The International Standards Organization (ISO) last updated the documents relating to milking machines in 1997. The widespread adoption of automatic milking installations (AMI) required reconsideration of these standards. After some deliberation, the machine milking group of the International Dairy Federation (IDF) suggested that, while many aspects of AMI are different than conventional milking machines, many aspects are also shared. It was decided to simultaneously create a new standard for AMI containing those aspects unique to this new technology and to revise the milking machine standards to update them and revise them to allow seamless reference from the AMI standard.

ISO Technical Committee 23 was convened in 2002 under the expert and heroic leadership of Lars Innings and began this task which resulted in the following standards. It is anticipated that these new standards will receive final approval in 2007. In the text that follows the scope of each draft standard is quoted along with a list of its’ major section headings. Lastly, notable changes/updates from the 1997 versions are highlighted.

ISO 5707 Milking machine installations: Construction and performance

This International Standard specifies the minimum performance and information requirements and certain dimensional requirements for satisfactory functioning of milking machines, for milking and cleaning. It also specifies minimum requirements for materials, design, manufacture and installation. This International Standard is applicable to milking machines for milking cows, water buffaloes, sheep and goats where animals are milked and pulsation created by vacuum, and where milk is, at least partly, transported with help of air flow. Some clauses are not applicable to all types of milking machines. The qualitative requirements apply to installations for milking other mammals used for milk production.

**General**
- Tests for compliance
- Access for measurements, Air flow measuring connections, Vacuum measuring connections, other necessary measures
- Safety and hygiene
- Materials
- User handbook: Instructions for installation, Instructions for use, Instructions for maintenance

**Vacuum system**
- Vacuum regulation: Drift, Regulation sensitivity, Regulation loss, Regulation characteristics and effective reserve
- Vacuum pumps: Influence of altitude, Exhaust, Prevention of reverse flow through vacuum pump, Location, Marking and specifications
- Vacuum regulator: Regulator leakage, Mounting, Marking and specification
- Vacuum gauge, Mounting
Perhaps the largest change to this standard is the inclusion of information for milking machines used for buffalo and small ruminants. Information to be provided for installation, use and maintenance of all types of milking machines has been specified in more detail than in previous versions. The vacuum section has been modified to incorporate variable capacity vacuum pump control of milking system vacuum. Regulation characteristics have been updated to specify that the individual components of vacuum drop, undershoot and overshoot (to be < 2kPa).

The former language relating to effective reserve has been modified to accommodate both very large and very small systems as follows:

One of the following requirements shall be fulfilled

- Vacuum drop and undershoot < 2 kPa (meant to apply to large milking systems).
- Minimum effective reserve given in Annex A for cows and buffaloes and in Annex D for sheep and goats (mean to apply to smaller milking machines).
Additional specifications for the milking unit have been added, including the teatcup or cluster fall off air use and data such as liner dimensions to assist in choosing the appropriate liner for a herd. The manufacturer is asked to provide the following guidance for vacuum in the milking unit for specified milk flows for different species:

a) the desired average liner vacuum and/or the desired average liner vacuum during the phase b and phase d of the pulsation chamber vacuum record; and

b) the corresponding nominal vacuum in the milkline.

It is noted that both research and field experience indicate that a mean liner vacuum, in the range 32 kPa to 42 kPa during the peak flow period of milking for cows ensures that most cows will be milked quickly, gently and completely. Similarly, a mean liner working vacuum, within the range 28 kPa to 38 kPa during the peak flow period of milking for sheep, and goats will ensure that most animals will be milked quickly, gently and completely.

**ISO 6690 Milking machine installations — Mechanical tests**

This International Standard specifies mechanical tests for milking machine installations in order to verify compliance of an installation or component with the requirements of ISO 5707. It also stipulates the accuracy requirements for the measuring instruments. This document is applicable for testing new installations and for periodic checking of installations for efficiency of operation. Alternative test methods may be applicable if they can be shown to achieve comparable results. It is important to determine which measurements are to be done for the specific milking machine before making the tests. Test procedures described in Annex A are primarily for testing in the laboratory.

**Test equipment**
- Measurement of vacuum, vacuum changing over time, atmospheric pressure, back pressure, air flow, pulsation characteristics, pump rotational frequency, Teatcup plugs

**Vacuum system**
- Preparation before testing
- Vacuum regulation: Test of vacuum regulation drift, Regulation sensitivity, Regulation loss, Tests of regulation characteristics, Effective reserve for milking, Calculation of effective reserve capacity to standard atmospheric pressure
- Vacuum pumps: Vacuum-pump capacity, Calculations for other atmospheric pressures, Vacuum pump exhaust back pressure
- Vacuum regulator: Regulator leakage
- Vacuum Gauge : Vacuum gauge accuracy

**Pulsation system**
- Air-flow rate at stall cocks
- Pulsation rate, pulsator ratio and pulsation chamber vacuum phases

**Milk system**
- Slope of milkline
- Milk system leakage
- Effective volume of receiver
- Leakage in releaser

**Milking unit**
- Teatcup
- Depth of mouthpiece and upper touchpoint
- Teatcup or cluster fall off air inlet
- Leakage through shut-off valves of milking units
- Air vent and leakage into cluster
Effective volume of buckets, transport cans and recorder jars
Measurement of the vacuum drop from accessories attached in the long milk tube
Air-flow rate at the end of the long milk tube

**Annex A (normative) Laboratory tests of vacuum in the milking unit**
Equipment and methods: Suitable measuring equipment, Test conditions
Description of the connection to the plant, Water flow rate, Vacuum in milkline, Measuring point, Measuring period, Results, Measuring the vacuum in the cluster

**Annex B (informative) Alternative method to the measurement of air inlet and leakages in cluster**

**Procedure**

**Annex C (informative) Examples of test procedure to reduce the test work**
General information, requirements and preparations before testing
Measurement of installation vacuum, regulation sensitivity and calculation of vacuum drop
Measurement and calculation of air flow rates in the installation
Check the pulsation system
Measure air inlets at the cluster
Measure leakage in milk system and in vacuum system
Vacuum drop at vacuum taps and stall cocks
Maintenance of the milking machine installation

**Annex D (informative) Test report for testing milking machine installations in accordance with ISO 6690**

Methods for measuring vacuum regulation characteristics of undershoot (A), vacuum drop (B) and overshoot (C) during a unit falloff test have been specified for milking unit falloff (both with and without automatic shutoff valves) and for quarter milking machines.

A new section has been added with methods for measuring the depth of the mouthpiece and effective length of a liner. The design of artificial teats for wet tests has been updated. An example test report and order of performing tests of a milking machine has been provided.

**ISO 3918 Milking machine installations — Vocabulary**

This International Standard defines terms to be used in research work, official regulations, design, manufacture, installation and use of milking machines for cows, water buffaloes, sheep, goats or other mammals used for milk production.

**General terms**

**Types of milking machine**

**Vacuum system**

**Pulsation system**

**Milk system**

**Milking unit**

**Cleaning and milk cooling equipment**

**Alphabetical index**

These definitions have been updated for terms describing both conventional as well as AMI.
ISO 20966 Automatic milking installations: Requirements and testing

The standard has been developed in response to worldwide demand for minimum specifications for automatic milking installations. The basic requirements for the construction and performance of milking machines for animals are determined by the physiology of the animal and the need for a standard of high hygiene and milk quality. In addition, the equipment has to be effective, easy and safe to use and test. It is also of greatest importance that milking equipment and connection to milk storage facilities on the farm are designed and maintained to minimize turbulence, frothing, foaming and agitation, thereby reducing physical damage to the milk fat and the development of free fatty acids.

This International standard specifies requirements for construction including specific safety and hygiene aspects and minimum performance requirements and testing for automatic milking installations (AMI) in addition to those described in ISO 5707 and ISO 6690. It does not contain requirements for the design of the building in which the milking installation is installed.

Safety and hygiene requirements

Functional requirements
- Milking: Accidental teatcup detachment, Milk yield measurement, Detection of abnormal milk, Teat cup removal, Post-milking teat applications
- Milk transport: Diversion of milk, Delivery lines
- Milk cooling and storage: Refrigerated bulk milk tank, Tank for temporary storage

Cleaning

Instructions for use

Management
- Alarms and notifications
- Retrieval of information

Monitoring
- Animals
- Sanitation
- Stored milk

Annex A (Normative) Safety requirements with respect to humans and animals
- Safety Requirements and measurements:

Controls
- Protection against non-mechanical hazards, Electricity
- Pneumatic, Hydraulic, Heat, Laser
- Provisions in case of faults
- Accesses and exits for the animals

Annex B (Informative) Example of a method to evaluate cleaning of teats and udders

Annex C (Informative) Example of Methods to evaluate detection systems for milk deemed as abnormal due to blood or changes in homogeneity
- Test of detection system for blood in milk
- Test of detection system for changes in homogeneity: Detection at the quarter level, Detection at the animal level
- Guideline for interpretation of results

This entire standard has been newly created and the table of contents will give the reader an idea of the specific elements of AMI that differ from conventional milking machines. Primary among these are requirements introduced by the milking process performed without the presence of a human observer.
References


