No.	Requirements on	Description	Relevant for machine type	Estimated Energy savings
	Improvement actions: Monitoring module according to ISO/DIS 14955-1			
1	Minimize energy losses in power supplies	Usage of high efficiency transformer or voltage-proof converters instead of conventional transformers (e.g. controlled switching power for auxiliary power 24V).	Metal cutting	3,1 – 3,6%
2	Avoidance energy losses of power supplies	Avoid power losses in the transformer by use of e. g. voltage-proof converter, controlled switching power supply for 24V control voltage	Mechanical Press; Servo Press; Hydraulic Press	
3	Converter with power factor correction	Power factor in the infeed unit for feed operation and regenerative feedback saves energy losses.	Metal cutting	3,7 – 4,5%
4	High efficiency transformer	Load requirement of a machine tool is not constant during the cycle. Therefore it is more efficient to install transformers optimized on low Fe- losses instead of transformers optimized on low Cu- losses.	Mechanical Press; Servo Press; Hydraulic Press	3,1 – 3,6%
5	Thermal management regarding control cabinet	Optimized concept for thermal management of the control cabinet;1. Minimization of waste heat;2. If waste heat is not avoidable, it has to be dissipated (air cooling or water cooling); for reuse of thermal energy water is given a preference compared to air; further use of waste heat has to be checked/discussed with customer; 3. Controlled ventilation (fan).	Metal cutting	3,7 – 4,5%
6	Apply the simultaneity factor when designing the power system	Avoid oversizing of power supply leads to lower absolute energy losses. Avoid overload as well.	Mechanical Press; Servo Press; Hydraulic Press	3,7 – 4,5%
7	Converter/inverter with power factor correction	Power factor in the infeed unit for feed operation and regenerative feedback saves power losses.	Mechanical Press; Servo Press; Hydraulic Press	3,7 – 4,5%

8	Thermal management regarding control cabinet	Optimized concept for thermal management of the control cabinet;1. minimization of waste heat;2. if waste heat is not avoidable, it has to be dissipated (air cooling or water cooling); for reuse of thermal energy water is given a preference compared to air; further use of waste heat has to be checked/discussed with customer;3. controlled ventilation (fan);4. low maintenance air conditioner (no air filter) and thermostatic air conditioning with open-door-shutoff.	Mechanical Press; Servo Press; Hydraulic Press	3,7 – 4,5%
9	Default setting for operating condition (customer specific unit switch-off, e.g. screen saver for operating terminal and work space lighting to be switched-off when not in use)	A method for minimizing energy consumption by adapting control parameters to the active type of processing is provided. The type of method can follow two different concepts:A) Static Methods for manual selection of a parameter set (e.g. including velocity limits, acceleration limits, feed forward and feedback control coefficients) according to a target application (e.g. different parameter sets for roughing and finishing).B) Dynamic Methods for automated adaptation of control parameters to process conditions on a real-time basis (e.g. by applying adaptive feed control).Provision to configure conditions for automatic switch over between different operating states (e.g….).	Metal cutting	4,6 – 5,5%
10	Energy optimized default setting for operating condition -energy level- (customer specific drive management)	possible operating conditions -energy levels-: e.g.;- switched off;- standby - ready to be started (mains on, controls running, auxiliary and peripheral units stopped); halted - ready for production (auxiliary and peripheral units; running); production; intelligent drive management	Mechanical Press; Servo Press; Hydraulic Press	
11	Automatic operating state switching	Switching between different operating states helps drive management to choose most efficient mode.	Mechanical Press; Servo Press; Hydraulic Press; Metal cutting	3,1 – 3,6%

12	Automatic operating state switching	A method for automated by switching of operating states to different levels is provided. Possible Operating States are e.g. - Switched off - Standby, ready to be started (mains on, controls running, auxiliary and peripheral units stopped) - Halted, ready for production (auxiliary and peripheral units running) - Production. The method should apply different states automatically with respect to the current machining situation, order schedule, and user preferences.Provision of different control parameter setups for different cutting conditions.	Metal cutting	
13	Recording or monitoring of current energy consumption together with energy relevant production data	the knowledge of the machine energy consumption under different operating conditions helps the user to follow EN 16001 - "energy management systems"	Mechanical Press; Servo Press; Hydraulic Press, Metal cutting	3,1 – 3,6%
14		Provision of motion control features for minimization of energy usage (e.g. adaptive feed control);(similar approach as in 2-11).	Metal cutting	