

# Definition of skill lists and engineering levels at Innomet system

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# 1. Skill types

Skill types are categorised in INNOMET system as follows (see Fig. 1 below):

- 1 General Skills
- 2 Basic Skills
- 3 Special Skills
- 4 Personal identities

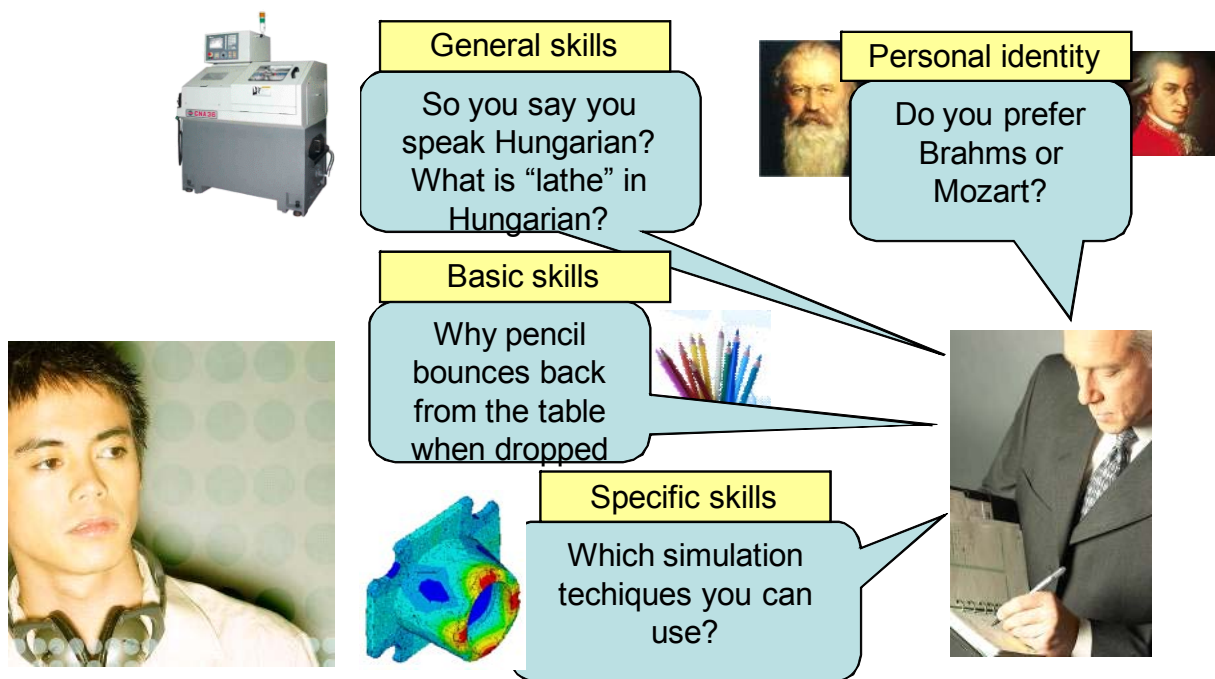


Fig. 1 Competence evaluation: existing competency

## 2. Skills

Skills are defined by system administrator and cannot be changed by other users. A recommended skills list is shown in Table 1.

Table 1. Skills list

No	Skill
1	3D modelling skills
2	Able to work independently
3	Accounting law knowledge
4	Accuracy and correctness
5	Administration skills
6	Analysing skills
7	Angular and double T-joints welding
8	Assembling skills
9	Assembling technologies
10	Assembling with detachable joints
11	Automated equipment using skills
12	Banking activity
13	basic Italian language skills
14	basics in mechatronics
15	Basics of micro and macro economics
16	Bookkeeping basics
17	Boring basics
18	Budgeting skills
19	Business culture
20	Business ethics
21	Business law and revenue code knowledge
22	Business law knowledge
23	Business plan writing skills
24	CAD systems knowledge
25	CAD systems user skills
26	CAD systems using skills
27	CAD/CAM user skills
28	Calculation of measuring chain
29	Cash flow planning skills
30	Circular welding skills
31	CNC machine tools general knowledge
32	CNC programming knowledge
33	CNC programming special skills
34	Communication skills
35	competence linguistic
36	Computer skills
37	Concentration ability
38	Construction calculations
39	Construction optimisation general knowledge

40	Construction optimisation
41	Constructions assembly
42	Contracting formalities
43	Control programs composing skills
44	Creativity
45	Culture
46	Cutting tool sharpening skills
47	Cutting data adjusting and tool life inspection ability
48	Cutting parameters adjustment skills
49	Cutting tools know-how
50	Cutting tools knowledge
51	Cutting tools selection
52	Decision-making skills
53	Design skills
54	Detail drawings reading skills
55	Die casting basics
56	Dies and moulds
57	Document Management Knowledge
58	Document management skills
59	Economic knowledge
60	EDM capabilities knowledge
61	EDM technology knowledge
62	Electric safety general knowledge
63	EN 287 knowledge
64	EN 729 implementation skills
65	Energetics general knowledge
66	Ensuring and securing quality
67	Enterprise manufacturing processes knowledge
68	Enterprise products and services knowledge
69	Enterprise quality management system knowledge
70	Enterprise resource planning skills
71	Enterprise structure knowledge
72	Enterprise technological capabilities knowledge
73	Environmental protection
74	ERP user skills
75	Essential norms and standards
76	Etiquette
77	FEM implementation skills
78	Finance basics
79	Financial analysis skills
80	Financial knowledge
81	Financial ratios
82	Finding and solving bottlenecks in production
83	First aid skills
84	Fiscal control skills
85	Fitter's tools using
86	Forming of technical drawings
87	Future visions prediction skills

88	General broaching knowledge
89	General EDM knowledge
90	General knowledge about products
91	General knowledge about grinding machine tools
92	General knowledge about logistics
93	General knowledge about machine tools
94	General knowledge about material engineering
95	General knowledge about milling machine tools
96	General knowledge about welding equipment and gases
97	General knowledge about welding methods and techniques
98	general knowledge for manufacturing a gear-wheel
99	General knowledge in machine tools
100	General knowledge in standardisation
101	General knowledge of machinery
102	General knowledge of mechanical engineering technology
103	General knowledge of pricing
104	General machine design skills
105	General marketing knowledge
106	General technical knowledge
107	Grinding skills
108	Grinding technology knowledge
109	Grinding tools knowledge and use
110	Grinding tools selection depending on different geometry
111	Hoisting equipment using skills
112	Innovation implementation skills
113	Innovation management skills
114	Innovativity
115	Internet using skills
116	ISO quality standards knowledge
117	Juridical knowledge
118	Knowledge about own Products
119	Knowledge about suppliers
120	Knowledge about surface finishing technological capabilities
121	Knowledge in BSC field
122	Knowledge in CAM systems
123	Knowledge in CNC technological capabilities
124	Knowledge in Computers
125	Knowledge in employment law
126	Knowledge in engineering materials
127	Knowledge in ERP systems
128	Knowledge in finishing materials
129	Knowledge in finishing technologies
130	Knowledge in fitter's tools

131	Knowledge in grinding machine tools capabilities
132	Knowledge in Machine Automation
133	Knowledge in manufacturing technologies
134	Knowledge in milling technologies
135	Knowledge in repair shop firms
136	Knowledge in statistics
137	Knowledge in Timing
138	Knowledge of designing control programs for CNC machine tools
139	Knowledge of machine elements
140	Knowledge of machine parts
141	Knowledge of machine shops
142	Knowledge of manufacturing technologies
143	Knowledge of materials and marking reading
144	Knowledge of materials for machinery
145	Knowledge of measuring equipment
146	Knowledge of measuring techniques
147	Knowledge of modern equipment and machinery
148	Knowledge of occupational safety and environmental protection
149	Knowledge of occupational safety
150	Knowledge of processes of the field
151	Knowledge of quality management
152	Knowledge of specific materials
153	Knowledge of subdivisions functioning and tasks
154	Knowledge of surface quality measurement equipment
155	Knowledge of working principles and capabilities of necessary equipment
156	Language skills
157	Leadership
158	Learning readiness
159	Machine design basics
160	Machine design skills
161	Machine tool adjusting skills
162	Machine tool capabilities knowledge
163	Machine tool fitting skills
164	Machine tool operating skills
165	Machine tools general knowledge
166	Machine tools repair skills
167	Machining tools capabilities
168	Management knowledge
169	Management skills
170	Management theory knowledge
171	Marketing policy knowledge
172	Marketing policy making skills
173	Marketing skills
174	Marking and lining-up skills
175	Measuring circuit solving



176	Measuring equipment using skills
177	Measuring techniques
178	Metal cutting theory
179	Metalworking knowledge
180	Metalworking skills
181	Metrology and measurement
182	MIG/MAG welding knowledge
183	Milling machine tools capabilities knowledge
184	Milling skills
185	Minimizing welding deformations
186	Motivation
187	Mounting (basing) skills
188	Negotiation skills
189	Office equipment knowledge
190	Office equipment using skills
191	Operations technology management
192	product price optimisation skill
193	Orders handling and planning skills
194	Organizing capacity
195	Painting skills
196	Paperwork skills
197	Personal safeguard using skills
198	Persuasion skills
199	Planning skills
200	Polishing knowledge
201	Polishing materials knowledge
202	Polishing skills
203	Polishing technology knowledge
204	Preparation of weldable constructions
205	Pricing principles
206	Problem solving
207	Process centred management skills
208	Processing tools knowledge
209	Product concept knowledge
210	Product development knowledge
211	Product experimentation skills
212	Production engineering in the field
213	Production engineering knowledge
214	Production logistics know-how
215	Production management at workplace
216	Production management skills
217	Production planning knowledge
218	Production planning skills
219	Production routes planning skills
220	Productivity development
221	Productivity management skills
222	Products and members knowledge
223	Professional knowledge

224	Profitable manufacturing organising skills
225	Project management skills
226	Project management knowledge
227	Protective gas welding skills
228	Purchase handling
229	Purposed management skills
230	Quality assurance knowledge
231	Quality management skills
232	Quality policy compilation skills
233	Rational profit-making management skills
234	Responsibility
235	Rush work tolerance
236	Salary administration and payroll accounting
237	Secretary knowledge
238	Selection of cutting tools for machining different geometrical features
239	Sense of liability
240	Simulation technologies skills
241	Skill of organisation of production
242	Skill of pre-initialisation of cutting instruments
243	Skill of using productive cutting conditions
244	Stainless welding
245	Standardisation and assignment of tolerances knowledge
246	Strategic management skills
247	Strength analysis skills
248	Supply chain management
249	Supply chain optimisation
250	Surface polishing basics
251	Surface preparation skills
252	Surface quality control skills
253	Surface roughness measurement skills
254	System creation and development
255	Teamwork organisation skills
256	Teamwork ability
257	Teamwork development ability
258	technical documentation knowledge
259	Technical drawings reading skills
260	Technical drawing
261	Technical general knowledge
262	Technical knowledge
263	Technical standards knowledge
264	Technological effectiveness calculation skills
265	Technology routing skills
266	Technology skills
267	Techno materials knowledge
268	Technological zero-point setup skills
269	Thick materials welding
270	TIG welding knowledge

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271	Timing calculations skills
272	Tool set and jigs basics
273	Tooling skills in machine tool
274	Tool using skills
275	Usage skills of different technological devices
276	Verbal and written communication skills
277	Welding equipment using
278	Welding materials knowledge and usage skills
279	Welding parameters selection skills
280	Welding skills
281	Welding technologies knowledge
282	Work environment knowledge
283	Work piece measurement and inspection skills

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**According to the aforementioned skills are generated skill card templates.**

### 3. Skill card templates

Skill card templates are recommended possibility for companies. However these can be easily generated or customized also for current need.

#### DESIGNER

#### Skill card template

##### skill

##### Special Skills

Technical standards knowledge  
Metrology and measurement  
Innovativity  
Enterprise technological capabilities knowledge  
FEM implementation skills  
Simulation technologies skills  
General knowledge of pricing  
Construction optimisation general knowledge  
Productivity management skills  
Project management skills

##### Personal identity

Creativity  
Motivation  
Learning readiness  
Organizing capacity  
Culture  
Responsibility  
Analysing skills  
Decision-making skills  
Sense of liability

##### Basic Skills

General machine design skills  
Knowledge of specific materials  
Purchase handling  
Knowledge of machine parts  
Construction calculations  
Strength analysis skills  
Measuring circuit solving  
Machine design skills  
Knowledge of quality management

##### General Skills

Technical general knowledge  
General knowledge about material engineering  
Computer skills  
Technical drawing  
General knowledge in standardisation  
Language skills  
CAD systems using skills  
Product development knowledge

## INDUSTRIAL ENGINEER

### Skill card template

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#### skill

##### Special Skills

Technical standards knowledge  
Knowledge of quality management

General knowledge of pricing  
Problem solving  
Products and members knowledge  
Enterprise technological capabilities knowledge  
Productivity management skills

##### Personal identity

Creativity  
Motivation  
Organizing capacity  
Culture  
Analysing skills  
Decision-making skills  
Sense of liability  
Responsibility  
Learning readiness

##### Basic Skills

Technology routing skills  
Operations technology management  
Knowledge of materials for machinery  
Timing calculations skills  
Tool set and jigs basics  
Calculation of measuring chain  
Cutting tools selection  
Knowledge of measuring equipment  
Knowledge of measuring techniques

##### General Skills

General knowledge about material engineering  
Technical general knowledge  
Technology skills  
Computer skills  
Machine tools general knowledge  
General knowledge in standardisation  
Knowledge in CAM systems  
Processing tools knowledge

## LEAD MECHANICAL DESIGNER

### Skill card template

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#### skill

##### **Special Skills**

Future visions prediction skills  
Innovativity  
Knowledge of quality management  
Environmental protection

##### **Personal identity**

Creativity  
Organizing capacity  
Teamwork organisation skills  
Responsibility  
Concentration ability  
Analysing skills  
Learning readiness

##### **Basic Skills**

Knowledge in engineering materials  
Purchase handling  
Machine design skills  
Knowledge of machine elements  
Technological effectiveness calculation skills  
Strength analysis skills  
Construction optimization  
CAD systems user skills  
Forming of technical drawings  
Essential norms and standards

##### **General Skills**

Product development knowledge  
Technical knowledge  
General knowledge of pricing  
Design skills  
CAD systems knowledge  
Language skills  
Computer skills

## MECHANICAL ENGINEER

### Skill card template

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#### skill

##### **Special Skills**

Able to work independently

##### **Personal identity**

Language skills

Sense of liability

Teamwork ability

Culture

Creativity

Decision-making skills

Planning skills

Accuracy and correctness

##### **Basic Skills**

Computer skills

Paperwork skills

Professional knowledge

Internet using skills

Protective gas welding skills

Welding skills

Metalworking skills

Knowledge of machine elements

Knowledge of working principles and capabilities of necessary equipment

Product experimentation skills

##### **General Skills**

Electric safety general knowledge

Enterprise products and services knowledge

Knowledge of occupational safety

Hoisting equipment using skills

## MECHATRONIC ENGINEER

### Skill card template

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#### skill

##### Special Skills

Calculation of measuring chain  
Technical drawing  
Business ethics  
Concentration ability  
Analysing skills  
Marketing skills

##### Personal identity

Etiquette  
Accuracy and correctness  
Responsibility  
Culture  
Problem solving  
Responsibility  
Sense of liability  
Learning readiness

##### Basic Skills

3D modelling skills  
Electric safety general knowledge  
CAD systems user skills  
CAD systems knowledge  
basics in mechatronics  
Assembling technologies  
Control programs composing skills

##### General Skills

Knowledge in Computers  
Knowledge of machine parts  
Technical drawing  
Assembling skills  
machine design basics  
Construction optimization



## TRANSPORTATION ENGINEER

### Skill card template

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#### skill

##### **Special Skills**

Supply chain optimisation  
Knowledge in Computers  
Business culture

##### **Personal identity**

Able to work independently  
Business ethics  
Negotiation skills

##### **Basic Skills**

Knowledge in ERP systems  
Computer skills  
Analysing skills

##### **General Skills**

General knowledge about logistics  
Knowledge about suppliers  
Production planning knowledge

## CNC OPERATOR

### Skill card template

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#### skill

##### Special Skills

Ensuring and securing quality  
Production management at workplace  
CNC programming special skills  
Skill of pre-initialisation of cutting instruments  
Skill of using productive cutting conditions

##### Personal identity

Sense of liability  
Accuracy and correctness  
Able to work independently  
Responsibility  
Concentration ability  
Teamwork ability  
Learning readiness

##### Basic Skills

Knowledge in CNC technological capabilities  
Technological zero-point setup skills  
Control programs composing skills  
Techno materials knowledge  
Detail drawings reading skills  
Production engineering in the field  
Machine tool operating skills  
Cutting tools knowledge  
Knowledge of measuring equipment  
Work piece measurement and inspection skills

##### General Skills

Computer skills  
CNC machine tools general knowledge  
Knowledge of manufacturing technologies  
Knowledge of occupational safety  
Economic knowledge  
Language skills  
CNC programming knowledge

## EDM OPERATOR

### Skill card template

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#### skill

##### **Special Skills**

Productivity development  
Ensuring and securing quality  
Tooling skills in machine tool  
Control programs composing skills

##### **Personal identity**

Sense of liability  
Accuracy and correctness  
Teamwork organisation skills  
Responsibility  
Concentration ability  
Decision-making skills  
Learning readiness

##### **Basic Skills**

EDM capabilities knowledge  
Machine tool adjusting skills  
Mounting (basing) skills  
Techno materials knowledge  
Detail drawings reading skills  
EDM technology knowledge  
Tool using skills  
Knowledge in Timing  
Knowledge of measuring equipment  
Work piece measurement and inspection skills

##### **General Skills**

Economic knowledge  
Knowledge of occupational safety  
Knowledge of manufacturing technologies  
General EDM knowledge  
Knowledge in Computers  
Language skills

## **FITTER**

### **Skill card template**

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#### **skill**

##### **Special Skills**

Problem solving  
Mounting (basing) skills  
CAD systems user skills  
CAD systems knowledge

##### **Personal identity**

Etiquette  
Teamwork ability  
Creativity  
Culture  
Motivation

##### **Basic Skills**

3D modelling skills  
machine design basics  
Tool using skills  
Analysing skills

##### **General Skills**

Assembling technologies  
Assembling skills  
Technical drawings reading skills  
Knowledge in fitter's tools

## FOREMAN

### Skill card template

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#### skill

##### Special Skills

Problem solving  
Productivity management skills  
Administration skills  
Finding and solving bottlenecks in production  
Teamwork organisation skills  
Salary administration and payroll accounting  
Ensuring and securing quality  
Project management knowledge

##### Personal identity

Creativity  
Motivation  
Organizing capacity  
Culture  
Teamwork development ability  
Communication skills  
Analysing skills  
Decision-making skills  
Sense of liability  
Learning readiness

##### Basic Skills

Knowledge in manufacturing technologies  
Rational profit-making management skills  
Knowledge of processes of the field  
Production planning skills  
Skill of organisation of production  
Knowledge of working principles and capabilities of necessary equipment  
Production logistics know-how  
Metrology and measurement

##### General Skills

General knowledge of machinery  
Economic knowledge  
Computer skills  
General knowledge about material engineering  
Production engineering knowledge  
Language skills  
General knowledge of pricing  
Business culture

## GRINDER

### Skill card template

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#### skill

##### Special Skills

Productivity development  
Ensuring and securing quality  
Cutting parameters adjustment skills  
Essential norms and standards  
Grinding tools selection depending on different geometry

##### Personal identity

Sense of liability  
Accuracy and correctness  
Teamwork organisation skills  
Responsibility  
Concentration ability  
Decision-making skills  
Learning readiness

##### Basic Skills

Knowledge in grinding machine tools capabilities  
Machine tool fitting skills  
Mounting (basing) skills  
Techno materials knowledge  
Detail drawings reading skills  
Grinding technology knowledge  
Grinding tools knowledge and use  
Knowledge in Timing  
Knowledge of measuring equipment  
Work piece measurement and inspection skills

##### General Skills

Computer skills  
Knowledge of occupational safety  
Knowledge of manufacturing technologies  
general knowledge about grinding machine tools  
Economic knowledge  
Language skills

## LOCKSMITH

### Skill card template

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#### skill

##### Special Skills

Essential norms and standards  
Welding technologies knowledge  
Knowledge of modern equipment and machinery  
Knowledge of occupational safety  
Hoisting equipment using skills  
Welding skills

##### Personal identity

Sense of liability  
Organizing capacity  
Teamwork development ability  
Responsibility  
Concentration ability  
Rush work tolerance  
Learning readiness

##### Basic Skills

Metalworking skills  
Marking and lining-up skills  
Detail drawings reading skills  
Assembling with detachable joints  
Usage skills of different technological devices  
Constructions assembly  
Techno materials knowledge  
Fitter's tools using  
Knowledge of measuring equipment  
Preparation of weldable constructions

##### General Skills

Computer skills  
Metalworking knowledge  
General knowledge of machinery  
Fitter's tools using  
Economic knowledge  
Language skills

## MACHINE TOOL OPERATOR

### Skill card template

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#### skill

##### Special Skills

Ensuring and securing quality  
Production management at workplace  
Cutting data adjusting and tool life inspection ability  
Cutting tool sharpening skills

##### Personal identity

Sense of liability  
Accuracy and correctness  
Able to work independently  
Responsibility  
Concentration ability  
Teamwork ability  
Learning readiness

##### Basic Skills

Machine tool capabilities knowledge  
Machine tool fitting skills  
Mounting (basing) skills  
Techno materials knowledge  
Detail drawings reading skills  
Production engineering in the field  
Machine tool operating skills  
Cutting tools knowledge  
Knowledge of measuring equipment  
Work piece measurement and inspection skills

##### General Skills

Computer skills  
General knowledge about machine tools  
Knowledge of manufacturing technologies  
Knowledge of occupational safety  
Economic knowledge  
Language skills



## MECHATRONICS TECHNICIAN

### Skill card template

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#### skill

##### Special Skills

CAD systems user skills  
Technical standards knowledge  
Teamwork ability  
Production engineering knowledge  
Measuring techniques

##### Personal identity

Culture  
Accuracy and correctness  
Responsibility  
Innovativity

##### Basic Skills

Control programs composing skills  
Innovation implementation skills  
Construction optimization  
Knowledge about own Products  
Product development knowledge  
machine design basics

##### General Skills

Computer skills  
General knowledge of machinery  
General knowledge of mechanical engineering technology  
basics in mechatronics

## METAL POLISHER

### Skill card template

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#### skill

##### Special Skills

Productivity development  
Ensuring and securing quality

##### Personal identity

Sense of liability  
Accuracy and correctness  
Teamwork organisation skills  
Responsibility  
Concentration ability  
Decision-making skills  
Learning readiness

##### Basic Skills

Polishing knowledge  
Polishing technology knowledge  
Mounting (basing) skills  
Techno materials knowledge  
Detail drawings reading skills  
Polishing materials knowledge  
Surface roughness measurement skills  
Knowledge in Timing  
Knowledge of measuring equipment

##### General Skills

Knowledge of manufacturing technologies  
Knowledge of occupational safety  
Computer skills  
Surface polishing basics  
Economic knowledge  
Language skills

## MILLER

### Skill card template

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#### skill

##### **Special Skills**

Ensuring and securing quality

Productivity development

Cutting parameters adjustment skills

Essential norms and standards

Selection of cutting tools for machining different geometrical features

##### **Personal identity**

Sense of liability

Accuracy and correctness

Teamwork organisation skills

Responsibility

Concentration ability

Decision-making skills

Learning readiness

##### **Basic Skills**

Milling machine tools capabilities knowledge

Machine tool fitting skills

Mounting (basing) skills

Techno materials knowledge

Detail drawings reading skills

Knowledge in milling technologies

Knowledge in Timing

Cutting tools know-how

Knowledge of measuring equipment

Work piece measurement and inspection skills

##### **General Skills**

Computer skills

General knowledge about milling machine tools

Knowledge of manufacturing technologies

Knowledge of occupational safety

Economic knowledge

Language skills

## PAINTER

### Skill card template

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#### skill

##### Special Skills

Ensuring and securing quality  
Production management at workplace  
Decision-making skills  
Problem solving

##### Personal identity

Sense of liability  
Accuracy and correctness  
Culture  
Responsibility

Concentration ability

Rush work tolerance

Learning readiness

##### Basic Skills

Knowledge in finishing technologies  
Knowledge in finishing materials  
Knowledge about surface finishing technological capabilities  
Surface preparation skills  
Painting skills  
Detail drawings reading skills  
Surface quality control skills  
Knowledge of surface quality measurement equipment

##### General Skills

Computer skills  
Technical general knowledge  
Environmental protection  
Knowledge of occupational safety  
Economic knowledge  
Language skills  
Personal safeguard using skills

## SHEET METAL WORKER

### Skill card template

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#### skill

##### Special Skills

Ensuring and securing quality  
Cutting parameters adjustment skills  
Essential norms and standards  
Selection of cutting tools for machining different geometrical features  
Productivity development

##### Personal identity

Sense of liability  
Accuracy and correctness  
Teamwork organisation skills  
Responsibility  
Concentration ability  
Decision-making skills  
Learning readiness

##### Basic Skills

Machining tools capabilities  
Machine tool fitting skills  
Mounting (basing) skills  
Techno materials knowledge  
Detail drawings reading skills  
Metal cutting theory  
Machine tool operating skills  
Cutting tools know-how  
Knowledge of measuring equipment  
Work piece measurement and inspection skills  
Knowledge in Timing

##### General Skills

Computer skills  
General knowledge about machine tools  
Knowledge of manufacturing technologies  
Knowledge of occupational safety  
Economic knowledge  
Language skills

## TOOLMAKER

### Skill card template

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#### skill

##### Special Skills

Enterprise technological capabilities knowledge  
Innovativity  
Essential norms and standards  
Grinding skills  
Milling skills  
Polishing skills  
Dies and moulds  
Calculation of measuring chain

##### Personal identity

Sense of liability  
Organizing capacity  
Motivation  
Responsibility  
Analysing skills  
Decision-making skills  
Learning readiness

##### Basic Skills

Metalworking skills  
Marking and lining-up skills  
Technical drawings reading skills  
Assembling skills  
Product experimentation skills  
Usage skills of different technological devices  
Measuring techniques  
Measuring equipment using skills

##### General Skills

Computer skills  
Metalworking knowledge  
Knowledge of manufacturing technologies  
Assembling technologies  
Economic knowledge  
Language skills  
Knowledge of occupational safety  
Standardisation and assignment of tolerances knowledge

## WELDER

### Skill card template

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#### skill

##### **Special Skills**

Personal safeguard using skills  
First aid skills  
Minimizing welding deformations  
EN 287 knowledge  
EN 729 implementation skills

##### **Personal identity**

Sense of liability  
Accuracy and correctness  
Able to work independently  
Responsibility  
Concentration ability  
Rush work tolerance  
Learning readiness

##### **Basic Skills**

Technical drawings reading skills  
Knowledge of materials and marking reading  
Welding materials knowledge and usage skills  
Welding parameters selection skills  
Welding equipment using  
MIG/MAG welding knowledge  
TIG welding knowledge  
Angular and double T-joints welding  
Circular welding skills  
Thick materials welding  
Stainless welding

##### **General Skills**

Computer skills  
General knowledge about welding equipment and gases  
General knowledge about welding methods and techniques  
Knowledge of occupational safety  
Economic knowledge  
Language skills  
Electric safety general knowledge

## DEVELOPMENT MANAGER

### Skill card template

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#### skill

##### Special Skills

Professional knowledge  
CAD systems user skills  
3D modelling skills  
technical documentation knowledge

##### Basic Skills

Accuracy and correctness  
General knowledge about welding equipment and gases  
Language skills  
Knowledge of modern equipment and machinery  
Able to work independently  
Internet using skills  
Pricing principles  
General knowledge about milling machine tools  
Enterprise products and services knowledge  
Enterprise technological capabilities knowledge  
Paperwork skills  
CNC machine tools general knowledge

##### General Skills

Productivity development  
Teamwork ability  
Enterprise manufacturing processes knowledge  
Leadership  
Computer skills  
Analysing skills



## PRODUCTION DIRECTOR

### Skill card template

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#### skill

##### **Special Skills**

Decision-making skills  
Persuasion skills  
Analysing skills  
Communication skills  
Knowledge in BSC field

##### **Personal identity**

Sense of liability  
Accuracy and correctness  
Teamwork organisation skills  
Responsibility  
Concentration ability  
Rush work tolerance  
Learning readiness

##### **Basic Skills**

Knowledge of specific materials  
technical documentation knowledge  
Work environment knowledge  
Machine tools general knowledge  
Technology skills  
Production planning skills  
Productivity management skills  
Knowledge in Timing  
Knowledge of measuring equipment  
Essential norms and standards

##### **General Skills**

General technical knowledge  
Economic knowledge  
General knowledge of mechanical engineering technology  
Knowledge of occupational safety  
Computer skills  
Language skills

## PRODUCTION MANAGER

### Skill card template

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#### skill

##### Special Skills

Decision-making skills  
Problem solving  
Productivity management skills  
Communication skills  
Teamwork organisation skills  
Analysing skills  
Ensuring and securing quality  
Project management knowledge

##### Personal identity

Creativity  
Motivation  
Teamwork development ability  
Organizing capacity  
Culture

Administration skills

Learning readiness

Decision-making skills

Sense of liability

##### Basic Skills

Knowledge in manufacturing technologies  
Knowledge of specific materials  
Knowledge of processes of the field  
Production planning skills  
Skill of organisation of production  
Knowledge of working principles and capabilities of necessary equipment  
Production logistics know-how  
Metrology and measurement

##### General Skills

General knowledge of machinery  
Economic knowledge  
Computer skills  
Internet using skills  
Production engineering knowledge  
Language skills  
Pricing principles  
Business culture

## PROJECT MANAGER

### Skill card template

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#### skill

##### **Special Skills**

Enterprise technological capabilities knowledge  
Knowledge of subdivisions functioning and tasks  
Productivity management skills  
General knowledge of pricing  
Simulation technologies skills  
Knowledge in ERP systems  
Innovativity  
Basics of micro and macro economics  
Administration skills  
Finding and solving bottlenecks in production

##### **Personal identity**

Organizing capacity  
Culture  
Analysing skills  
Decision-making skills  
Sense of liability  
Responsibility  
Learning readiness  
Creativity  
Motivation

##### **Basic Skills**

Orders handling and planning skills  
Supply chain management  
Knowledge of materials for machinery  
Enterprise resource planning skills  
Project management skills  
Profitable manufacturing organising skills  
Production routes planning skills  
Enterprise manufacturing processes knowledge  
Knowledge of quality management

##### **General Skills**

General knowledge about material engineering  
Technical general knowledge  
Knowledge of manufacturing technologies  
Computer skills  
Production engineering knowledge  
Production planning knowledge  
Project management knowledge  
Language skills

## PURCHASING MANAGER

### Skill card template

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#### skill

##### **Special Skills**

Planning skills

Business plan writing skills

Enterprise technological capabilities knowledge

Financial knowledge

Decision-making skills

Analysing skills

Knowledge of occupational safety and environmental protection

##### **Personal identity**

Creativity

Motivation

Organizing capacity

Culture

Persuasion skills

Administration skills

Decision-making skills

Analysing skills

Sense of liability

Learning readiness

##### **Basic Skills**

Basics of micro and macro economics

General knowledge about material engineering

Contracting formalities

Knowledge about suppliers

Supply chain optimisation

General knowledge about logistics

Knowledge about own Products

Marketing policy knowledge

##### **General Skills**

Technical general knowledge

General marketing knowledge

Language skills

Computer skills

Internet using skills

Juridical knowledge

General knowledge about products

Business culture

## QUALITY MANAGER

### Skill card template

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#### skill

##### **Special Skills**

Enterprise quality management system knowledge

Quality policy compilation skills

Document management skills

##### **Personal identity**

Sense of liability

Accuracy and correctness

Able to work independently

Responsibility

Concentration ability

Teamwork ability

Learning readiness

##### **Basic Skills**

Enterprise manufacturing processes knowledge

Enterprise structure knowledge

ISO quality standards knowledge

Quality management skills

Process centred management skills

Quality assurance knowledge

Problem solving

Analysing skills

Decision-making skills

Negotiation skills

##### **General Skills**

General knowledge of machinery

Economic knowledge

Knowledge of quality management

General knowledge of mechanical engineering technology

Computer skills

Language skills



## 4. Estimation of Needed Level

In the first stage of the process are determined training needs according to competency charts of the company. Competency charts are filled personally for each employee or vocation (e.g., CAD engineer, CNC operator, welder, etc.). The competency charts can be filled through Internet in every enterprise, whereas sensitive information of enterprise will remain undisclosed. The analysis is based on average indicators of vocations, industrial fields (tool making, machine-building, etc.) or on regional basis. The existing (EL) and needed levels (NL) are estimated in scale of weights from 0 to 5, where 0 means “the skill has no importance” and 5 means “the skill is has high importance”. In case the  $EL < NL$ , there exists need for additional training.

The system includes expert tools for deciding the needed competence level. In principle, the scales can be combined by own experience, by using the opinion of technical consultant or by integrated expert system. The expert system tool is based upon short questionnaire concerning production and management data. The estimation can be given for engineering staff, management staff or workpeople. Also single skills/knowledge can be evaluated using the same methodology. However, in practice the evaluation of every single skill separately can be time-consuming; therefore more general staff estimation is recommended. It gives a good reference about the real need for workforce level for a current enterprise job.

<b>MANUFACTURING ENGINEER/ MECHANICAL ENGINEER/TRANSPORTATION ENGINEER/MECHATRONIC ENGINEER</b>			
Situation description			
1	Number of various production processes		
	1-3	4-7	over 7
	1-2	3-4	5
2	Average number of operations in the process		
	less than 5	5-12	over 12
	1-2	3-4	5
3	Average number of workers in the production area		
	less than 50	51-150	over 150
	1-2	3-4	5
4	Average number of machine tools		
	less than 20	20-50	over 50
	1-2	3-4	5
5	Different products in production		
	less than 20	21-50	over 50
	1-2	3-4	5
6	Annual turnover (million EUR)		
	Less than 2	3-7	Over 7
	1-2	3-4	5
7	Materials to be machined		
	Good machinability	Average machinability	In addition with poor machinability
	1-2	3-4	5
8	Annual production, pieces		
	Less than 500	500-20000	Over 20000
	1-2	3-4	5
9	Surface quality ensuring technologies		
	Machining	Grinding	Honing, superfinish
	1-2	3-4	5
9	Quality control		
	Visual	Random, using different methods	100% with different methods
	1-2	3-4	5



<b>PRODUCT DEVELOPER/LEAD MECHANICAL DESIGNER/DESIGNER</b>			
Situation description			
1	Foreign languages skills		
	1-2	3-4	over 5
	Weight:	1-2	3-4
2	Average number of product development engineers in the enterprise		
	less than 5	5-15	over 15
	Weight:	1-2	3-4
3	Virtual testing		
	Virtual testing is not used	Virtual testing is used in some cases	Virtual testing is necessary in all developed products
	Weight:	1-2	3-4
4	Annual R&D budget share of company (million EUR)		
	Less than 0.2	0.2-1	Over 1
	Weight:	1-2	3-4
5	IP politics in company		
	Patent search is not necessary in product development	Patent searches are necessary	There is IP specialist in the company for patent search
	Weight:	1-2	3-4
6	Market analysis for product done in product development		
	Regional analysis	European level analysis	Global level analysis
	Weight:	1-2	3-4
7	Prototyping		
	Prototypes are not built	Simple prototypes	Full scale complex prototypes
	Weight:	1-2	3-4
8	CAD system used in company		
	2D	3D	FEM
	Weight:	1-2	3-4

<b>WELDING ENGINEER/INDUSTRIAL ENGINEER</b>			
Situation description			
1	Number of various production processes		
	1-3	4-7	over 7
	1-2	3-4	5
2	Average number of operations in the process		
	less than 5	5-12	over 12
	1-2	3-4	5
3	Average number of workers in the production area		
	less than 50	51-150	over 150
	1-2	3-4	5
4	Average durability of the machinery in use		
	More than 10 years	5-10 years	Less than 5 years
	1-2	3-4	5
5	Number of different assemblies/products per year		
	Less than 20	21-50	Over 50
	1-2	3-4	5
6	Annual turnover (million EUR)		
	Less than 2	3-7	Over 7
	1-2	3-4	5
7	Materials to be welded		
	Construction steels with good weldability	Stainless steels and other steels with limited weldability	Other materials (e.g. Al) in addition to steels.
	1-2	3-4	5
8	Different welding processes		
	1-2	3-4	Over 4
	1-2	3-4	5
9	Quality regulations for welding joints		
	Quality control of welds is not required	Simple requirements or random control	High requirements or 100% control of welds
	1-2	3-4	5

<b>CNC OPERATOR/EDM OPERATOR</b>			
Description of the situation			
1	Production characteristics I		
	Drill, lathe	Mill	Machining centre
	1-2	3-4	5
2	Production characteristics II		
	Machine tool is preset	Detail has to be set	Detail and instrument both have to be set
	1	2-3	4-5
3	Production characteristics III		
	Programs are entered centrally	Programming has to be done for similar type of details	Programming has to be done for different CNC systems
	1	2-3	4-5
4	Geometrical complexity of the workable detail (number of different surfaces to be machined)		
	Less than 8	8-15	Over 15
	1-2	3-4	5
5	Quality of the workable surface		
	< IT 12	IT 12 ... IT 8	> IT 8
	1	2-3	4-5
6	Selection and preset of tools		
	Is not necessary	At simple cases	Always
	1	2-3	4-5

<b>FITTER/LOCKSMITH/TOOLMAKER</b>			
Description of the situation			
1	Complexity of assembly (number of components of the product)		
	1-6	7-16	Over 16
	1	2-3	4-5
2	Nature of fitting process I		
	Mass production	Serial production	Individual manufacturing
	1	2-3	4-5
3	Nature of fitting process II		
	Fitting with special tool set	Fitting with universal tool set	Fitting without jigs and tool sets
	1-2	3-4	5
4	Types of joints in use		
	Single type	Two different types	3 and more
	1-2	3-4	5
5	Need for different type fitting operations		
	1-2	3-5	More than 5
	1	2-3	4-5
6	Different type fitter's skills		
	1-2	3-4	5 and more
	1-2	3-4	5
7	Accuracy of fitting the surfaces		
	$< \pm 1$ mm	$\pm 0.1$ mm ... 1 mm	0.01 mm ... 0.1 mm
	1	2-3	4-5
8	Use of control measuring instruments		
	Missing	Accuracy up to $\pm 0.1$ mm	Accuracy over $\pm 0.1$ mm
	1	2-3	4-5

<b>FOREMAN</b>			
Description of the situation			
1	Number of employees on the department		
	Less than 5	5-15	Over 15
	1	2-3	4-5
2	Number of different machine tools in the department		
	Less than 3	3-7	Over 7
	1	2-3	4-5
3	Production characteristics		
	Mass production	Serial production	Individual manufacturing
	1	2-3	4-5
4	Different products manufactured in the department		
	Less than 24	24-50	Over 50
	1	2-3	4-5
5	Number of different technologies in the department		
	Less than 3	3-5	Over 5
	1	2-3	4-5
6	Complexity of the manufactured products		
	Simple	Average complexity	Very complicated
	1	2-3	4-5
7	Duties I		
	Organisation of work	Organisation of work and production engineering	Organisation of work and production engineering, resource management and control
	1-2	3-4	5
8	Duties II		
	Teamwork organising	Organising teamwork, finding bottlenecks	Organising teamwork, finding bottlenecks, ensuring motivation system
	1-2	3-4	5

<b>MACHINE TOOL OPERATOR/GRINDER/MILLER/</b>			
Description of the situation			
1	Production characteristics		
	Mass production	Serial production	Individual manufacturing
	1	2-3	4-5
2	Number of different machine tools to be operated		
	1	2	3 and more
	1	2-3	4-5
3	Main operation		
	Turning, drilling	Milling	Boring
	1-2	3-4	5
4	Geometrical complexity of the workable detail (number of different surfaces to be machined)		
	Less than 6	6-12	Over 12
	1-2	3-4	5
5	Quality of the workable surface		
	< IT 12	IT 12 ... IT 8	> IT 8
	1	2-3	4-5
6	Surface roughness of the workable surface		
	Ra < 80	20 < Ra < 80	Average Ra 1.25
	1	2-3	4-5
7	Characteristics of the work		
	Work at preset machine tool	Technology is pre-determined	Fully independent work
	1	2-3	4-5
8	Selection and sharpening of tools		
	Not necessary	Partly	Full tool management
	1	2-3	4-5
9	Measuring devices using need		
	One type	2-3 different	4 and more
	1	2-3	4-5

<b>WELDER</b>			
Situation description			
1	Materials to be welded		
	With good and satisfactory weldability	In addition: with limited weldability	In addition: with poor weldability
	1-2	3-4	5
2	Number of different welding processes		
	1-2	3-4	Over 4
	1-2	3-4	5
3	Welding positions		
	PA, PB	In addition: PC, PD, PE	In addition: PF
	1-2	3-4	5
4	Form of weldable pieces		
	Plate	Pipe	Plate and pipe
	1-2	3-4	5
5	Thickness of materials		
	3-20 mm	0-20 mm	In addition: over 20 mm
	1-2	3-4	5
6	Welding drawing reading skills		
	Cannot read	Can read	Can draw
	1-2	3-4	5
7	Instruction of trainees		
	Does not supervise	Seldom	Continuous
	1-2	3-4	5
8	Quality control		
	Visual	Random, with different methods	100% , With different methods
	1-2	3-4	5
9	Quality regulations for welding joints		
	Basic requirements	Average requirements	High requirements
	1-2	3-4	5

<b>PRODUCTION MANAGER/PRODUCTION DIRECTOR/PURCHASING MANAGER/PROJECT MANAGER/DEVELOPMENT MANAGER</b>			
Situation description			
1	Number of various production processes		
	1-3	4-7	over 7
	1-2	3-4	5
2	Average number of operations in the process		
	less than 5	5-12	over 12
	1-2	3-4	5
3	Average number of workers in the production area		
	less than 50	51-150	over 150
	1-2	3-4	5
4	Average durability of the technologies in use		
	More than 10 years	5-10 years	Less than 5 years
	1-2	3-4	5
5	Number of different products per year		
	Less than 20	21-50	Over 50
	1-2	3-4	5
6	Annual turnover (million EUR)		
	Less than 2	3-7	Over 7
	1-2	3-4	5
7	Use of Production Planning Systems		
	Not at all	BSC/Simple ERP	ERP/6 $\sigma$ / Lean Manuf.
	1-2	3-4	5

Additional explanation: for production management, where

BSC - Balanced Scorecard; ERP - Enterprise Resource Planning; PPS - Production Planning System; 6 $\sigma$  - Six Sigma; LM - Lean Manufacturing



<b>QUALITY MANAGER</b>			
Description of the situation in enterprise			
1	Awareness of employees about quality management system and ability to use it		
	Less than 20% understands and is able to use it	20-60% understands and is able to use it	Over 60% understands and is able to use it
	1	2-3	4-5
2	Elaboration of the quality management system (QMS)		
	QMS is at implementation phase or partly elaborated	QMS has been elaborated	QMS has been elaborated and is functioning
	1	2-3	4-5
3	Assuring compliance with selected (internal and superficial) standards, norms, and legal requirements		
	Compliance evaluation methods are not implemented	Compliance evaluation methods are elaborated and implemented	Compliance evaluation methods are elaborated and implemented, and realized effectively at fixed intervals
	1	2-3	4-5
4	Functioning of QMS		
	QMS is partly functioning, but could work better	QMS is working and meets the requirements of enterprise	QMS is working and meets the requirements of enterprise, is always maintained and in improvement according to changing conditions
	1	2-3	4-5
5	Quality policy		
	Quality policy is not clearly stated/fixed or is not in accordance with organisation's needs	Quality policy has been elaborated and corresponds to the needs of the organisation	Quality policy has been elaborated, in good correspondence with the needs of the organisation, it is up-to-date and employees are aware of this
	1	2-3	4-5
6	Elaboration of quality management related strategies and making of improvement proposals		
	Are not done at all or there are only few of them	There are made few improvement proposals	Are made enough or a lot, these are substantial and applicable in the organisation
	1	2-3	4-5
7	Internal audits		
	Are not performed periodically	Are performed periodically, but these are mainly formal and improvement proposals are not pointed out	Are performed periodically, in the process are found and initiated improvement activities
	1	2-3	4-5

<b>INNOVATION SKILL</b>			
Situation description			
1	University degree of current staff member		
	BSc	MSc	PhD
	1-2	3-4	5
2	2) Academic research and development funding		
	Less than 10000 EUR	10000-50000 EUR	Over 50000 EUR
	1-2	3-4	5
3	3) The number of patents and utility models issued by company		
	1-2	3-10	Over 10
	1-2	3-4	5
4	4) Scientists and engineers as a share of the workforce in the company		
	Less than 5% (1) 5-15% (2)	16-25%	Over 25%
	1-2	3-4	5
5	5) The number of scientific publications during last 5 years of current staff member		
	Less than 3	3-10	Over 10
	1-2	3-4	5
6	6) Creativity enhancing in the company		
	Tolerant work environment (1) Special facilities for project meetings (2)	Special facilities for creative thinking (3)	Common workshops out of the office (4)
	1-2	3-4	5
7	7) For how many from the following activities is suitable your enterprise environment : meetings, negotiations, measuring, testing, electronics work		
	2	4	Over 4
	1-2	3-4	5