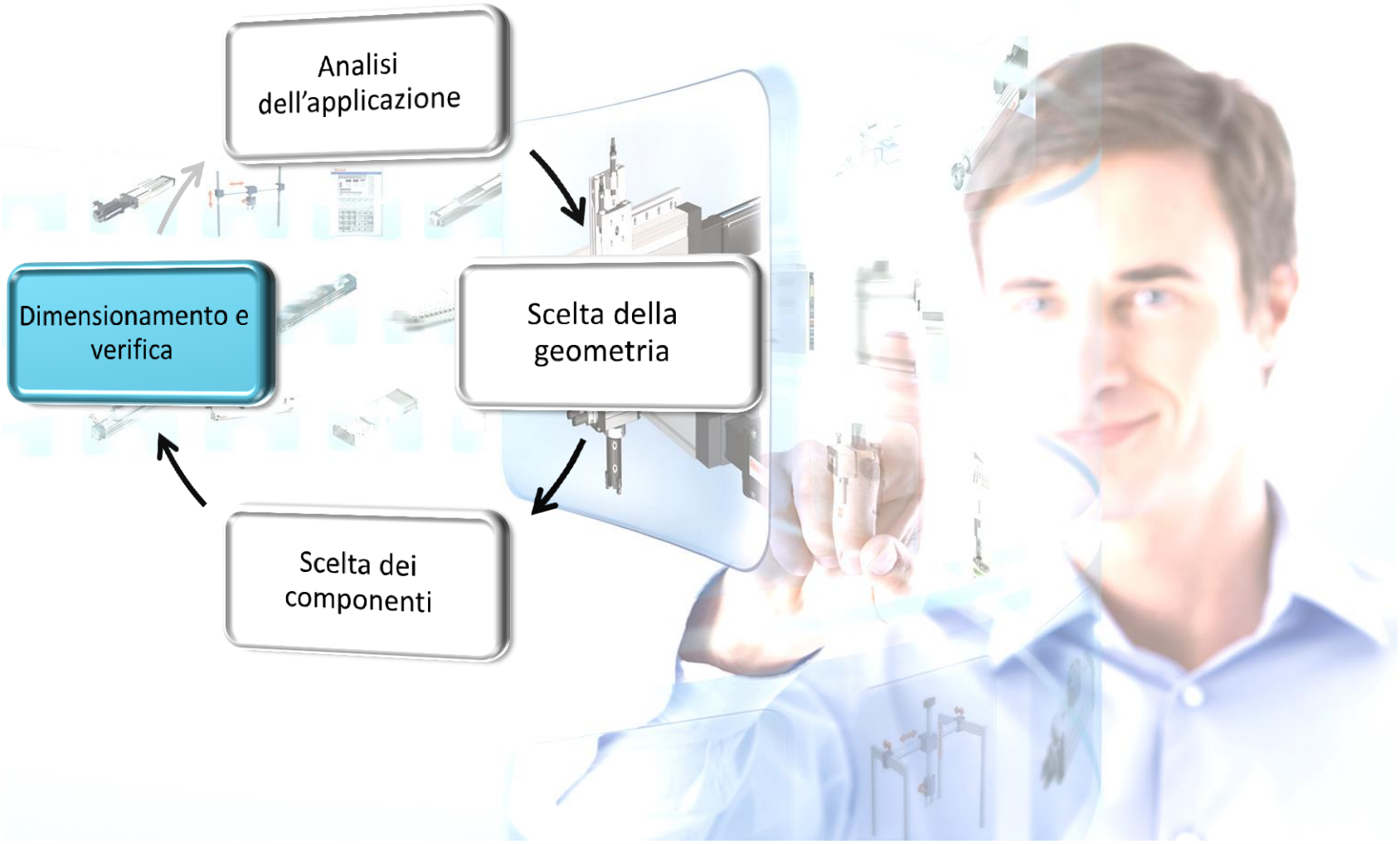
Afferrare l'oggetto il più vicino possibile al suo centro di massa

E' sempre preferibile utilizzare dita di presa che non reggano il pezzo solo per attrito ma che abbiano un accoppiamento geometrico.

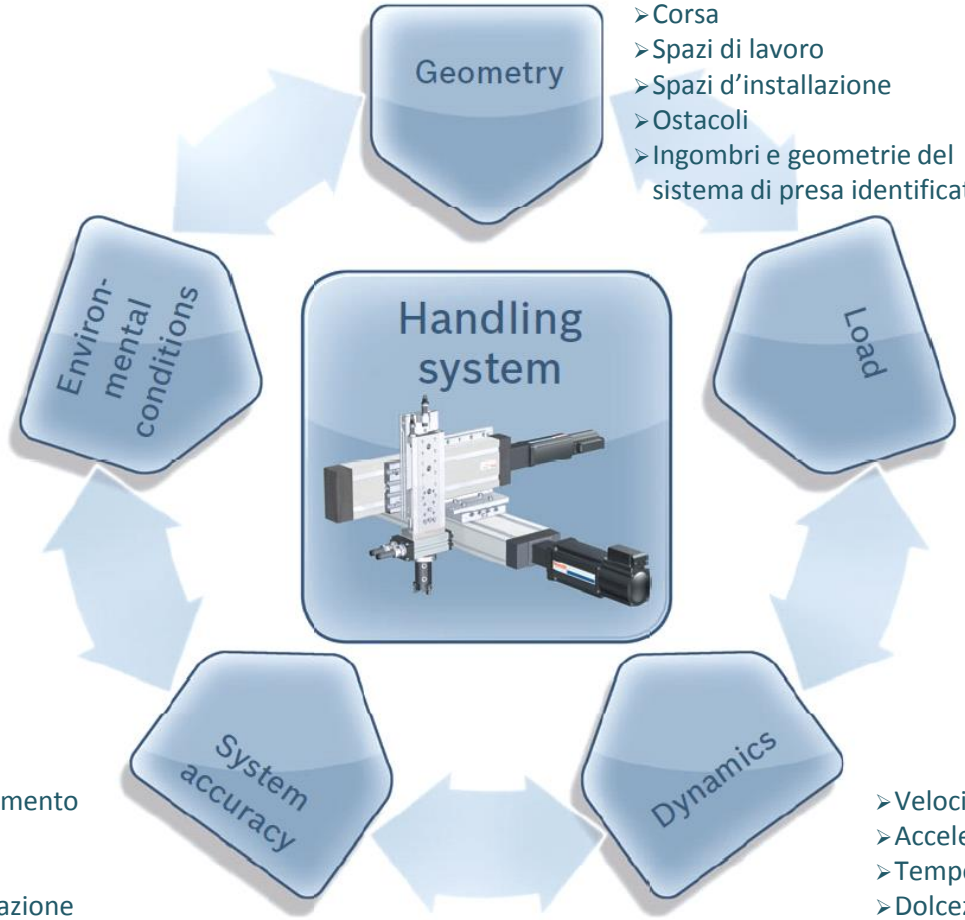




Progettazione di un Sistema Meccatronico



I parametri di verifica



- Corsa
- Spazi di lavoro
- Spazi d'installazione
- Ostacoli
- Ingombri e geometrie del sistema di presa identificato

- Masse trasportate
- Forze
- Momenti
- Carichi extra
- Durata a fatica dei componenti

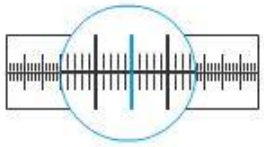
- Velocità
- Accelerazione
- Tempo ciclo
- Dolcezza di funzionamento

- Precisione di posizionamento
- Precisione della corsa
- Rigidezza
- Necessità di sincronizzazione

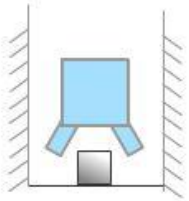
- Ambiente operativo
- Temperatura
- Umidità
- Presenza di contaminanti
- Presenza di sporcizia
- Caratteristiche del materiale lavorato

Verifica del sistema di presa

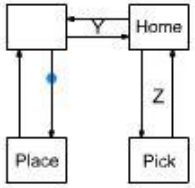
E’ necessario verificare le scelte fatte sulla base dei dati disponibili



Positioning accuracy

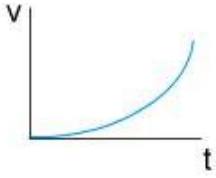


Gripper freedom

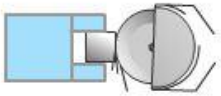


Cycle time

Set-down conditions



Acceleration



Contamination

repeat

Presa pneumatica?

Presa meccanica?

Flusso di lavoro pratico
nella progettazione di un Sistema Meccatronico

Flusso di lavoro pratico

Analisi per quotazione

- Analisi dell'applicazione
- Scelta della geometria
- Scelta componenti
- Verifiche tecniche principali

Approfondimento tecnico

- Verifica sistema di guida
- Verifica sistema di azionamento
- Verifica di motore e drive
- Verifica tempi ciclo
- Considerazioni sulla struttura
- Verifica del sistema di presa
- Eventuale progettazione dita di presa speciali
- Valutazione soluzioni energy saving

Dettagli

- Componenti opzionali
- Interruttori e fine corsa
- Protezioni
- Accessori specifici