

Safety instructions for ReBeL[®]



igus.eu/rebel

igus[®] ReBeL[®]

motion plastics[®] ...

igus[®]

1. General legislation and standards

Collaborative robot systems fall under the scope of the EC Machinery Directive 2006/42/EC. They must be provided with an EC Declaration of Conformity and a CE mark before being made available on the market. The application of the harmonised European standards EN ISO 10218-1 [2] and EN ISO 10218-2 [3] triggers the so-called presumption of conformity. It can therefore be assumed that the requirements of the EC Machinery Directive have been complied with. As the robot weighs less than [10kg], it falls into the robot class.

The collaborative robot system comprises the collaborative robot(s), tools, workpieces and devices that together form a machine in accordance with the EC Machinery Directive. A single robot is considered partly completed machinery. Partly completed machinery must be provided with a declaration of incorporation instead of an EC Declaration of Conformity.

Info:

The igus® ReBel® robot is only provided with a declaration of incorporation. The preparation of an EC Declaration of Conformity for the robot system is the sole responsibility of the distributor.

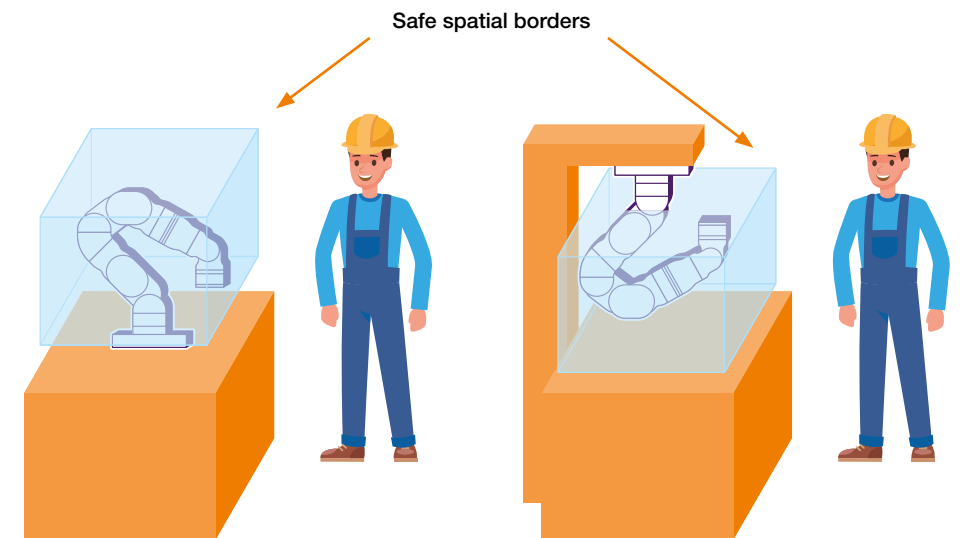
2. Your robot system (application)

In addition to the robot, the robot system also includes the robot tools, the workpieces, conveyor technology and all devices and protective equipment involved.

Large, angular and heavy workpieces are not suitable for this type of collaboration according to the current state of the art. The inertia of heavy workpieces usually leads to the force or pressure limits being exceeded.

Due to the proximity to humans, the robot movements (paths) intended for collaborative operation are also decisive. As a rule, the system design and the movement range's "Safe limitation" function (safe spatial borders) must be used to limit the robot's travels, including tool and workpiece, so as to exclude sensitive body parts, such as the head and neck, from the work area during intended use.

In principle, the system concept must rule out contact with the head, even in the case of foreseeable misuse. If this cannot be fully guaranteed, these contact situations must be minimised. For these contact situations, measurements of the biomechanical limit values must be carried out. However, sensitive areas of the head or neck (e.g. eyes or larynx) must not become a point of contact under any circumstances.



If risks still exist, these areas must be excluded from access, e.g. by means of additional separating (transparent) protective devices, and provided with additional instructions for users.

Info:

Generally, contact situations between people and the robot system must be kept to a minimum. Contact between the robot and the head/neck area must generally be ruled out. Crushing between the robot and surrounding equipment is prohibited. Avoid points, sharp edges and shearing edges within the robot system.

3. Limit values of igus® ReBeL®

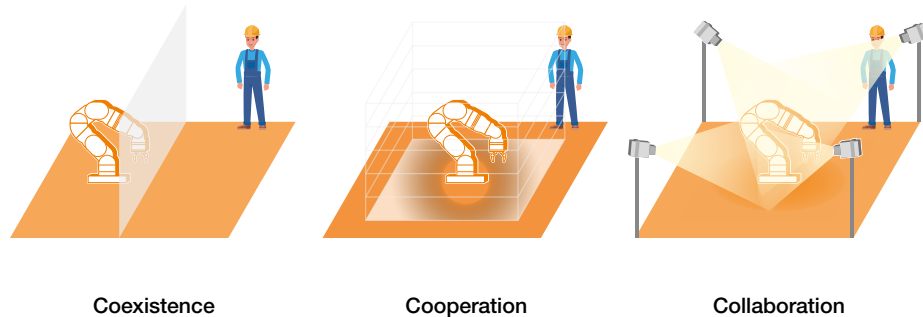
The ReBeL® robot has no power and force monitoring. The following measurement results of the biomechanical loads must be observed when setting up the robot system. The risk assessment in the appendix must also be taken into account.

Info:

The ReBeL® may only be used if static contact and any contact with the head and neck area are excluded.

4. Types of collaboration

There are different types of collaboration in robotics. As a rule, these are the following.



Info:

The use of the ReBeL® is recommended in coexistence and cooperation. However, it can also be used in collaboration after a test of the biomechanical loads.

The limit values marked in green are complied with in the event of a collision with the robot's TCP. All other types of contact and positions should be avoided.

Body localisation		Limit values			
Specific localisation	Body region	QS*		TR**	
		Compressive force [N/cm²]	Force [N]	Compressive force [N/cm²]	Force [N]
1 [1] Centre of forehead	1 Skull and forehead	130	130	130	130
2 [2] Temple	1 Skull and forehead	110	130	110	130
3 [3] Masticatory muscle	2 Face	110	65	110	65
4 [4] Neck muscle	3 Neck	140	150	280	300
5 [5] Spinous process 7th cervical vertebra	3 Neck	210	150	420	300
6 [6] Shoulder joint	4 Back and shoulders	160	210	320	420
7 [7] Spinous process 5th lumbar vertebra	4 Back and shoulders	210	210	420	420
8 [8] Sternum	5 Chest	120	140	240	280
9 [9] Pectoral muscle	5 Chest	170	140	340	280
10 [10] Abdominal muscle	6 Belly	140	110	280	220
11 [11] Pelvic bone	7 Pelvis	210	180	420	360
12 [12] Deltoid	8 Upper arm and elbow	190	150	380	300
13 [13] Humerus	8 Upper arm and elbow	220	150	440	300
14 [14] Radius	9 Forearm and wrist	190	160	380	320
15 [15] Forearm muscle	9 Forearm and wrist	180	160	360	320
16 [16] Arm nerve	9 Forearm and wrist	180	160	360	320
17 [17] Index fingertip dominant	10 Hand and finger	300	140	600	280
18 [18] Index fingertip not dominant	10 Hand and finger	270	140	540	280
19 [19] Index finger joint dominant	10 Hand and finger	280	140	560	280
20 [20] Index finger joint not dominant	10 Hand and finger	220	140	440	280
21 [21] Thenar eminence	10 Hand and finger	200	140	400	280
22 [22] Palm dominant	10 Hand and finger	260	140	520	280
23 [23] Palm not dominant	10 Hand and finger	260	140	520	280
24 [24] Back of hand dominant	10 Hand and finger	200	140	400	280
25 [25] Back of hand not dominant	10 Hand and finger	190	140	380	280
26 [26] Thigh muscle	11 Thigh and knee	250	220	500	440
27 [27] Kneecap	11 Thigh and knee	220	220	440	440
28 [28] Shinbone	12 Lower leg	220	130	440	260
29 [29] Calf muscle	12 Lower leg	210	130	420	260

Fulfils the requirements according to the test in relation to the TCP***
 *QS = Quasi-Static **TR = Transient contact ***TCP = Tool Centre Point

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Subject to technical alterations. MAT0075649.20 Issue 12/2023

