

## Quote for Robotic Equipment

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- Deadline: 10 August 2010, 17:00 Brussels time

### 1 Background information

This quote for robotic equipment is related to the EU-funded FP7 project ECHORD (European Clearing House for Open Robotics Development, Grant Agreement Number 231143).

In the context of ECHORD, small-scale projects, so-called “experiments” will be conducted, which will use state-of-the art robotic equipment. The third call for experiment proposals is planned to be published on 24 August 2010. The proposers of experiments, typically research institutes, will be given the opportunity to buy equipment from a qualified equipment list (see section 2.2) from European Robot manufacturers at special prices. The research institutes will perform research and development with relevance to industrial applications. This will initiate knowledge transfer between industry and academia.

A manufacturer can either solely sell the equipment to an experiment, or it can become a partner in the experiment’s consortium. In both cases, a research partner of the experiment’s consortium has to buy the equipment according to the conditions and prices given in the qualified equipment list.

A general overview of the project is given in the document “ECHORD: Background, objectives and implementation”.

The objective of this quote for robotic equipment is to update the list of qualified equipment. **Manufacturers of robotic equipment are asked to submit offers or to update the offers submitted for previous quotes for robotic equipment. The equipment will be classified in different categories (grouped by functionality and price range).**

The equipment for the experiments will be divided into classes of standard components, accessories, such as cables or mounting material, and custom designed devices. Standard components and accessories will be grouped into pre-defined categories for comparability (e.g., a 6 kg payload six axis robot with controller, programming environment, force-sensor, colour camera and gripper). The categories are given in annex 3 “Types and price categories”. For non-standard or prototypical custom-designed devices, typical building blocks (“components”) are recommended to be proposed by manufacturers (e.g., motors,

axes, controllers, peripherals). With respect to the relatively short duration of experiments, it is strongly recommended to offer packages which include everything for a quick and easy start.

The qualification of equipment for the list does not necessarily mean that the equipment will be bought by research institutes and used in an experiment. Similar equipment from different manufacturers may be available so that the experiment consortium can choose with respect to various criteria, such as functionality, software, support, training, price, etc.

**It is up to the experiment consortium to decide which equipment they want to buy and in which quantities.**

For transparency and fairness reasons, the list (including prices) is fixed before a call for experiment proposals is issued and no modifications will be made while the call is open. The list is updated between the calls for experiment proposals.

## 1.1 Scenarios and research foci

**Three scenarios** for likely future robot use have been defined to outline the scope of research work to be performed in the experiments. These scenarios make it possible for all stakeholders to get a clear picture if and how their proposed work and envisaged results can be embedded into a coherent vision of robotic applications. Thus, they describe the application context from an exterior view. The individual scenarios are described in Section 1.2.

For breaking down the application-driven scenarios into **four research foci** have been identified. The research foci guide the research work. They were chosen as to provide a complete coverage of the relevant aspects of all the scenarios. The research foci are described in section 1.3.

## 1.2 Scenarios

The set of research topics and subjects in the field of robotics is virtually unlimited. Thus, ECHORD uses a clear thematic research orientation which is reflected in **scenarios**.

Three **scenarios** have been identified which are both scientifically challenging and commercially relevant. They represent comprehensive sets of challenges in an illustrative way, so that robotics experts can easily relate their own research to them. The scenarios build on each other.

The **first scenario** of ECHORD is the **human-robot co-worker**. In this scenario, the traditional idea of a robot performing pre-programmed action will change drastically, in that a robot co-worker interacts with a human towards achieving a common goal.

The **second scenario** is the **hyper-flexible cells scenario**. This scenario envisages not only one or more highly dexterous and cooperative robots, but also the hardware and software integration of the robots with an automatic warehouse system and the other

devices present in the cell.

The **third scenario** is the **cognitive factory**. This future scenario will embrace both the first and the second scenario and take the classical concept of the flexible manufacturing systems to a new level. Cognitive factories will, to a large extent, configure themselves and be fault-tolerant. They will contain autonomous robots jointly participating in the production process with their human counterparts.

### 1.3 Research foci

Within the scenarios, different **research foci** have been identified. The research foci are reference points for the expected scientific progress of experiment proposals. They bring together mechanical design and controller technology from manufacturers with the knowledge and experience in sensing, cognition and behaviour control of the research community.

The **first research focus** is on **human-robot interfacing and safety**. Here, the main goal of the experiments is to show that safe human-robot cooperation is possible, taking all kinds of sensor failures and inconsistencies into account.

The **second research focus** is on **robot hands and complex manipulation**. Here, the experiments will have to show the improvement of laboratory setups towards practical usability as well as promising breakthroughs in the areas of sensors and sensor-guided manipulation.

The **third research focus** is on **mobile manipulators and cooperation**. Here, mobile manipulators will have to solve concrete problems in dynamically changing environments with moving obstacles and interaction with humans.

The **fourth research focus** is on **networked robots**. Here, two areas are possible: One is networked industrial robots, where the expectation is to use demonstrators that can only be built in collaboration between industry and academia, with industry providing controller architecture and academia contributing knowledge in advanced real-time networking technologies as well as service-oriented architectures. The second area concerns more loosely coupled systems, where experiments with mobile robots are expected that establish new showcases, e.g. in the area of search and rescue with robots, new applications of robots in urban areas, and robot systems for monitoring tasks.

The intended relation between scenarios and research foci is given in the following non-exhaustive table:

Research focus	Scenario	Scenario 1: Human-robot co-worker	Scenario 2: Hyper- flexible cells	Scenario 3: Cognitive factory
Focus 1: Human-robot interfacing and safety		X		
Focus 2: Robot hands and complex manipulation		X	X	
Focus 3: Mobile manipulators and cooperation		X	X	X
Focus 4: Networked robots			X	X

## 1.4 Intended use of equipment

The upcoming **third call** for ECHORD experiment proposals recommends deriving applications from the **third scenario**, the **cognitive factory**.

This scenario will embrace both the first and the second scenario and take the classical concept of the flexible manufacturing systems to a new level. A cognitive factory will be composed of a multitude of machines with built-in sets of cognitive skills for adaptation – to the environment, to the manufacturing processes and objects, as well as to the human co-worker. Cognitive factories will, to a large extent, configure themselves and be fault-tolerant. They will contain autonomous robots jointly participating in the production process with their human counterparts. The cognitive skills needed include perception of assembly objects, perception of context conditions and the assessment of production results. Moreover, through “introspection” based on the integration of all available sensory information, models of context-specific operations of machines (and the output they produce) can be autonomously constructed. These models will enable the factories to further optimize themselves by modifying machine parameters and avoid failures, based solely on prediction.

## 2 Form and content of an offer

### 2.1 General information

This quote for robotic equipment is open from 9 July 2010 and will be closed on 10 August 2010 at 17:00 Brussels time. The offer must meet the following requirements:

- It has to be submitted electronically by the given deadline. The details of electronic submission will be made available on the ECHORD web site [www.echord.info](http://www.echord.info).
- It must comprise all documents listed in section 2.3.

## 2.2 Qualified equipment list

### 2.2.1 Process for updating the qualified equipment list for the third call for experiment proposals

- The manufacturers of equipment are asked to submit offers or update the list which was set up for the previous calls through the web platform of ECHORD ([www.echord.info](http://www.echord.info)). The equipment list generated for the third call will be copied so that there is no need for entering these items anew.
- The equipment offer information needs to be confirmed by the manufacturer on the website before it can be made available to experiment proposers.
- If an equipment item, which was on the list of the previous call, is no longer being offered, the manufacturers are asked to remove it from the list.
- To update the list of equipment, a qualification process (see 2.2.3) is carried out by the Executive Committee of ECHORD. The list will be finally approved by the European Commission.
- Price negotiations may take place after an overview of the offered equipment is available to avoid big price differences for similar equipment.
- All equipment that is selected and whose price and terms of usage are confirmed will be put on the equipment list, from which the experiment proposers can choose the equipment they are interested in.
- There will be no ranking of the equipment. All equipment on the list will be treated equally.
- If one specific item (single robot or kit) in the offer does not meet the criteria (e.g., by being out of the scope of the quote), it will not affect the rest of the offer.
- After the equipment list is finalized (after negotiations), the manufacturers commit themselves to sell the equipment to all experiments. The conditions of sale are fixed and will be the same for all experiments.

### 2.2.2 Pricing and dissemination levels of the price list

For standard components, prices may be negotiated with the ECHORD consortium if there is similar equipment from different manufacturers with a big price difference. These prices will not be revealed to the public. The actual price list will be given only to potential experimenters who give evidence for serious interest in submitting a proposal. This is done by registering for proposal submission (including an experiment title) with the ECHORD web platform. The price list must be kept confidential. For potential experiment proposers to judge whether the equipment has an attractive price for their experiment proposal, an indicative price range category will be made available together with the call for experiments. For non-standard equipment, i.e., equipment that manufacturers can build to the experimenters' specifications, tendering manufacturers will have to provide component or package specifications with prices (plus their labour costs in EUR/hour for the design and assembly of the end device from the components).

Expecting each experiment to have a budget of approx. 300,000 euros, the hardware costs should usually be well below 100,000 euros. This should be reflected in the price and the contents of an offered item or package.

### 2.2.3 Qualification criteria

- The offer must be made by a manufacturer established in one of the member states of the EU or in an associated country. For a list of associated countries, see [ftp://ftp.cordis.europa.eu/pub/fp7/docs/third\\_country\\_agreements\\_en.pdf](ftp://ftp.cordis.europa.eu/pub/fp7/docs/third_country_agreements_en.pdf).
- The type of equipment must be within the scope of this call.
- The offer must include all statements (such as guarantee, software, ...) given in annex 2.

### 2.3 Structure of an offer

For easy offer generation, we provide the following templates or web forms which are available on the ECHORD web site [www.echord.info](http://www.echord.info):

- Form 1: Company information (annex 1 shows which information is asked in the form, but the form itself will be a web form)
- Form 2: Description of offered equipment (annex 2 shows which information is asked in the form, but the form itself will be a web form)

Form 2 is structured as follows:

1. Description of items for the equipment list including type of equipment as given in the annex 3 "Types and price categories". An item can be a component, a robot, another functional unit or a package containing several of these and/or other equipment. Pricing information (confidential) and price category (for rough information for experiment proposers) must be provided.
2. Statements on guarantee, maintenance, support/training and software:
  - 2.1 Guarantee: The guarantee included in the price after the experiment has bought the equipment (minimum: 30 months).
  - 2.2 Maintenance and after-sales service: Manufacturers must commit themselves to provide full maintenance included in the price after the experiment has bought the equipment (minimum: 30 months).
  - 2.3 Training and Support: A statement of the training and/or the support provided by manufacturers must be given.
  - 2.4 Software: A statement of the software included or provided by manufacturers and

the terms and conditions of usage, modification, disclosure during the experiment and afterwards must be given.

3. Application suggestions in which the equipment can be used are strongly recommended to give ideas to potential experiment proposers. In case of special equipment, please provide additional descriptions of previous uses of the equipment in the above mentioned scenarios (e.g. Scenario 3, cognitive factory).
4. Technical specifications

### **2.3.1 Payment and usage modalities**

The experimenter buys the equipment at the beginning of an experiment. Re-use and re-selling of equipment bought by a research partner of an experiment is restricted unless agreed otherwise with the manufacturer. As a general rule, re-sale is not allowed for 3 years after completion of the experiment.

### **2.3.2 Special equipment and prototypes**

For special equipment, manufacturers should provide the technical specifications of the components with their prices. They should also provide the descriptions of two recent sample devices that were produced as custom designs, together with an indication of the approximate special price intended for experiments. This information only serves the purpose of delineating the range of devices that can be provided as part of the manufacturers's capabilities to deliver special equipment.

## **3 Annexes**

1. Form 1: Identification of the company (this will be a web form)
2. Form 2: Description of offered equipment and sample application(s) (this will be a web form)
3. Types and price categories for the equipment list (pdf)
4. Background document (pdf)