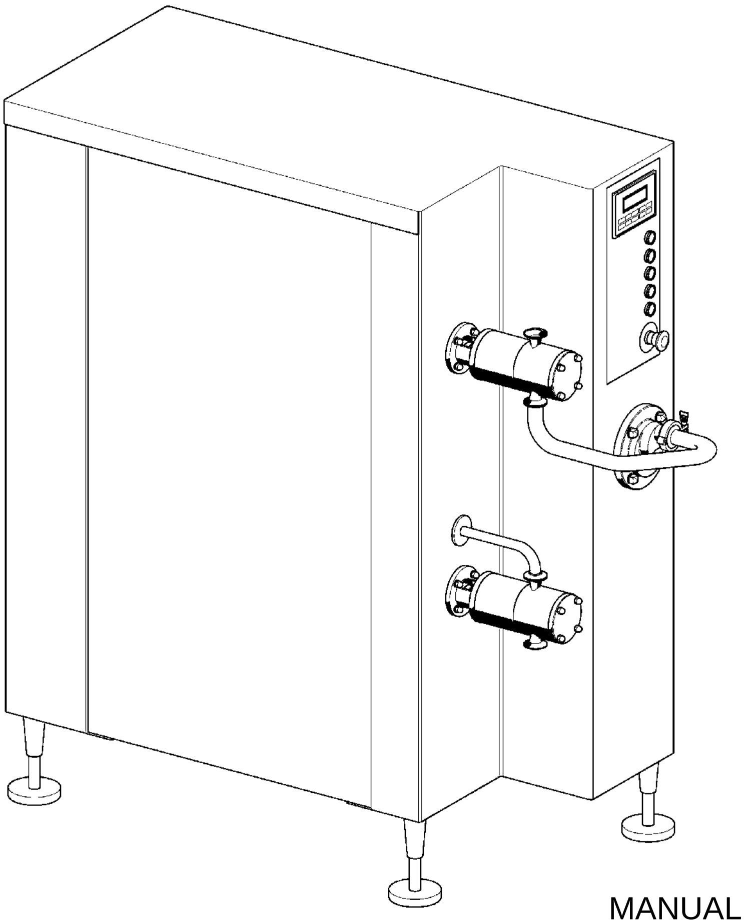
Gram Equipment
Sidam

INSTRUCTION MANUAL
SPARE PARTS

FREEZER GIF 600



MANUAL: M8620000GB-UL

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1. INTRODUCTION

1.1 SAFETY INSTRUCTIONS

WARNING: Do not operate or service your Sidam equipment or machine before having read these safety rules.

1.1.1 USER'S RESPONSIBILITY

The basic rules of safety set forth in this secton are intended as a guide for the safe operation of Sidam equipment or machines.
This general safety information, along with explicit service, maintenance and operational materials for each specific machine, make up the complete instruction manual.
All personnel, who will operate, service or be involved with this equipment in any way, should become totally familiar with this information prior to start-up.
It is the Buyer's responsibility to make certain that these procedures are followed and, should any major deviation or change in use from the original specifications be required, appropriate procedures should be established for the continued safe operation of the machine.
It is strongly recommended to contact Sidam to make certain the machine can be converted to the new use in a reasonably safe manner.
If the machine is not purchased directly at Sidam or its representative, it is the responsibility of the purchaser to ensure that the machine is according to the valid safety regulations.
It is strongly recommended that the purchaser contacts Sidam to safeguard that the machine can be operated in a reasonably safe manner.

1.1.2 SAFETY FIRST

The equipment from Sidam is designed and manufactured with due consideration and care for generally accepted safety standards.
However, the proper and safe performance of this equipment depends upon using sound and prudent operating, maintenance and servicing procedures under properly trained supervision. For your protection, and the protection of others, learn and always follow the safety rules outlined in this chapter.
Form safe working habits by reading the rules and abiding by them.
Keep this booklet handy and review it from time to time to refresh your understanding of the rules.

1.1.3 IMPORTANCE OF THE MANUAL

Personnel who work on the machine for production, cleaning, maintenance or repair, must be familiar with this manual either about instructions, or about risks and safety rules.
In particular operator must know the meaning of the safety labels placed on the machine.
For this reason the manual should be alweays available for the operators.
Personnel authorized to maintenance or repair must be informed about the existence of this manual and they must have a look at it before beginning operations.
Because the manual is subject to damages on account of use, we suggest to keep a copy in a safe and sheltered place. In any case is always possible to ask Sidam for a new copy.

1.1.4 SAFETY SIGNS

The machine has some safety signs: see the related section for their meaning.
Operators must know the meaning of these several signs before beginning operations.
Signals must be checked every day for making sure that no one is damaged or came off, or illegible anyway.
In this case this adhesive tally has to be replaced with a new one.

1.1.5 OPERATIVE ZONE

An operating zone should be established around all machines.
A brightly painted guard rail or warning stripe can be used to define the zone.
The distance from machine surface to the limit from the operative zone should be at least 2 metres.
Only operators or other authorised personnel should be within the operating zone when machine control circuits are energised or the machine is running.
No tools or other equipment should be kept within the operating zone.

1.1.6 INSTALLATION

Power sources such as electric and air should be installed by trained and authorised personnel only.
Make sure a power disconnector on/off for the power sources is installed on the machine.
The disconnector must be of a type that can be locked in the power off position and the key must be removed.
Installation must comply with all applicable codes and standards, including those established by the Directorate of Labour Inspection of the country in question.

1.1.7 INSPECTIONS

Before starting the machine

- Be absolutely positive all guards and safety devices are installed and operative.
- Make certain that all personnel are clear of the machine.
- Remove from the operating zone any materials, tools or other foreign objects that could cause injury to personnel or damage the machine.
- Make certain that the machine is in operating condition.
- Make certain all indication lights, horns, pressure gauges or other safety devices or indicators are in working order.

In operation

- Do not operate this machine until you read and understand the operating instructions and become thoroughly familiar with the machine and its controls.
- Never operate a machine while a safety device or guard is removed or disconnected.
- Always wear any required safety/hygienic equipment, such as glasses, hats, shoes, ear protection or any required safety equipment.
- Do not start the machine until all other personnel in the area have been warned and have moved outside the operating zone.
- Remove any tools or other foreign objects from the operating zone before starting.
- Absolutely do not have loose clothing, neckties, necklaces or unrestrained long hair near an operating machine.
- Do not wear rings, watches, bracelets or other jewellery near an operating machine.
- Keep the operating zone free of obstacles that could cause a person to trip or fall towards an operating machine.
- Never sit or stand on anything that may cause you to fall against the machine.
- “Horseplay” around a machine at any time is dangerous and prohibited.
- Know the emergency stop procedure for the machine.
- Never operate the machine above specified speeds, pressures or temperatures.
- Keep alert and observe indicator lights and warnings that are displayed on the machine.
- Never leave the machine unattended while in operation.
- Do not operate faulty or damaged equipment. Make certain proper service and maintenance procedures have been performed.
- Avoid placing fingers, hands, or any parts of your body into the machine or near moving parts when control circuits are energised.

After Shut-down

- Make certain all air and electric power is turned off.

1.1.8 WORKING POSITIONS

Machine is equipped with safety protections in accordance with the European laws in force and it has some devices which stop it if some anomaly happen.
However below general instructions must be observed by operators in working positions:

- Use non-skid footwear.
- Keep the floor clean.
- Do not have unrestrained hair or loose clothes.
- In case a procedural error occurs, never remove wasted/damaged products from the machine, before the control voltage is disconnected.
- Never clean the machine unless the control voltage is disconnected.
- The manual should always be available to the personnel.

1.1.9 SERVICE AND MAINTENANCE

- Do not service a machine until you are thoroughly qualified and familiar with the tasks to be performed.
- Never operate any controls while other persons are performing maintenance on the machine.
- Do not by-pass a safety device.
- Always use the proper tool for the job.
- Never open covers that house electrical components when power is on.
- Only perform maintenance on a machine in motion when properly trained and required to do so. When directed to make adjustments on machines in motion, extreme care must be taken.
- All air and pressure must be relieved before performing maintenance or loosening connection on any pressurised system.
- Air and electrical power are to be turned off unless they are absolutely required for the specific servicing being performed.
- Replace fuses only when electrical power is off (locked out).
- Do not enter a confined space without first checking for toxic fumes and providing standby personnel on the site.

1.1.10 CLEANING

Manual cleaning procedures

- Do not use toxic and/or flammable solvents to clean a machine.
- Turn off air and electrical power (lock out) prior to cleaning a machine, unless otherwise specified in the equipment manual.
- Keep electrical panel covers closed when washing a machine.
- Always clean up spills around machine as soon as possible.
- Never attempt to clean a machine while it is operating.

Cleaning-in-place (C.I.P.) procedures

- Make certain that all connections in the cleaning circuit are tight to avoid contact with hot water or cleaning solutions.
- When the cleaning cycle is controlled from a remote or automated control centre, establish fail-safe procedures to avoid automatic start-up while servicing equipment in the circuit.
- On equipment which includes manways, make certain covers are closed, latched and nobody is left behind prior to starting the cleaning cycle.

1.1.11 ELECTRIC SYSTEM

- All electrical/electronic maintenance and service should be performed by trained and authorised electricians only.
- Always assume that power is on and treat all conditions as live. This practice assures a cautious approach which may prevent an accident or injury.
- To remove the load from circuit or equipment, open disconnecter or breaker and lock in open position.
- Make certain that the circuit is open by using the proper test equipment.
- **NOTE:** Test equipment must be checked at regular intervals.
- Capacitors must be given time to discharge, otherwise it should be done manually with care.
- There may be circumstances where “trouble-shooting” on live equipment may be required. Under such conditions, special precautions must be taken as follows:
- Make certain your tools and body are clear of the ground.
- Extra safety measures should be taken in damp areas.
- Be alert and avoid any outside distractions.
- Before applying power to any equipment, make certain that all personnel are clear of the machine.
- Control panel doors should be open only when checking out the electrical equipment or doing electrical connections.
- All electrical apparatus must be properly grounded and overload protected.
- All electrical connections should be protected by confining them within a sealed junction box.

WARNING: Do not disconnect the motors (pumps) connected to inverters before 10 min. have passed since machine shut down.

1.1.12 HYDRAULIC SYSTEM

- Never operate a hydraulic system unless covers, safety devices and indicators are operating and in place.
- Never operate a hydraulic system above the pressure specified.
- Hydraulic fluid should never be allowed to collect on floors or equipment outside foreseen drip-trays.
- Skin contact with hydraulic fluid should be avoided. Always wear proper protective clothing when handling hydraulic fluid.
- Never loosen any hydraulic connection when the system is under pressure.
- Never operate a machine that has leaks in the hydraulic system.
- A hydraulic system retains the power to complete its intended motion even after the power is off. Care is required to avoid injury.

1.1.13 PNEUMATIC SYSTEM

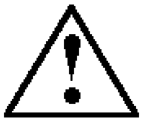
WARNING: We require our customers to supply air at a dew point of max 2°C to avoid condensation, cause of unproper functioning, rust and so on, especially when the air is used in delicate electronic systems as the measurers of course air for freezer.
If this is not available, the customer should install an air dryer.

- Never operate an air system unless covers, safety devices and controls are operating and in place.
- Air operated mechanical devices may operate unexpected from a remote control signal.
- If an air supply system exceeds design limits, connections could come apart and move around uncontrolled.
- Never loosen any pneumatic connection when the system is under pressure.
- Discharge and air leaks should never be allowed above product area due to oil mist.
- A pneumatic system retains the power to complete its intended motion even after the power is off. Care is required to avoid injury.

1.1.14 FREEZING SYSTEM

- Maintenance and service of the refrigeration system must be performed by trained and authorised service personnel only.
- Never valve off a vessel filled with liquid refrigerant, unless it is protected with a properly sized valve. Never expose refrigerant vessels, drums, or bottles to excessive heat.
- Develop an “emergency procedures plan” and arrange for rehearsals and training of personnel.
- Make sure fire extinguishers are in operating condition and that sufficient numbers are available in the right places.
- Always wear a gas mask when making repairs in an area where a leak might occur.

1.1.15 SAFETY OF GIF FREEZERS



WARNING: The cladding plates must be mounted when operating the freezer and should never be dismounted while the freezer is working.

Sidam's GIF freezers are manufactured in accordance with internationally recognised safety measures.
They havew been designed with the operator and maintenance personnel in mind.
However, as with all production equipment, it has to be used in accordance with basic safety precautions.
Sidam urges that all production personnel carefully consider the following precautions during normal operation of the plant:

- Never open the lateral and posterior operator control panel nor the main electrical panel unless the power has been turned off.
- Never operate the machine if panels or doors are open or misplaced.
- Never modify the plant nor any of its electrical functions and never secure any electrical interlock device to function in any manner other than its designed function.
- Always manouvre the dasher and its blades with the utmost care and precaution - the dasher blades are extremely sharp! - when assembling, transporting or installing.

1.1.16 RISKS DURING FUNCTIONING

RISKS	HOW TO AVOID ACCIDENTS	IF AN ACCIDENT HAS HAPPENED
The metal components and the tubing get very cold during the production and very hot when cleaning the freezer. There's the risk of frostbites and burns.	These parts should never be touched when freezer is working.	In both cases of burns and frostbites, pour immediately much water on the affected parts. Summon a doctor.
Pay attention when opening the cooling installation valves because leaks might occur.	The valves must often be checked to avoid leaks. Leakages must be immediately reported to the person responsible for cooling installation.	If the refrigerant is leaking, the area must be evacuated. The operator responsible for the cooling installations must be summoned. Further information is available in the "General Safety Instructions" section.

1.1.17 RISKS DURING CLEANING

RISKS	HOW TO AVOID ACCIDENTS	IF AN ACCIDENT HAS HAPPENED
The personnel could get hurt when trying to reach the freezer open bottom.	Be careful when carrying out the cleaning underneath the freezer. The main switch must be off when working below the machine.	Summon a doctor in case a person has been seriously injured.
Pay attention when opening the valves as leaks might occur.	The valves must be frequently checked to avoid leaks. Leakages must be immediately reported to the person responsible for the cooling installations.	If a refrigerant leak has happened, evacuate the area. The operator responsible for the cooling installations must be summoned. For further information about the refrigerants, see what explained in the "General Safety Instructions" chapter.
When carrying out a C.I.P. cleaning, very corrosive cleaning materials are usually employed.	Be careful when working with cleaning materials. Use gloves and other safety garments.	Should any part of the body get in contact with the cleaning material, rinse liberally with water.
The control panel and other electrical components must not be flushed. Water and cleaning materials might damage the electrical installation. People could be exposed to danger if the the electrical installation was damaged.	Be careful during the cleaning of the freezer.	The mains voltage must be disconnected. Summon a qualified electrician.

1.1.18 SAFETY SIGNS

Safety signs to be stuck onto a Sidam freezer, are shown below.
A safety sign must be replaced by a new one when:

1) it has come off;
2) it is worn;
3) it is loose;
4) it is illegible in any way;

The surface has to be dry and clean when sticking a new sign onto the machine.
When re-ordering new signs please state the article number placed in the bottom right-hand corner of the sign.

1.1.19 SAFETY SIGNS POSITION

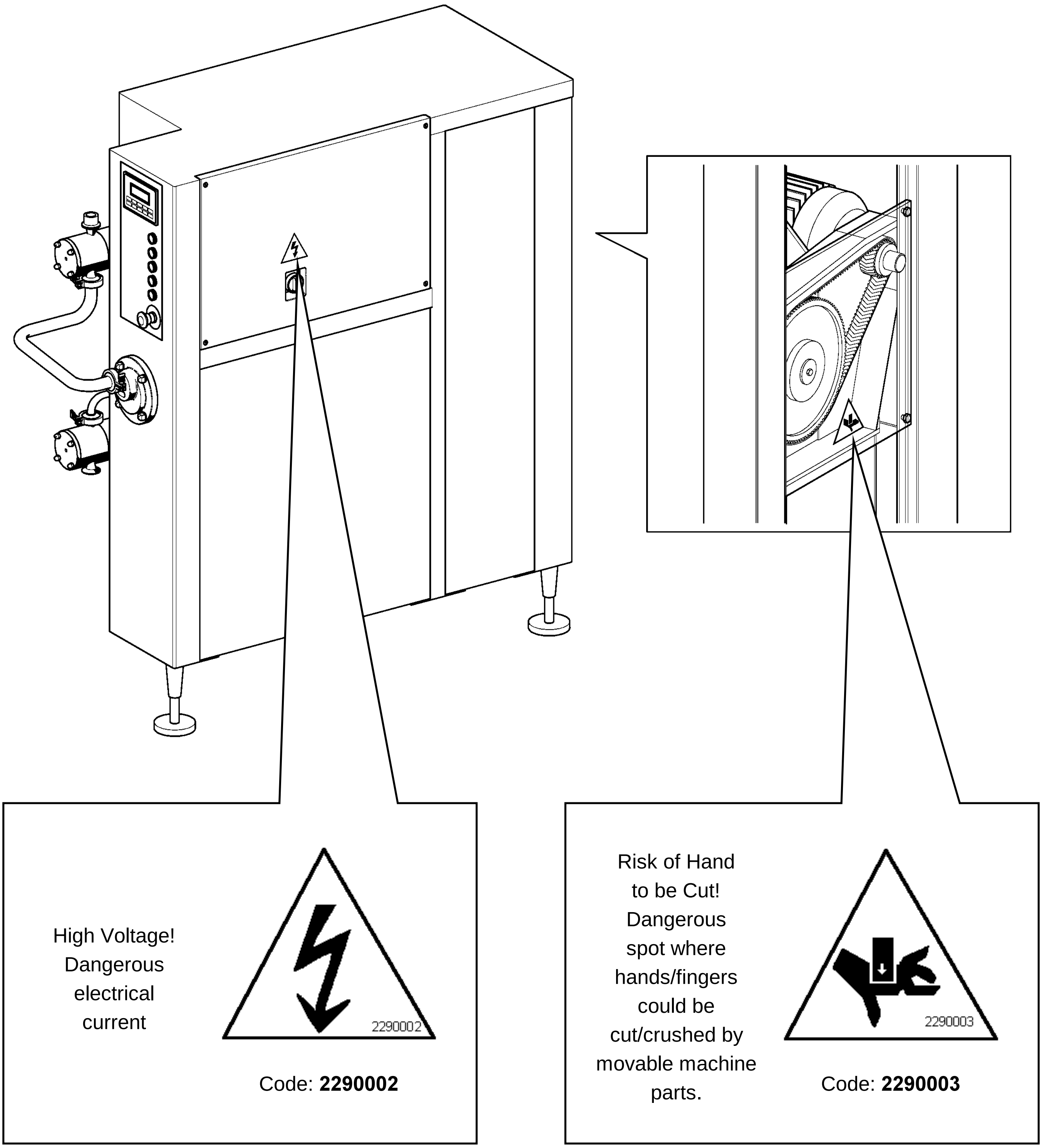


Fig. 1-1 – Safety signs position

1.2 MANUAL

1.2.1 INFORMATION ABOUT THE MANUAL

We hope that the information included in this manual can help You.
It aims to give an explanation about the right and safe use of Your machine and are based on data as well as on our best up-to-date knowledge.
Read carefully what is written on this manual, included the recommendations and suggestments, as well as the sale and guarantee conditions.
Sidam has edited this manual with the maximum care, trying to make it as complete and clear as possible. However, should any point be incomplete or unclear, please contact us without hesitation.

1.2.2 MANUAL IMPORTANCE

This instruction manual has been conceived to help You install correctly, set-up, use and maintain Your machine.
Special importance has been afforded to the operators safety, describing in detail the protection devices and the procedures for a safe use of the machine.
We ask You to consider this manual as an actual part of the machine, in order to obtain the best performances.
We suggest in particolar to:

- ♦ Keep the manual for the whole life of the product;
- ♦ Make sure that any possible revision is included in the text;
- ♦ Make this manual be easily available for consultation by the various operators (if necessary, make a copy of the needed parts);
- ♦ Deliver the manual to any other new user or step-owner of the machine.

1.2.3 BASIC WARNINGS

- ♦ Figures and drawings have to be intended only as generic references and are not necessarily thorough in every detail.
- ♦ Dimensions and characteristics reported in this manual are not binding and they could be modified without notice.
- ♦ No part of this manual can be reproduced or transmitted to outside parties without written consent by SIDAM S.r.l..

1.2.4 CONSULTATION

Structure

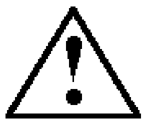
The manual is divided in three sections:

1) Installation, use and maintenance instructions, as well as those about the risk zones signalings and safety rules.
2) Spare parts catalogue.
3) Information about complex commercial components installed on the machine (the description of the commercial components installed on the machine is available in the supplied cd-rom, attached to this manual).

Warning notes

In addition to parts enhanced to give special prominence to characteristics or technical infotmation, the following notes are very important:

- Safety notes, that refer to possible dangers for the operators and to the rules to minimize the risks, introduced by the signal:



- Warning notes, that refer to operations to be done or avoided for a good functioning of the machine, introduced by the signal:

1.2.5 CONSERVATION

We advise Yuo to keep this manual with the maximum care for the whole life of the machine.
Some useful suggestions for a perfect conservation are:

- Shelter the manual against humidity and heat;
- Use the manual correctly, not to damage, neither wholly nor partly, its content;
- Do not remove of tear for any reason parts of the manual;
- Make a copy of the parts needed for consultation by the various operators;
- Do not overwrite for any reason parts of the manual, unless in case of late revisions by SIDAM S.r.l.

2. TECHNICAL DATA AND IDENTIFICATION

2.1 IDENTIFICATION DATA

A tally stuck on the machine reports the data which unequivocally identify your plant or equipment. These data are the following:

1) type and model;
2) order number;
3) power supply;
4) year of construction.

COSTRUTTORE MANUFACTURER
FABRICANT BAUER

Sidam

INDIRIZZO ADDRESS ADRESSE ADRESSE:
VIA FABIO FILZI 37
20032 CORMANO (MI) - ITALY

MACCHINA EQUIPMENT **MACHINE MACHINE**	**FREEZER GIF 600**
MATRICOLA SERIAL NUMBER **MATRICULE REGISTRIENNUMMER**	
ALIMENTAZIONE POWER SUPPLY **ALIMENTATION SPEISUNG**	
ANNO YEAR ANNÉE JAHR	

In case you contact Sidam for information or spare parts concerning this machine, inform us these data in order to get everything you require as soon as possible and error-free.

The voltage of your machine is properly marked. Be certain that your power supply is the same before carrying out the installation.

2.2 TECHNICAL DATA

Performance	
Capacity (ice cream at 100% overrun; standard mix with 36% of solid part and inlet temperature +4 °C; outlet temperature up to –6 °C)	120-600 lt/h
Freezing circuit	
Freezing capacity (condensation at 15 bar)	14 kW
Refrigerant	R404A
Quantity of refrigerant	3,5 kg
Consumptions	480 V / 60 Hz
Compressor	10 kW – 25 A
Dasher motor	7,5 kW – 16 A – 4 poles
Pumps motor	2 x 0,75 kW – 1,5 A
Condensing water (tower water, 27 °C) – Condenser pressure drop	3,5 m^3/h – 1,2 bar
Condensing water (town water, 18 °C) – Condenser pressure drop	1 m^3/h - 0.3 bar
Air (ice cream at 100% overrun)	Max 400 lt/h
Required air pressure	Min. 5 bar
Dimensions	
Height	1600 ± 40 mm (1850 mm stand)
Length	1450 mm (1800 mm stand)
Width	600 mm (800 mm stand)
Weight	
Gross weight	~ 750 kg
Net weight	~ 560 kg
Connections	
Mix inlet	1 ½" clamp
Ice cream outlet	1 ½" clamp
Air inlet	8 mm
Condensing water inlet	1” gas
Condensing water oulet	1” gas

2.3 OVERALL DIMENSIONS

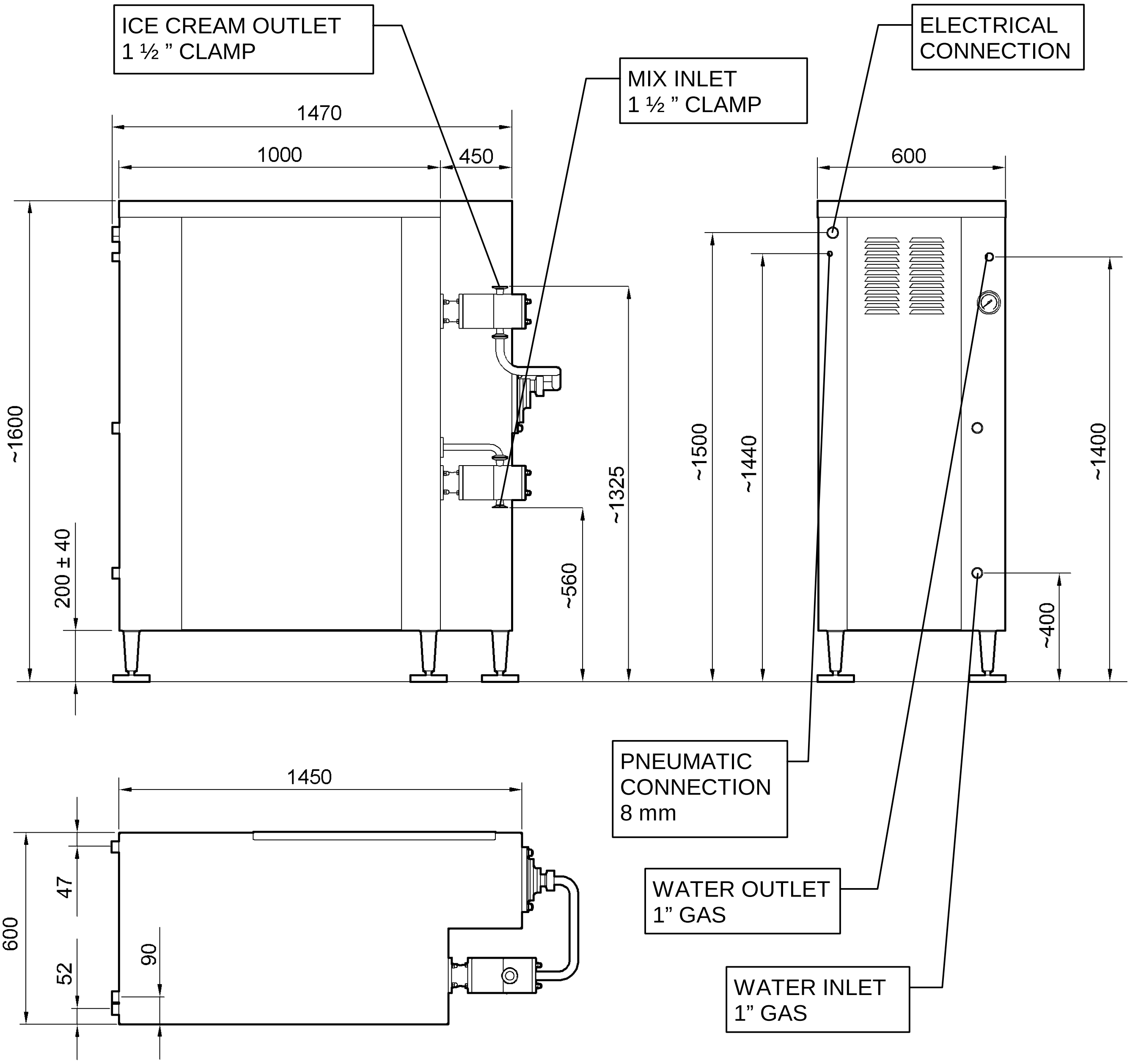


Fig. 2-1 – Overall dimensions

2.4 WORK ENVIRONMENTAL LIMITS

The machine is quilified to work within the following environmental limits:
Temperature: from 4°C to 40°C;
Humidity: from 20% to 80%;
Height from the sea level: up to 1000 m.

NOTE: Our company declines any responsibility for damages deriving from not following the warnings above.

2.5 COMPLIANCE

The machine has been built according to the international standards and to the hygienic-sanitary rules regarding food machines.
In particolar, SIDAM abuts, through the Declaration of Conformity supplied together with the machine, that the productive unit has been projected and built according to what is indicated in the Directive 89/392/CE (Machines Directive) and complying with the rules mentioned above concerning it.

2.6 SOUNDING EMISSION LEVEL

During production, the level of sounding emission results to be inferior to 85 dB (A).
The measure of that value has been surveyed following the instructions in the directive EN 98/37/CE (1 meter off the machine and 1,60 m above the ground) and employing the methodology foreseen by the standard UNI EN ISO 11202.

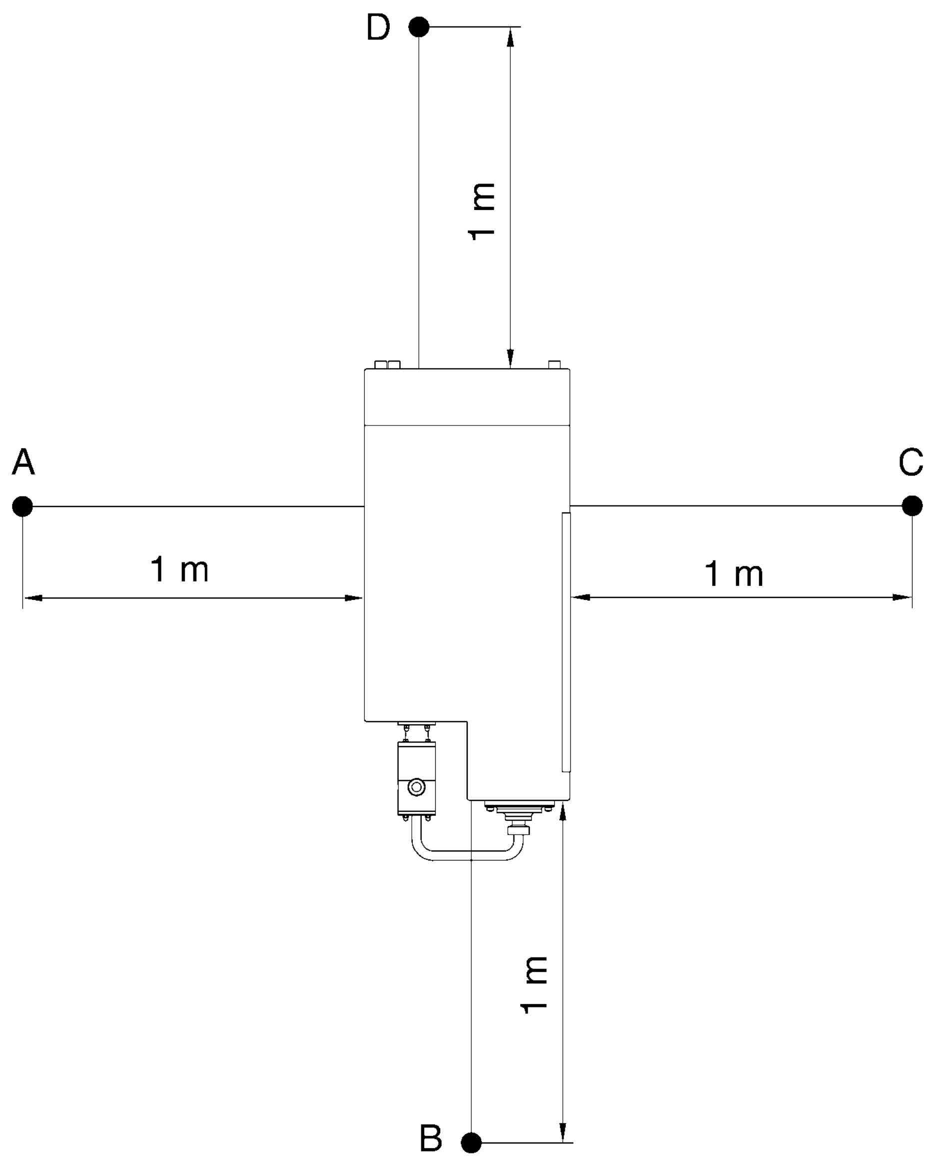


Fig. 2-2 – Sounding emission level

3. DESCRIPTION OF THE MACHINE

3.1 GENERAL DESCRIPTION

The machine tasks are: to mix sanitary air up with the ice cream mixture supplied to the machine to reach the desired volume increase; to cool down the resulting mixture added with air in order to obtain the viscous product which we call ice cream; to supply the sufficient pressure to convey the ice cream to the use, making it flow through an adequate pipe.
The GIF continuous freezers serie has been projected with a phylosophy horiented to the maximum ease.
Keeping tight to the ice cream production basis, the GIF freezers are able to deliver a stiff, dry and smooth product fit for packing, or a soft and flowable one to be dosed in moulds.
A modular design allows complete access to all the components of these freezers.

- The cabinet is wholly made with stainless steel with legs adjustable in height. The panels are easily removable to permit complete access to all the mechanical, electrical and freezing components.
- All the parts in contact with the product are made with materials compatible with food, normally with stainless steel. This composition hinders the contamination, assuring years of correct functioning without maintenance problems.

To carry out the functions above, the machine comprises inside:

- A pump (Fig. 3-1 pos. 2) that receives the mixture from the maturing vats and sends it towards the freezing cylinder (Fig. 3-2 pos. 4), adding sanitary (Fig. 3-2 pos. 3) air.
- A flow gauger (Fig. 3-2 pos. 8), that senses accurately the mixture flow entering in the machine.
- A set of filters (Fig. 3-1 pos. 1) that allow to obtain sanitary air from the compressed air mains.
- A freezing cylinder (Fig. 3-2 pos. 4), with whipping shaft, scraping blades and lip seal, within which the air is uniformly scattered in the mixture and the product obtained this way is cooled down until it becomes pasty. The whipping shaft is operated by a motor (Fig. 3-2 pos. 5) with belt transmission (Fig. 3-2 pos. 7).
- A freezing installation (Fig. 3-2 pos. 6) connected to the outer wall of the freezing cylinder to supply the necessary cooling.
- Electrical and pneumatic installation controlling all the functions of the machine kitted with an operator panel with display that allows to read and modify the functioning conditions and to get an explanation of the alarm signs.

Fig. 3-1 – General description

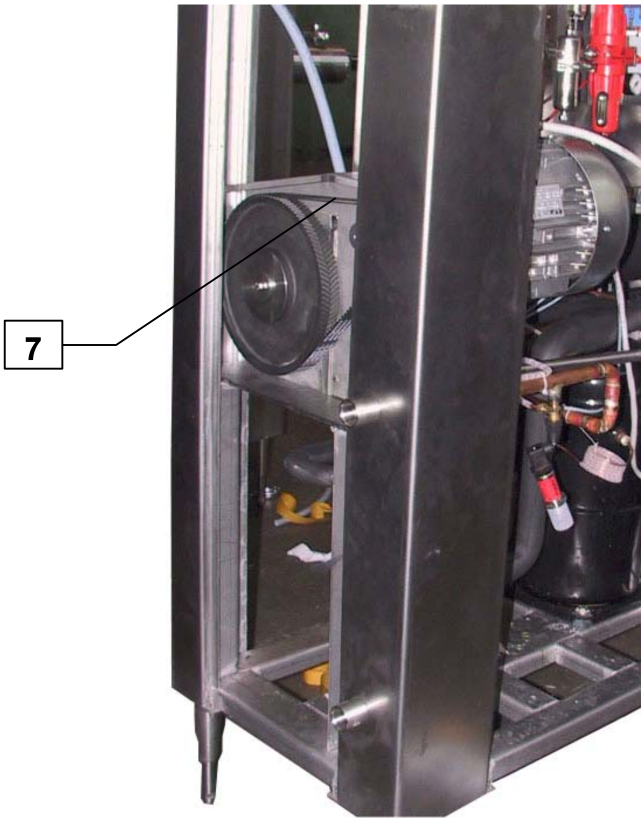


Fig. 3-2 – General description

3.2 FREEZING CYLINDER

The freezing cylinder (Fig. 3-3 pos. 1) placed in the machine, provides to batch the mixture supplied by the costumer with sanitary air introduced in the machine, and to freeze the whole new mixture to obtain a type of ice cream coming out of the pump (Fig. 3-3 pos. 2) that complies with the temperature and viscosity values required.
It is positioned horizontally inside the machine: it is made by a thick layer chrome plated pipe with interspace and by a whipping shaft.
A freezing gas is made flow through the cylinder interspace, during the production, to lower the ice cream temperature down to the required value.
Apart from improving the level of batching of mixture and sanitary air, the whipping shaft, working with eccentric rotation, provides to hinder the ice cream bunching over the cylinder walls thanks to scraping blades.
To guarantee a good long-lasting functioning of the machine, it is necessary to pay much attention to the assembly and to the sharpening conditions of the scraping blades. Pay extreme attention also not to damage the chrome plated wall inside the cylinder.

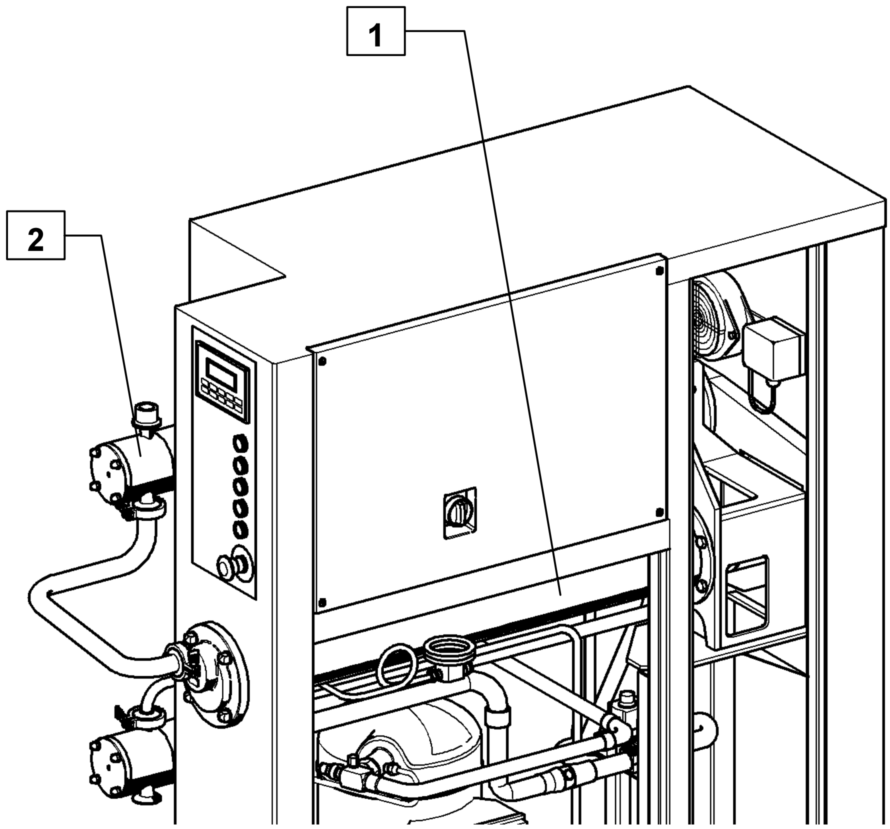


Fig. 3-3 – Freezing cylinder

3.3 PUMPS

The machine is equipped with two pumps.
The first one (Fig. 3-4 pos. 1) introduces the mixture supplied by the costumer into the freezing cylinder, whereas the second one (Fig. 3-4 pos. 2) sends ice cream to the freezing cylinder of the working machine through the feeding pipe (not supplied).
The pumps are operated by ratiomotors (Fig. 3-4 pos. 3), each of which is controlled by an inverter (permitting this way the automatic speed control).
The pumps are kitted with a pneumatic drive by-pass that allows a clear crossing of the cleaning solution during the CIP washing and the zero setting of the pressure inside the cylinder when turning the machine off.

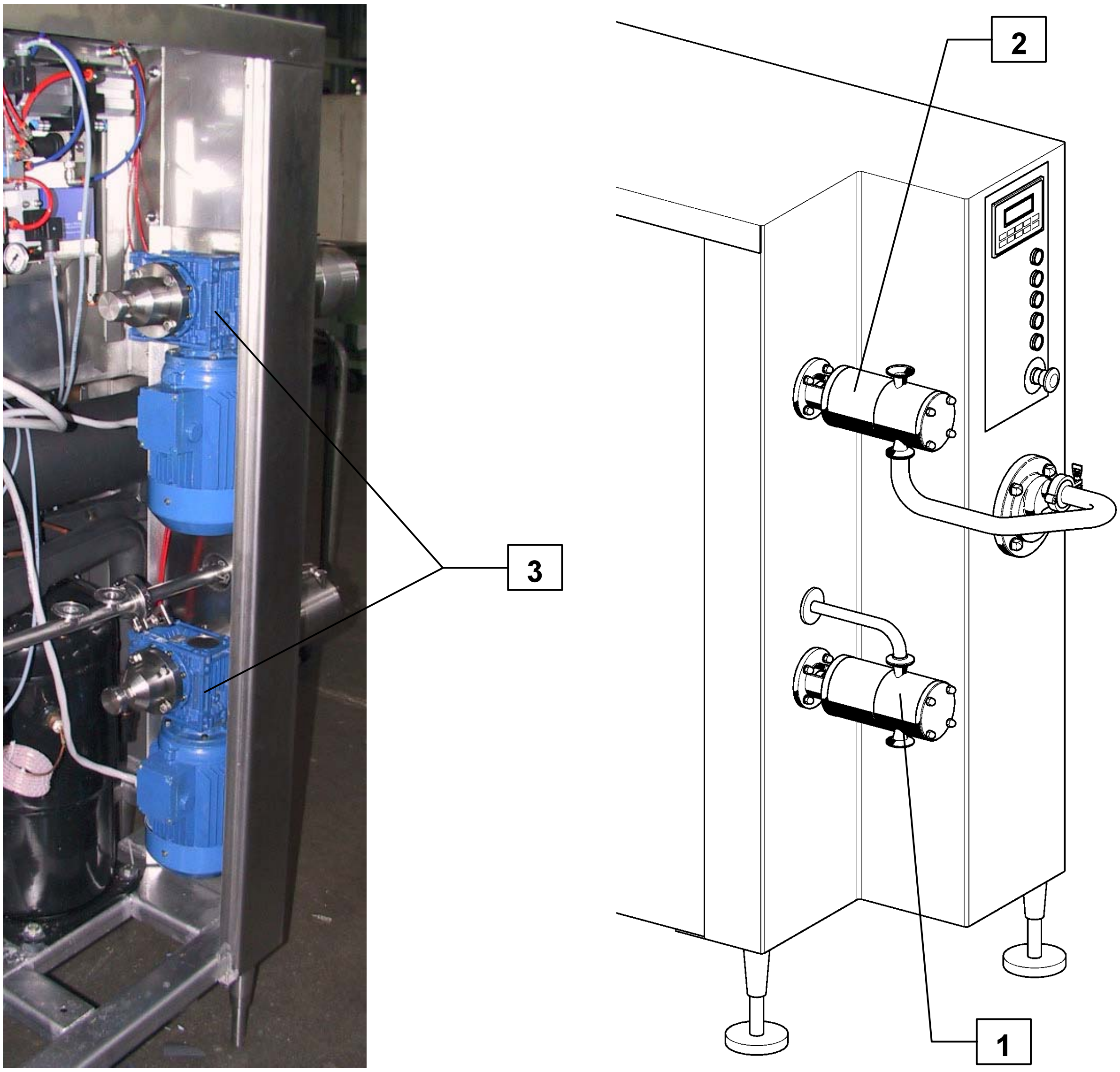


Fig. 3-4 – Pumps

3.4 PNEUMATIC INSTALLATION

The compressed air supplied to the machine (the machine doesn't include an air compressor) passes through a 1° filter (Fig. 3-5 pos. 1), a pressure multiplier (Fig. 3-5 pos. 2) to obtain the fit pressure to introduce air into the mixture, a 2° filtering set (Fig. 3-5 pos. 3) that carries out a separating-the-oil straining and an activated charcoals filtering to remove any oil steam and bad smells.
Eventually, before being introduced into the mix, the air flows through a sterilizing microporous filter (Fig. 3-5 pos. 4) specifically dimensioned to stop particles with typical bacteria dimensions.
The air is introduced into the duct through a flow adjusting valve (Fig. 3-5 pos. 5) that adjusts the quantity of air to mix according to the freezer capacity.
The pneumatic installation comprises also a pressure pickup (Fig. 3-5 pos. 6), which supplies an alarm when the mains compressed air pressure is too low, and the solenoid valve operating the by-passes of the CIP washing pumps.

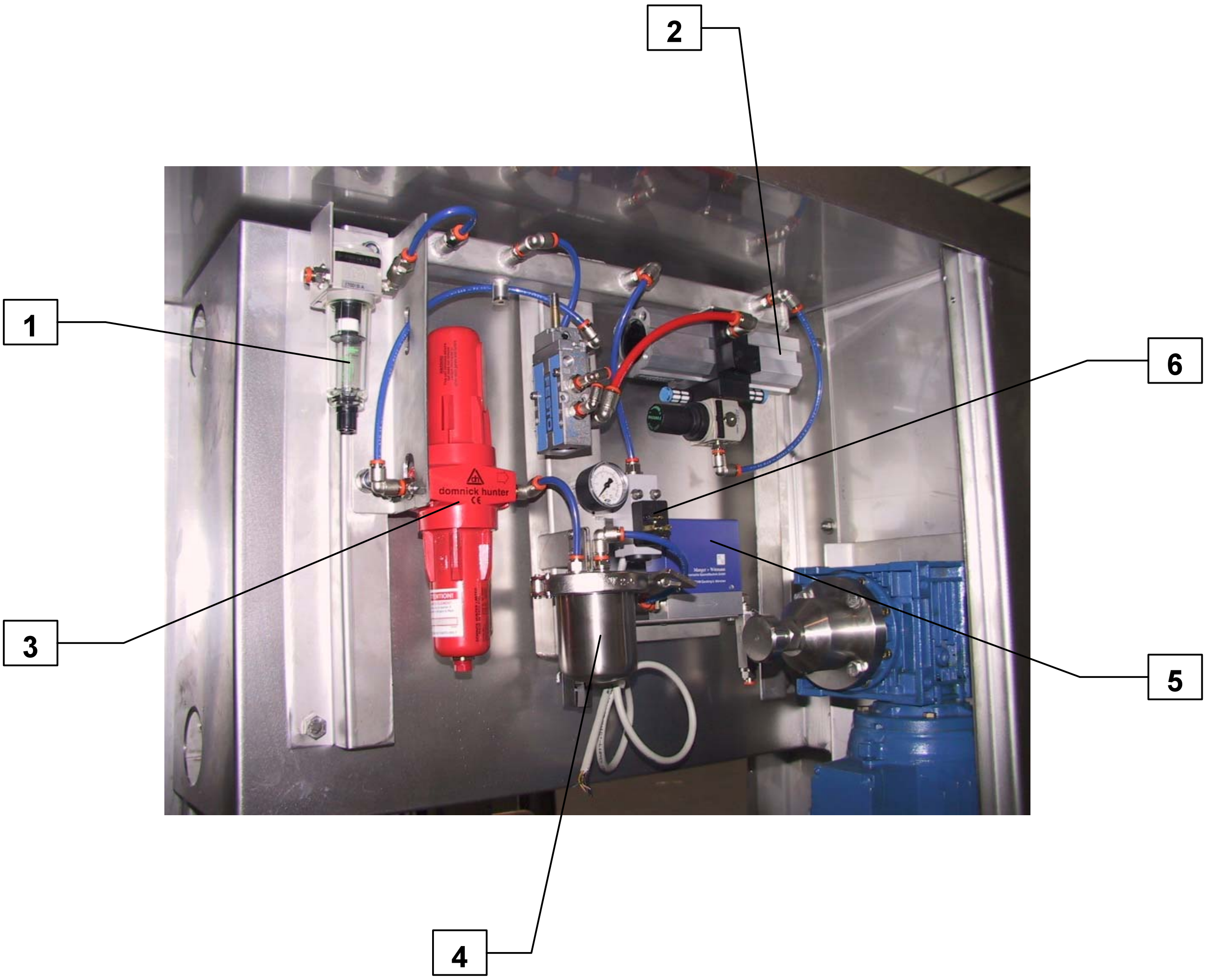


Fig. 3-5 – Pneumatic installation

3.5 FREEZING CYLINDER

It is composed of a frosting cylinder (Fig. 3-6 pos. 1) (evaporator), a rotatory Copeland Scroll (Fig. 3-6 pos. 2) compressor, a high efficiency condenser, the thermostatic valve and various minor fittings.
All these components are specifically foreseen and dimensioned for the low temperature functioning with R404A refrigerant gas. The cooling function is executed through gas compression: therefore, the compressor pumps the gas into the condenser where it is cooled and liquefied; the liquid gas obtained this way passes through the thermostatic valve and vaporizes in the frosting cylinder (Fig. 3-6 pos. 1) (turning back to the gaseous state) just to reach then the compressor and start the cycle again.
The vaporization of the gas in the frosting cylinder subtracts heat from the ice cream mixture, which cools down; this heat is then eliminated in the condenser yielding it to the cooling water, which gets warmed this way.
On the condenser water circuit is mounted a pressure adjusting valve that keeps the condensation pressure constant, whatever the water temperature value is.

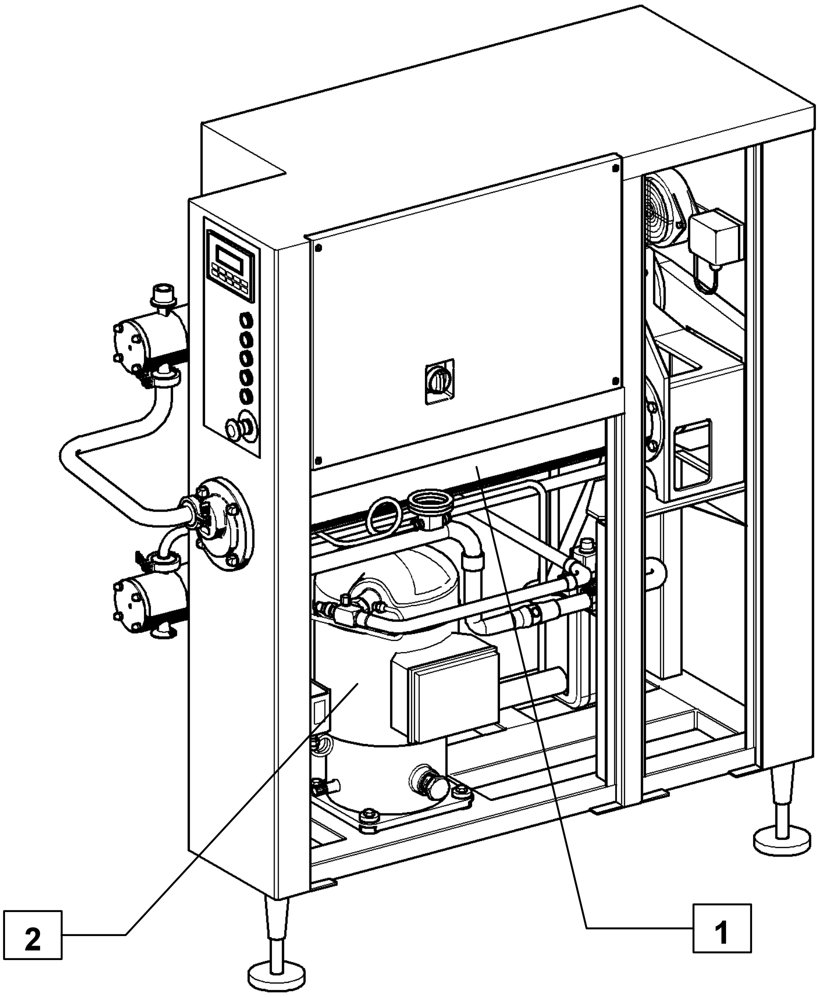


Fig. 3-6 – Freezing installation

3.6 ELECTRICAL INSTALLATION

It is made of an operator panel (Fig. 3-7 pos. 1) and the electrical board (Fig. 3-7 pos. 2) which lies in the right side of the machine.
On the operator panel it is possibile to: activate or deactivate all the machine functions; carry out all the functioning adjustments; check the anomalies indications.
In the electrical box (Fig. 3-7 pos. 2) placed in the right side of the machine, are positioned all the control and power equipments and on the outer side is the general switch (Fig. 3-7 pos. 3).

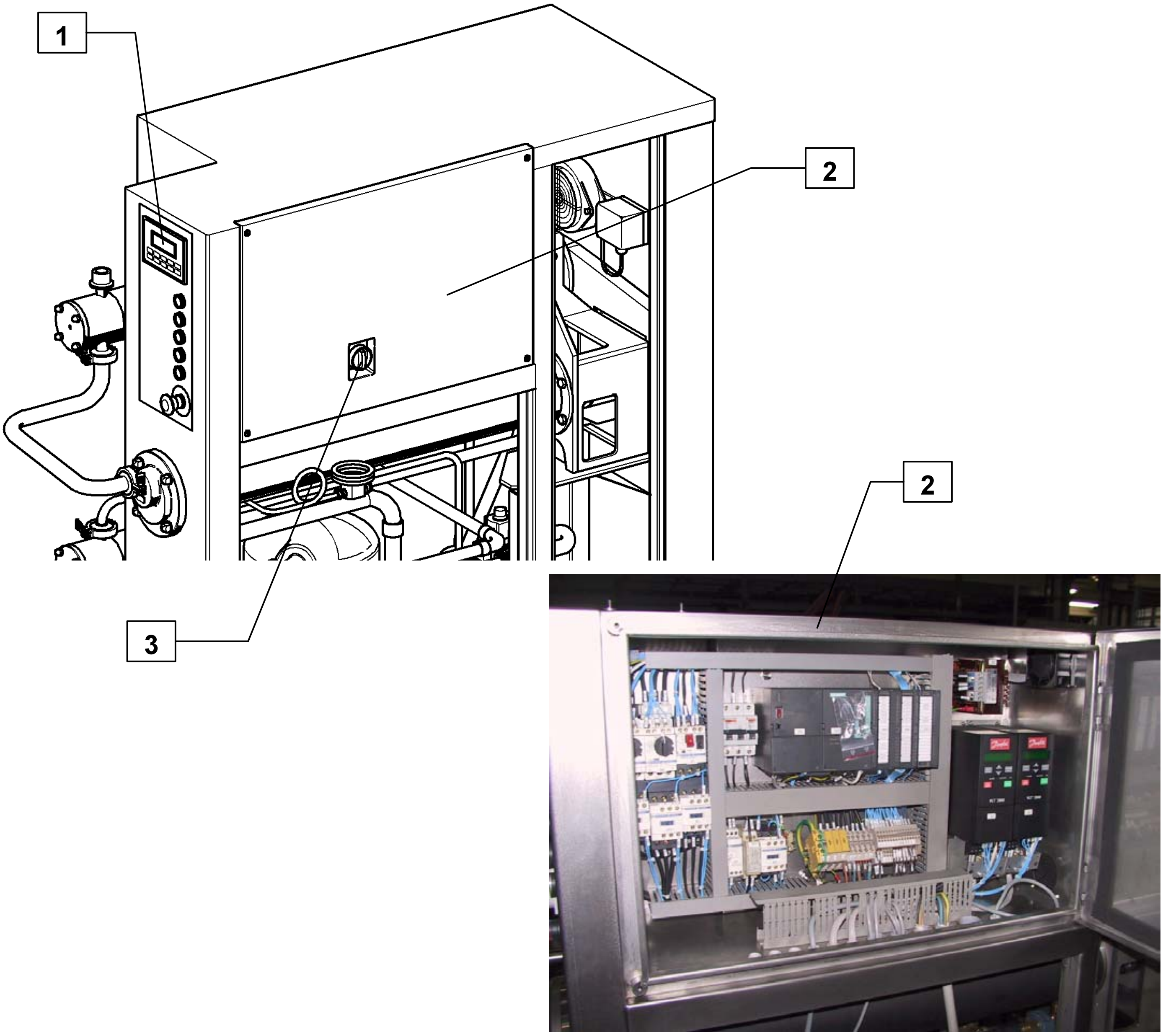


Fig. 3-7 – Electrical installation

3.7 CONTROL PANEL

The control panel described hereby allows to control and check all the functions of the machine, that is:
Through luminous push-button it is possible to operate the GIF 600 devices.
They light up if the corresponding device is on, they blink quickly if the device cannot work or is in alarm mode. The corresponding alarms are displayed on the operator panel too.

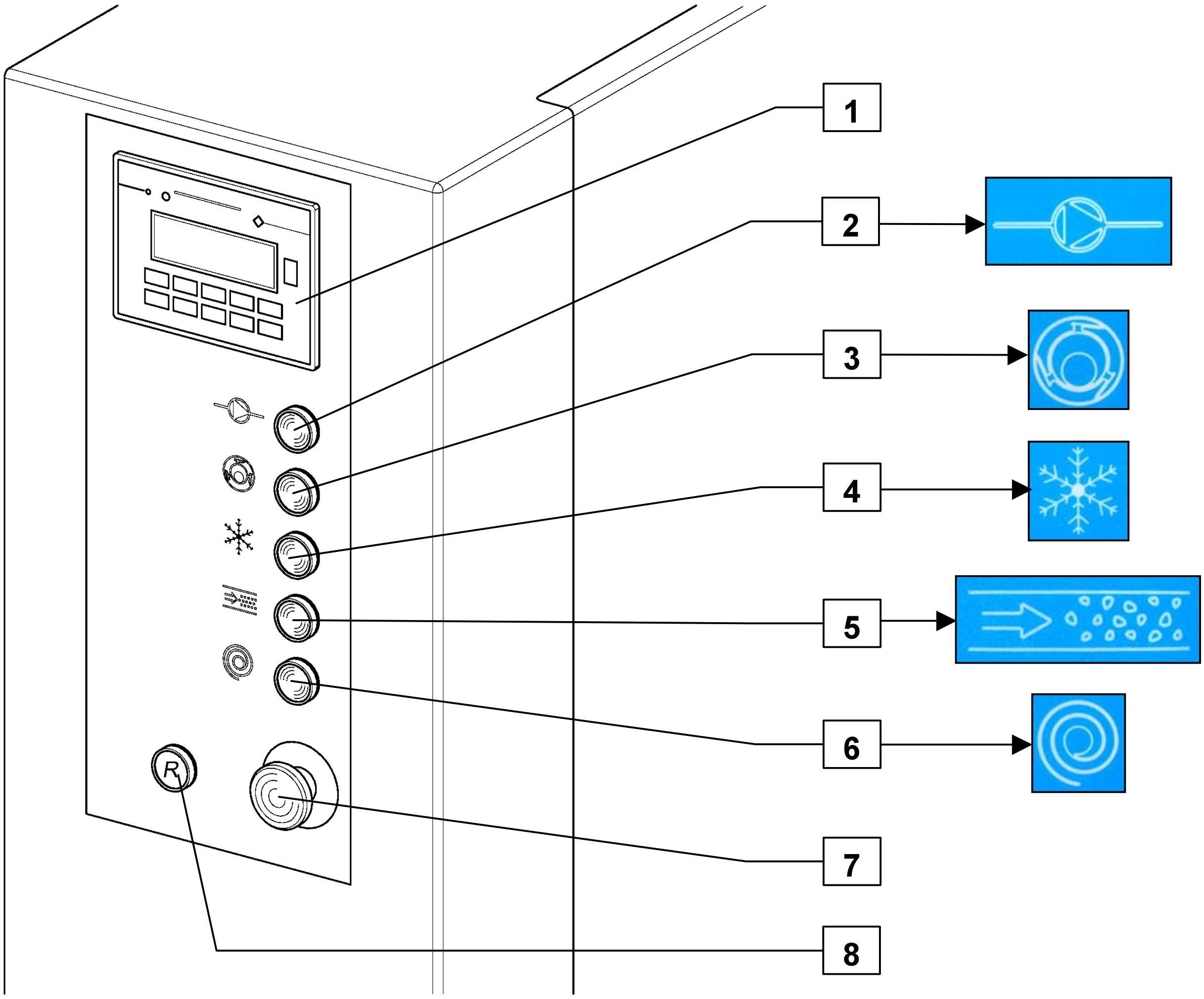


Fig. 3-8 – Control panel

Ref.	Description
1	OPERATOR PANEL
2	PUMPS ON/OFF
3	CYLINDER ON/OFF
4	COMPRESSOR ON/OFF
5	AIR (OVER-RUN) ON/OFF
6	CIP ON/OFF
7	EMERGENCY PUSH-BUTTON
8	EMERGENCY RESET

3.8 OPERATOR PANEL

Through the operator panel it is possible to change the main variables of the GIF 600 functioning.
The **Mix flow-rate**, in l/h. Changing this value, the speed of the inlet pump varies consequently.
The ***overrun***, in %. Changing this value, the flow of the air introduced into the mix varies consequently.
The **viscosity**, in %. Changing this value, the cylinder motor absorption is controlled, to keep the desired viscosity.
The **pressure**, in bar, of the ice cream inside the freezer.
It is also possible to change the recipes. Every recipe will recall a set of stored values. 25 recipes are available.

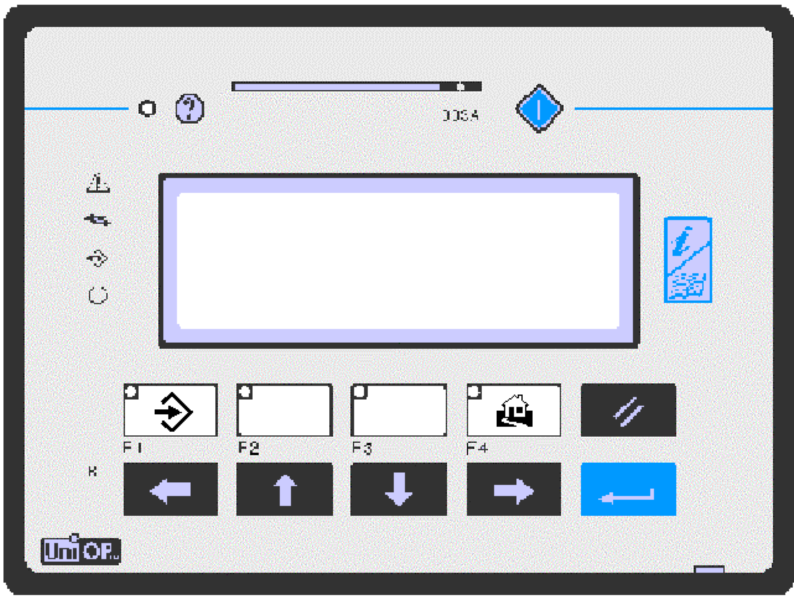
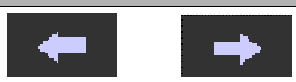
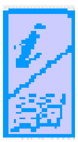


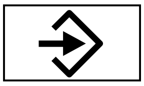
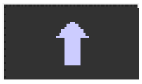
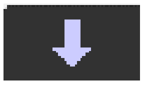
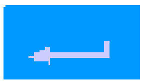
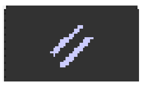
Fig. 3-9 – Operator panel

<u>Using the operator panel:</u>

Key	Description
	THEY ARE USED TO SCROLL THE PAGES IN SEQUENCE
	THEY ARE USED TO SCROLL THE PAGES VERTICALLY
	BY PUSHING THIS KEY, IT GOES BACK TO PAGE 1
	BY THIS KEY IT IS POSSIBLE TO ENTER OR EXIT THE ALARMS PAGE (IF ANY ALARM IS PRESENT)

Parameters modification:

The following keys are used:

Key	Description
	BY PUSHING THIS KEY THE INSERT MODE IS ACTIVATED; THE DATUM TO EDIT STARTS TO BLINK
	IT INCREASES THE PARAMETER VALUE: BY KEEPING IT PUSHED DOWN, THE VALUE INCREASES MORE QUICKLY
	DECREASES THE PARAMETER VALUE: BY KEEPING IT PUSHED DOWN, THE VALUE DECREASES MORE QUICKLY
	IT CONFIRMS THE MODIFICATION OF THE INSERTED VALUE
	IT ESCAPES THE PARAMETER EDITING

3.8.1 PAGE SEQUENCE (PAGE 1 – MAIN ONE)

In this page the main functioning parameters are displayed.
In this page it is not possible to change any parameter.

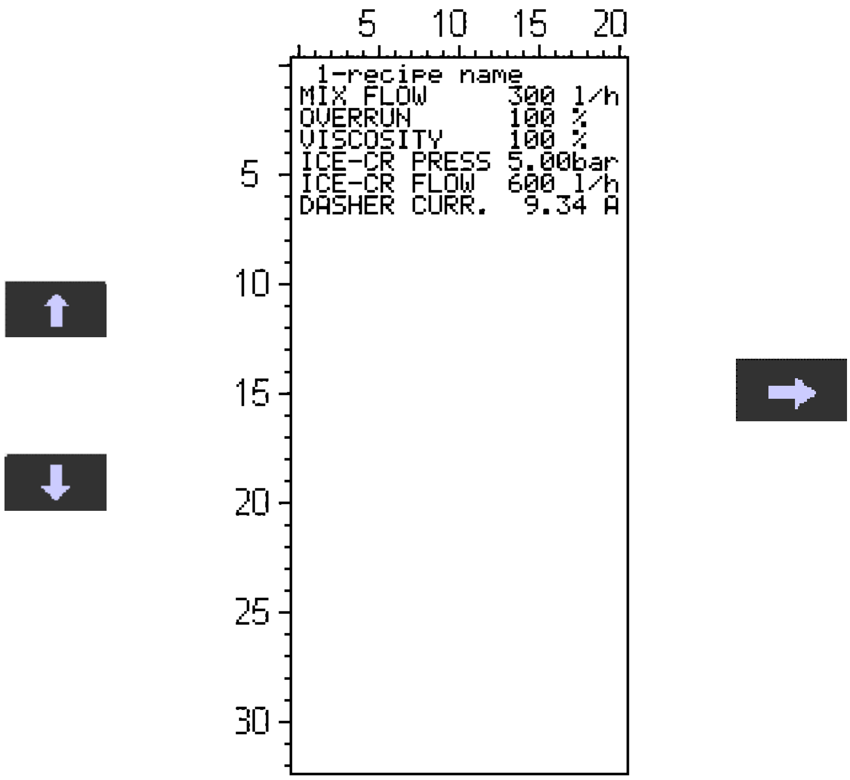


Fig. 3-10 – Page sequence (Page 1 – Main one)

3.8.2 PAGE SEQUENCE (PAGE 2 – MIX FLOW)

In this page it is possible to change the mix flow.
“Act” refers to the value currently employed by the machine; by pushing ↵ the edited value will become the current one.

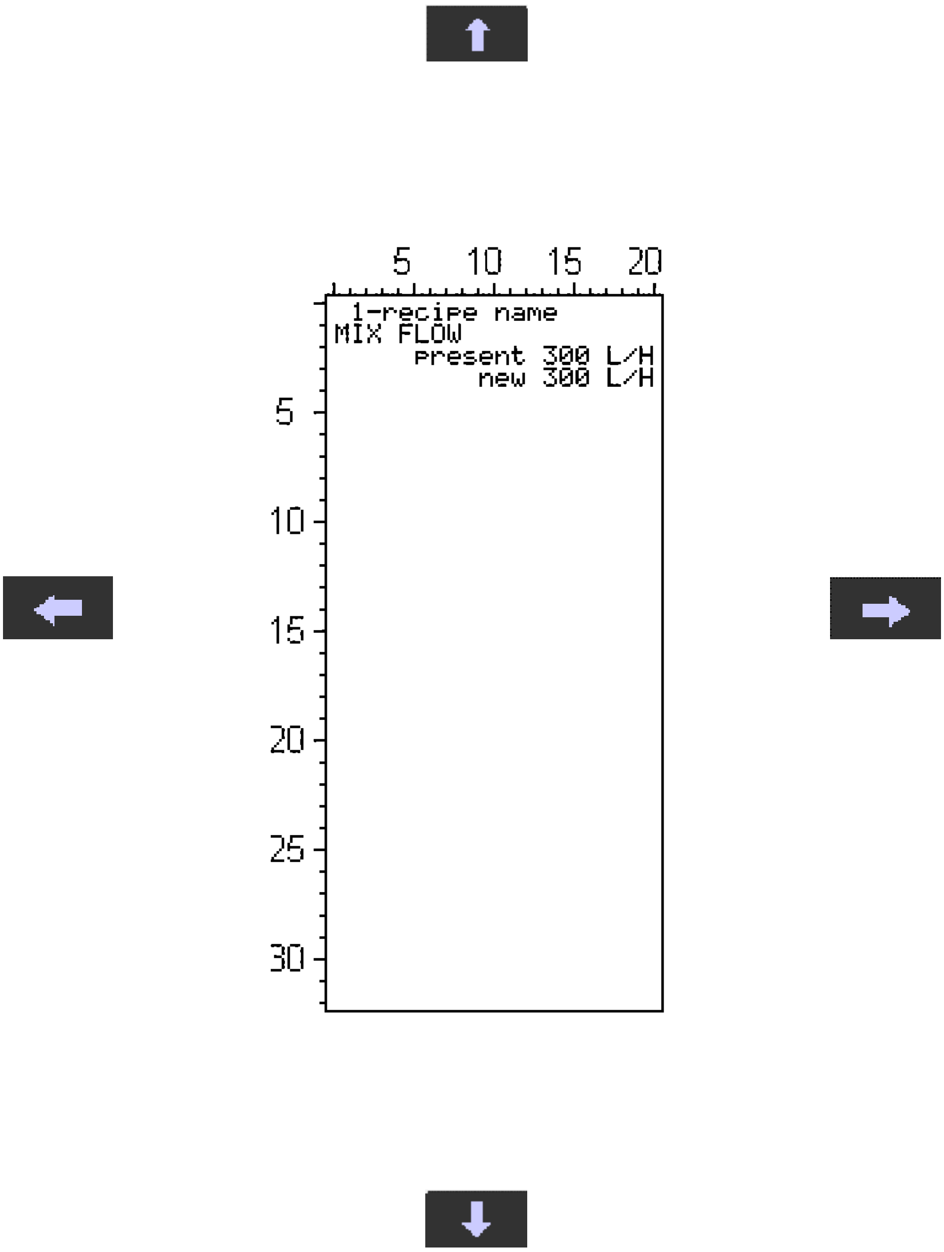


Fig. 3-11 – Page sequence (Page 2 – Mix flow)

3.8.3 PAGE SEQUENCE (PAGE 3 – OVERRUN)

In this page it is possibile to change the overrun value.
"Act" refers to the value currently used by the machine; by pushing ↵ the edited value will become the current one.
It is also possibile to display the flow of the air set in l/h and the reading of the air flow pickup.

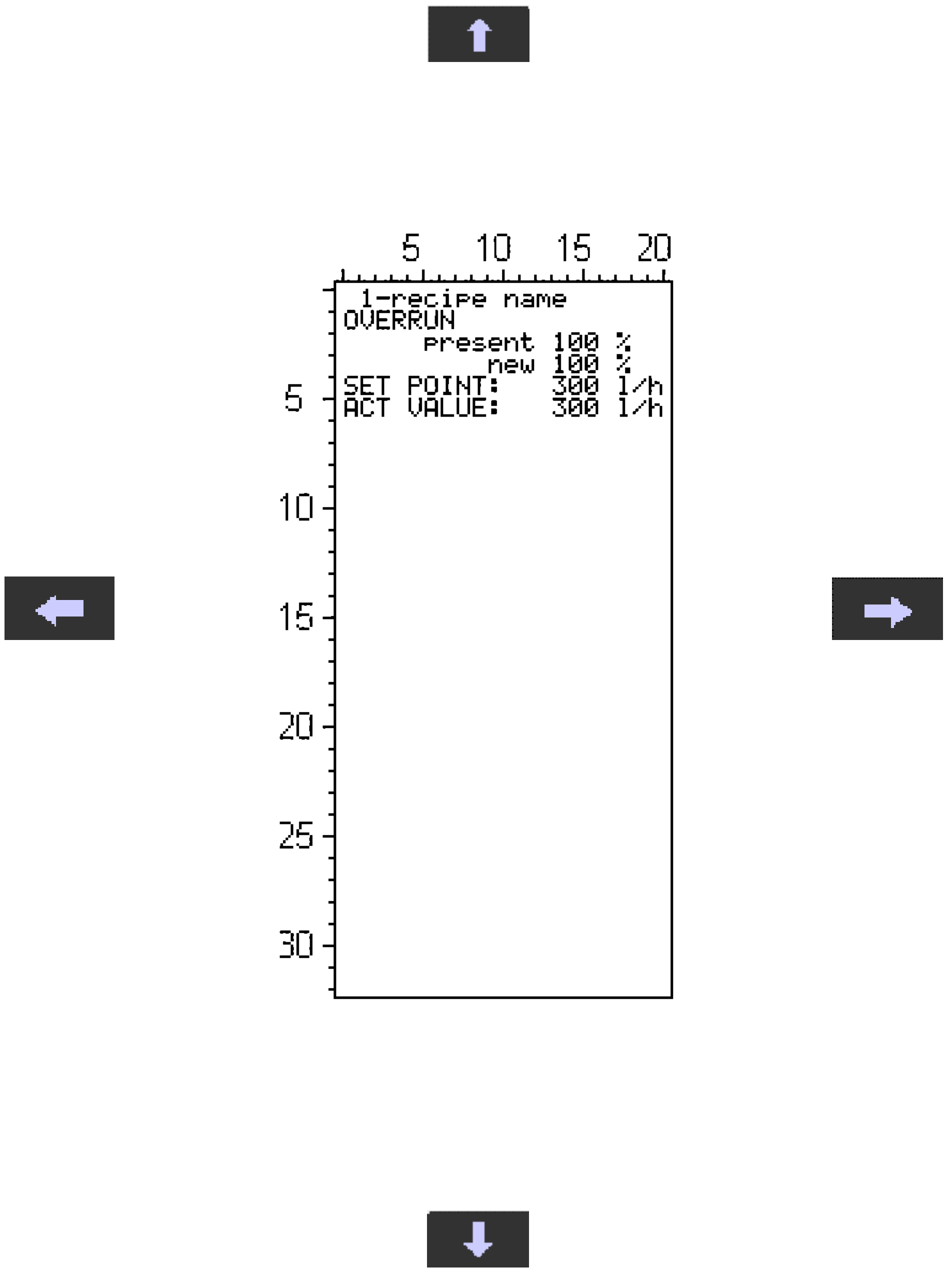


Fig. 3-12 – Page sequence (Page 3 – Overrun)

3.8.4 PAGE SEQUENCE (PAGE 4 – VISCOSITY)

In this page it is possibile to change the viscosity value.
"Act" refers to the value currently employed by the machine; by pushing ↵ the edited value will become the current one.
It is also possibile to display:

- The current absorbed by the cylinder motor;
- The adjustment activation threshold.

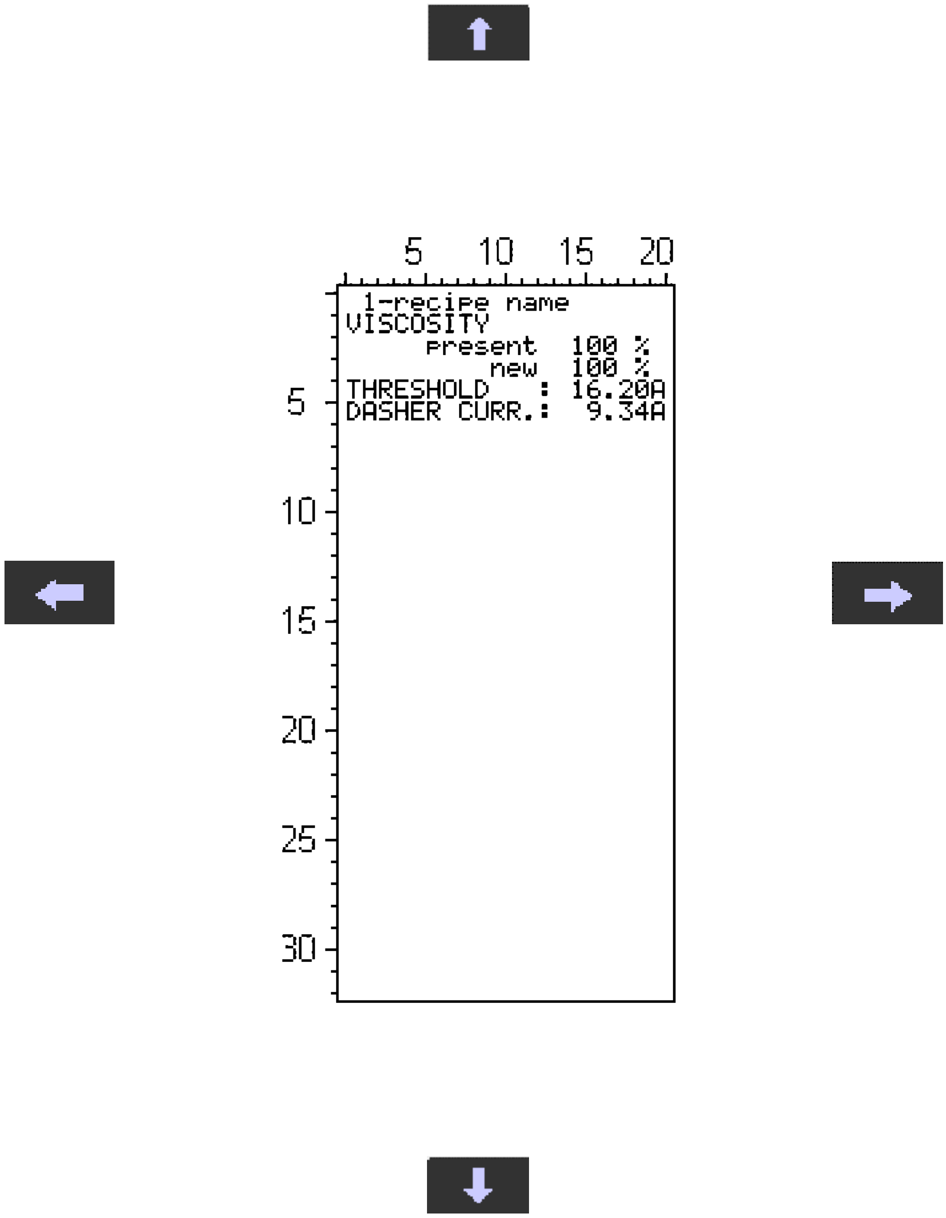


Fig. 3-13 – Page sequence (Page 4 – Viscosity)

3.8.5 PAGE SEQUENCE (PAGE 5 – ICE CREAM PRESSURE)

In this page it is possible to change the value of the ice cream pressure inside the freezer.
“Act” refers to the value currently used by the machine; bu pushing ↵ the edited value will become the current one.
It is also possibile to display the reading of the pressure pickup.

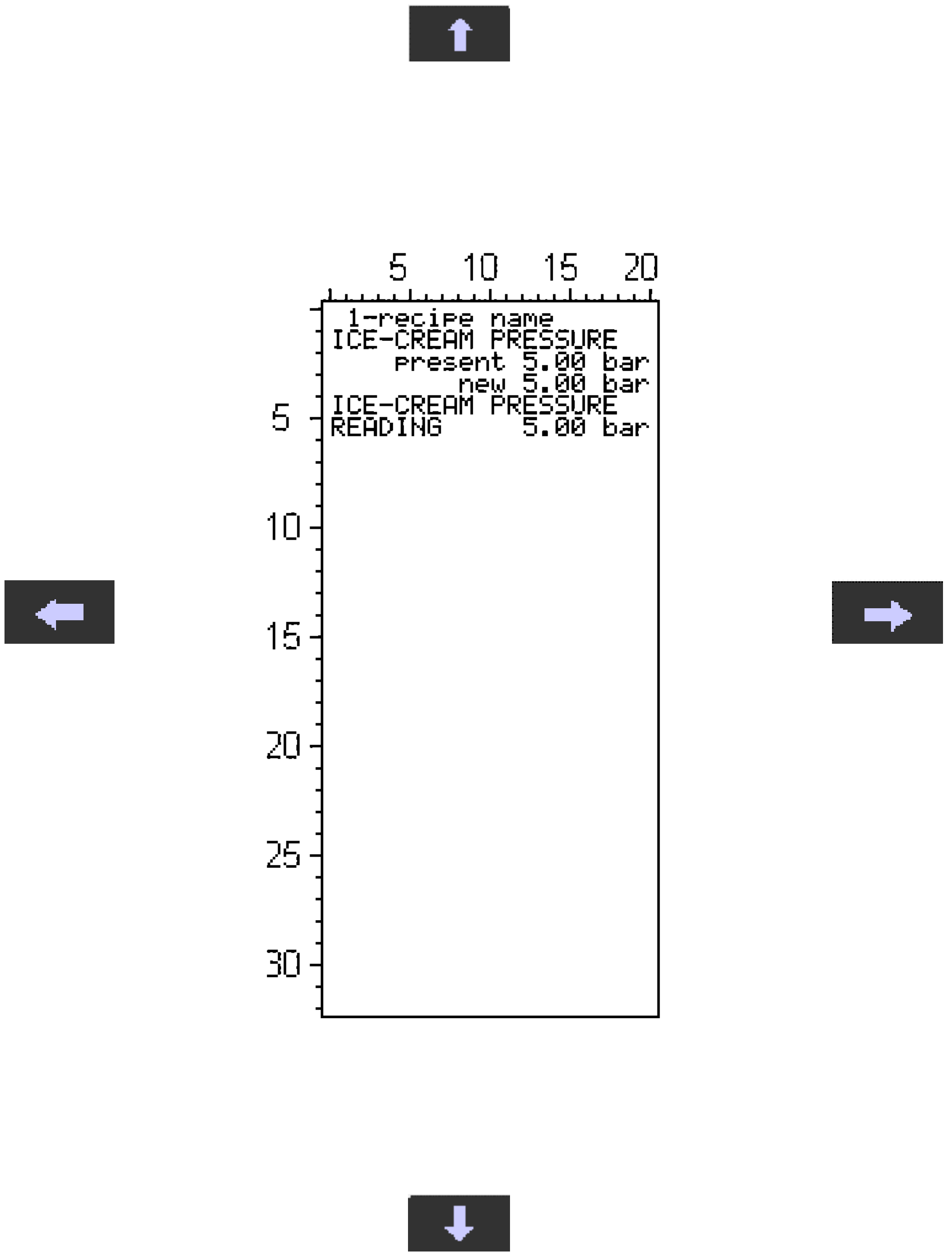
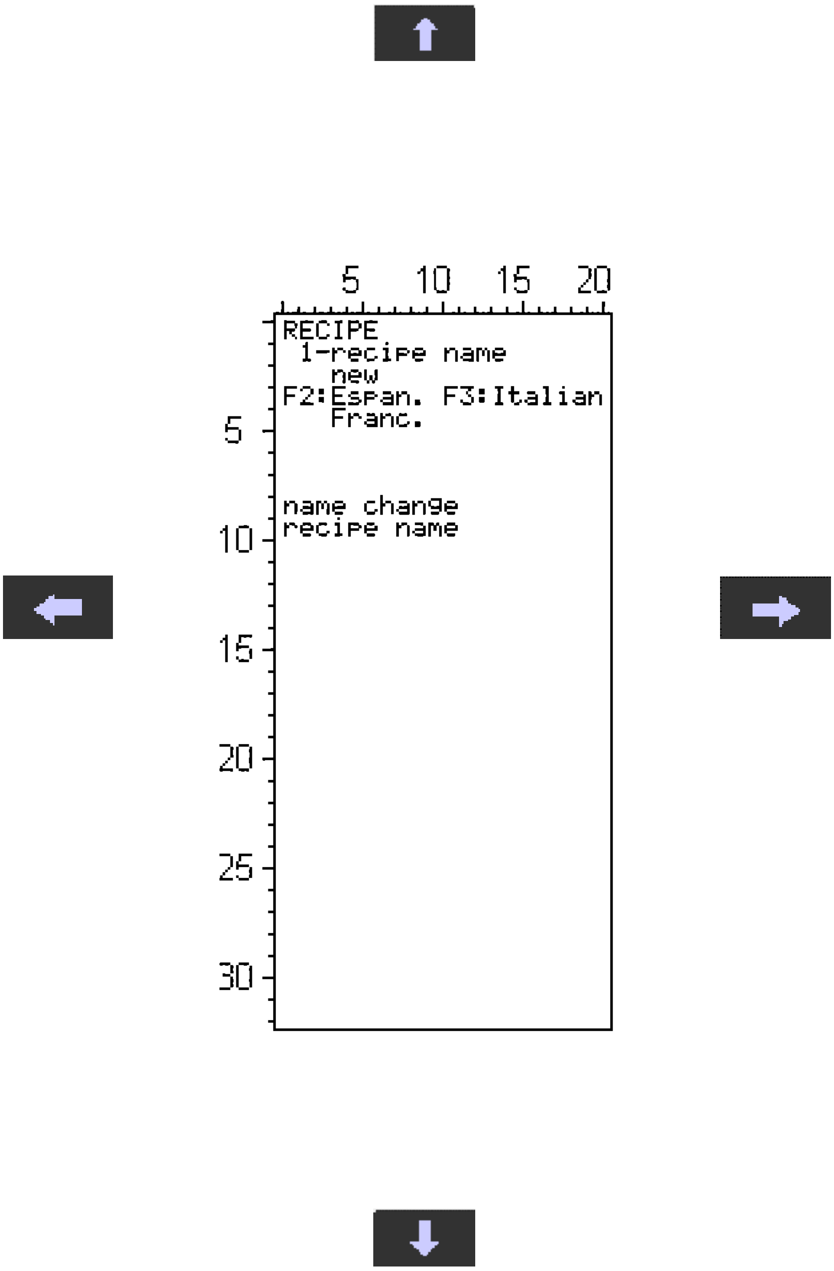


Fig. 3-14 – Page sequence (Page 5 – Ice cream pressure)

3.8.6 PAGE SEQUENCE (PAGE 6 – RECIPE CHANGE AND LANGUAGE CHANGE)

In this page the work recipe is selected.
“Act” is the recipe currently at work on the machine. Setting up a new recipe, the values stored before will be recalled.
By pushing F2, the operator panel language will turn to English; by pushing F3, it goes back to the former language (see example).



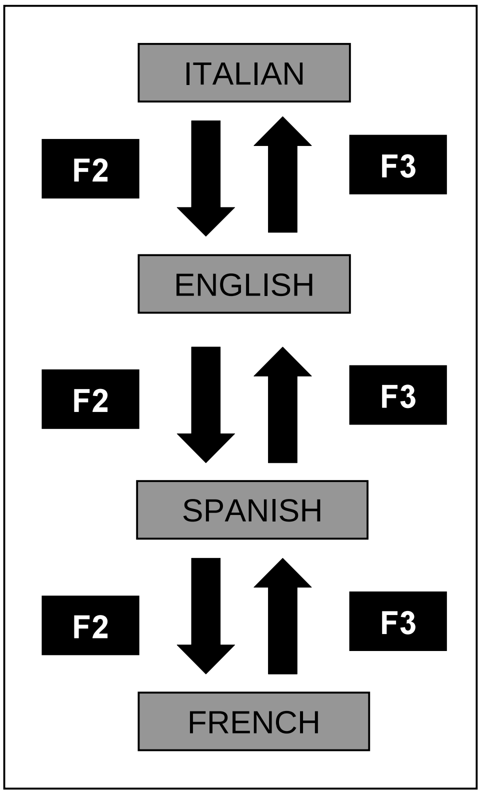
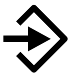


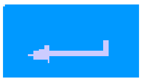
Fig. 3-15 – Page sequence (Page 6 – Recipe change and language change)

The set of stored parameters for every recipe is made up of the following values:
MIX FLOW RATE
OVERRUN
VISCOSITY
PRESSURE
Overrun correction factor
Recipe name

RECIPE NAME MODIFICATION:
scroll the page (⇓) until there appears:

name change `recipe name`

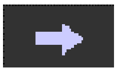
press the introduction key 

use the arrows ⇐ ⇒ to move to the letter to edit and use the keys ⇑ ⇓ to change the letter.
Press 

to finish the name modification.

3.8.7 PAGE SEQUENCE (PAGE 7 – CIP)

In this page the maximum washing time is set.
To move from the hours field to the minutes one, push:



The F2 key enables the modification of the h (hours) datum.
The F3 key enables the modification of the ‘ (minutes) datum.
It is also possible to display the time elapsed from the CIP function activation.

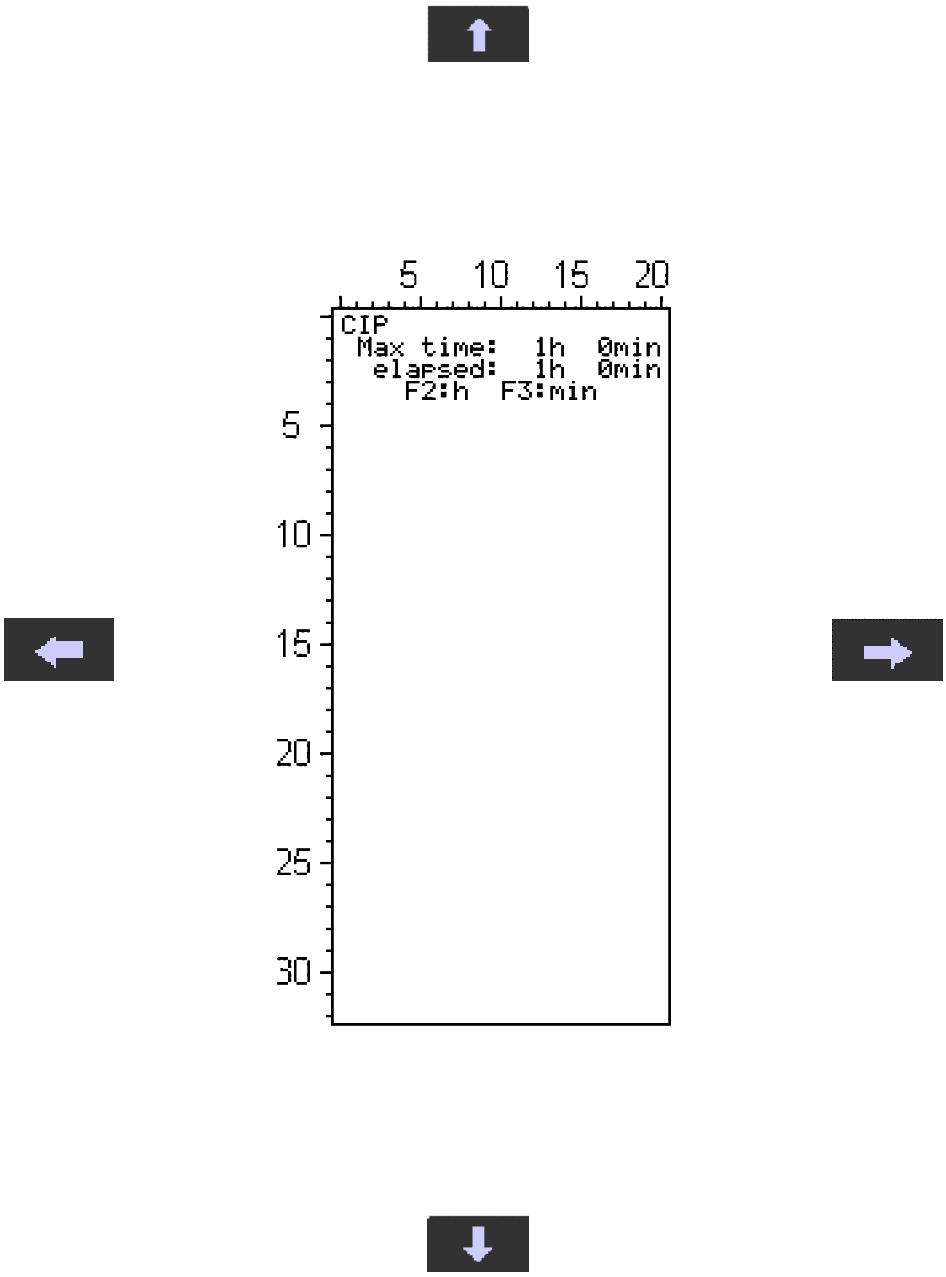


Fig. 3-16 – Page sequence (Page 7 – Cip)

3.8.8 PAGE SEQUENCE (PAGE 8 – OVERRUN ADJUSTMENT)

In this page it is possible to set a k-factor to adjust a possibile inaccuracy of the set overrun value.
Es.:
set overrun value: 100
Through a measurement it is found that the real overrun value is 95.
Once inserted the real value, by pushing F2, an adjusting (k)factor is calcuated.
It is also possibile to display the set overrun value in l/h, as well as the surveyed one.
By pushing the F3 key, the adjustment is escaped and the value fixed is K=1.

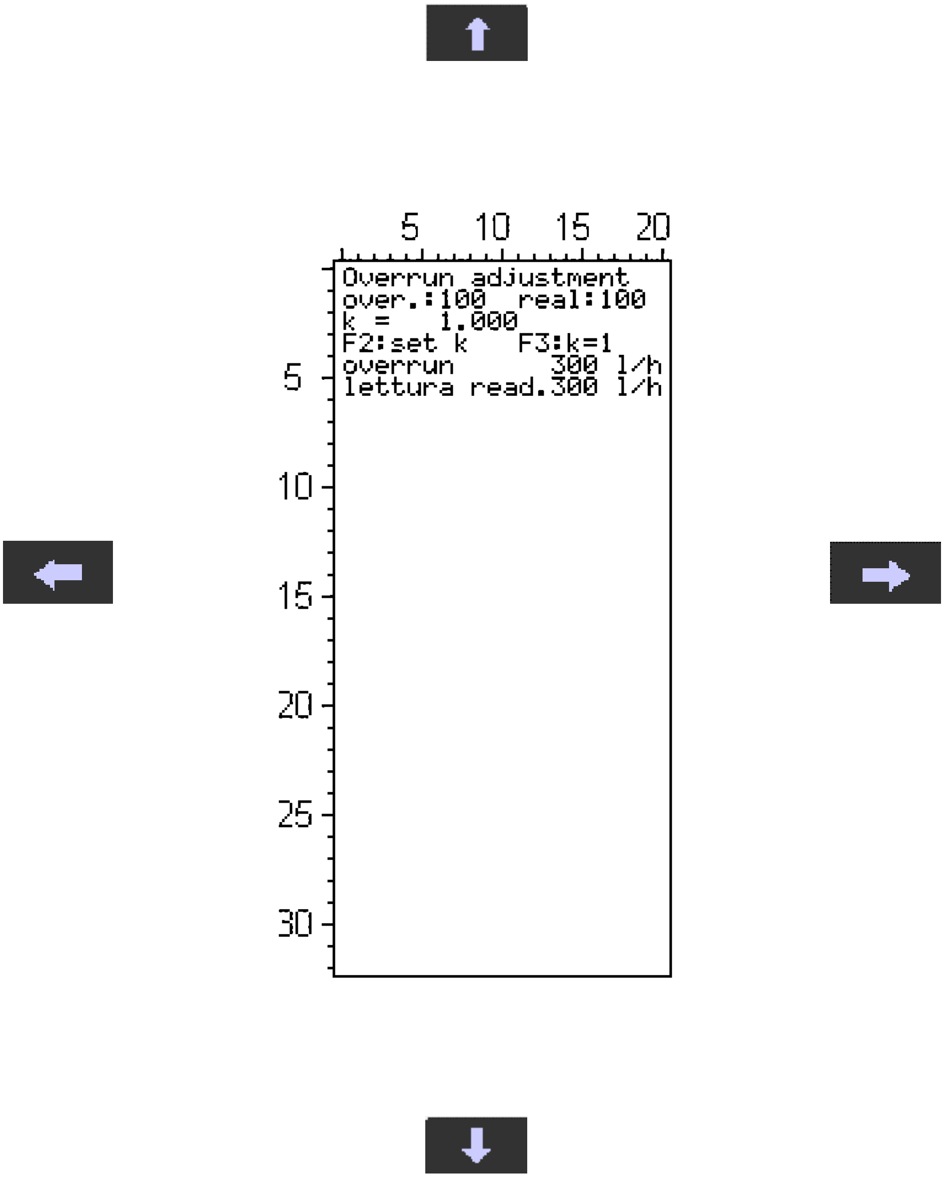


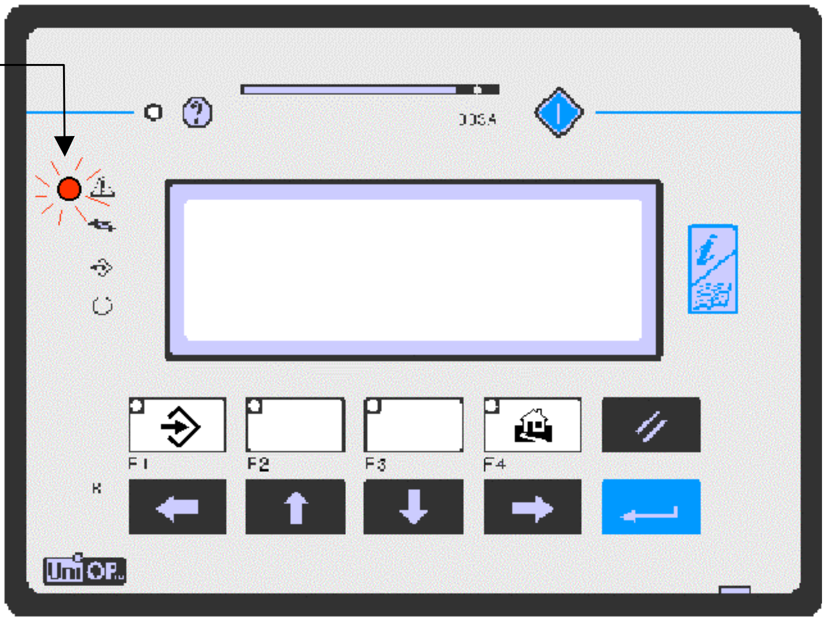
Fig. 3-17 – Page sequence (Page 8 – Overrun adjustment)

3.9 ALARMS

If an alarm occurs, the display switches to the alarm page showing which alarm is on; a red lamp lights up on the OP and, if the alarm regards one of the five devices linked to the bright push-buttons, the light of the button starts to blink quickly.

The operator has to confirm the alarm by pushing the ↵ key.

The red light will flash if the alarm still needs confirmation by the operator.
It will not blink if the alarm has been confirmed even though still present.



After eliminating the cause that generated the alarm, before restarting production it's required to push the "R" pushbuttom (Fig. 6-1 pos. 9).

Fig. 3-18 – Alarms

<u>Alarms list:</u>

1. Cylinder thermic protection
2. Compressor thermic protection
3. Inverter thermic protection
4. Inlet pump overcurrent
5. Outlet pump overcurrent
6. Air pressure
7. Refrigerant fluid pressure
8. Compressor protection
9. Inverter in alarm
10. Emergency
11. Air flow pickup
12. Cylinder motor overcurrent
13. Ice cream pressure pickup

Alarms description:

Cylinder motor thermic protection:
The dasher motor thermic protection has tripped; check the motor and the transmission to the dasher.

Compressor thermic pressure:
The compressor thermic protection has tripped. Check the compressor.

Inverter thermic protection:
The inverters thermic protection has tripped. Check both the pumps inverters.

Inlet pump overcurrent:
An exceeding absorption of current by the mix pump motor has been noted; check motor and pump.

Outlet pump overcurrent:
An exceeding absorption of current by the ice cream pump motor has been noted; check motor and pump.

Air pressure:
A < 4 bar pressure is being detected in the compressed air supply circuit.

Refrigerant fluid pressure:
A too high of too low pressure value is being detected in the freezing circuit.

Compressor protection:
The compressor electronic protection or the stages control relay has tripped. Check that the supply stages be correctly connected (luminous light on the stages control relay (2B1) is on). Check the compressor.

Inverter in alarm:
One of the two inverters has gone into alarm mode; check the pumps inverters.

Emergency:
The Emergency button has been pushed.

Air flow pickup:
An anomaly of the air flow sensor is being detected; check the sensor wiring harness and the device inlet air pressure.

Cylinder motor overcurrent:
A current consumption more than 10% over the motor nominal consumption is being detected.
This alarm stops the compressor to decrease the load to the dasher motor. The problem could be deriving from a too low ice cream flow keeping the pressure in the cylinder too high.

Ice cream pressure pickup:
An anomaly of the ice cream pressure pickup is being detected; check the sensor and its wiring harness.

3.10 WORK STATIONS

For the functioning of the GIF freezer it takes:

- 1 operator for the startingup, adjustment and general control during production.

Every other operator must keep at a safety distance avoiding to hinder the normal work operations being performed.

4. INSTALLATION

4.1 PACKING

The machine is fixed with wooden blocks.
The spare parts box is placed on a pallet beside the machine and is fastened with adhesive tape.
Possible extra-equipments are also placed below or aside the freezer and are secured with adhesive tape.

4.2 LIFTING

The freezer must be positioned on a pallet with the weight equally distributed.
The pallet that contains the freezer must be lifted in one of the following ways:

1. by fork truck;
2. by crane on which a fork is installed;
3. by crane and slings around the pallet.

4.3 DELIVERY CHECKS AND UNPACKING

Upon receipt of the freezer, inspect for any visible damages that may have been caused during transportation.
Please pay careful attention to the packaging and look out for damage clues, because any external damage could mean that the container was subjected to violent blows or jolts that would have probably damaged the contents inside, being that invisible from the outside.
Any damage ascertained after inspection will have to be reported to the delivery company as well as to the insurance company.
During the assembly and before the shipment, all the fixing elements (screws, bolts, rings, nuts) have been carefully tighened and tested, but the continuous vibrations present during shipment can cause their loosening.
After receiving the machine and before its startingup, we suggest that a technician checks carefully their tightening.
We suggest to carry out this operation also during the maintenance periodic control of the installation, to avoid expansive downtimes and repairs.

4.4 REQUIRED SPACE

The required space for the installation of the freezer must be such to allow the carrying out of all the use and maintenance operations with absolute safety.
Make sure, therefore, that a free room of at least 0.7 m is by the sides and on the rear part of the machine, whereas on the work front side the free space must be at least of 1.5 m.

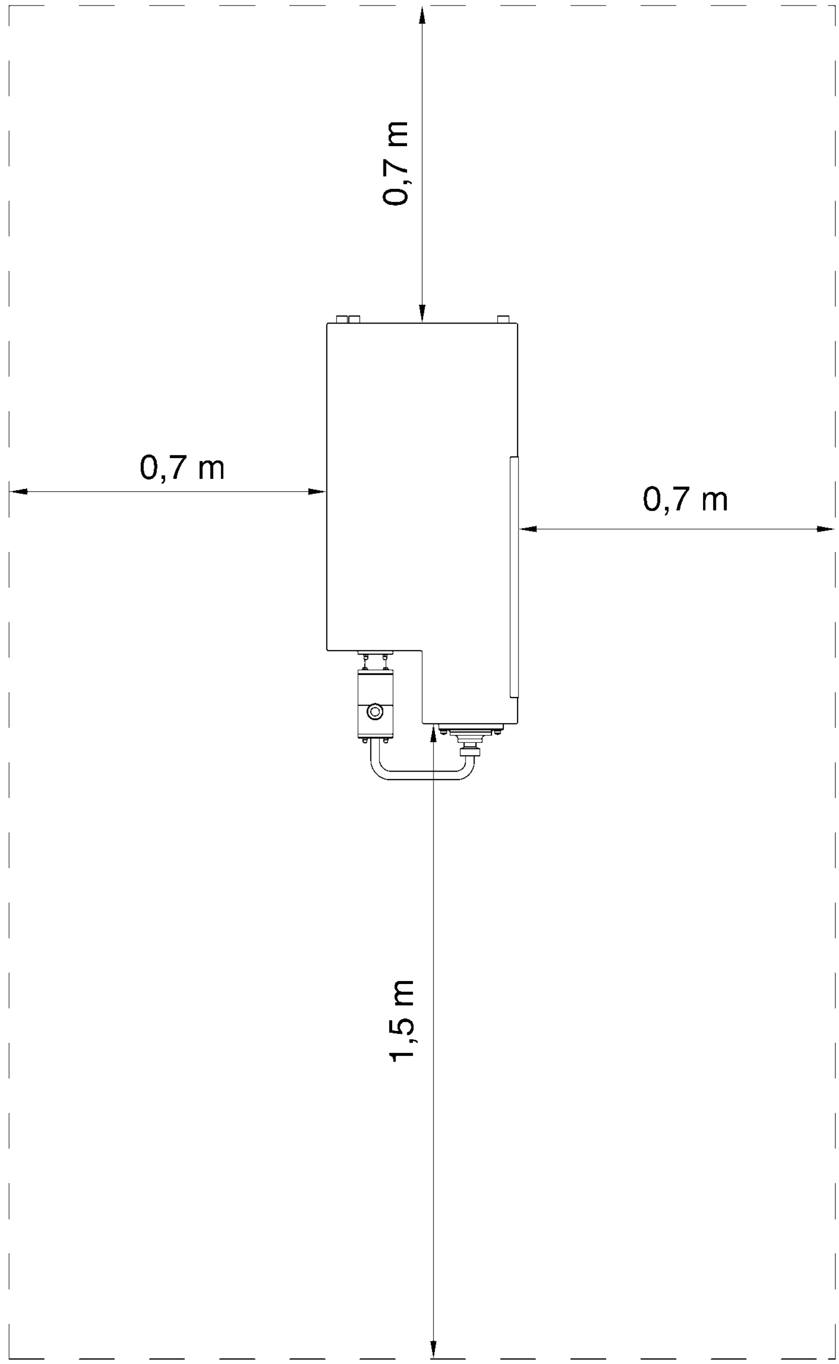


Fig. 4-1 – Required space

4.5 POSITIONING AND INSTALLATION

1. Remove carefully the package, and bring the freezer to the destined area, leaving it on its wooden base (see drawing below). Lift it up with adequate frames fit for its weight and taking care not to damage it.
2. Screw the levelling feet taking care to position the proper anti-slide pads on the feet resting point. Lean the machine on the pads and adjust the height from the ground to about 200 mm (8”).
3. Level the freezer both longitudinally and transversely by means of its adjustable feet **providing a slight gradient backwards in order to let the washing waters flow and be drained.**
4. Mount the cartridge for the sterilizing filtration inside the corresponding steel container paying attention not to affect them nullifying their sterility conditions.

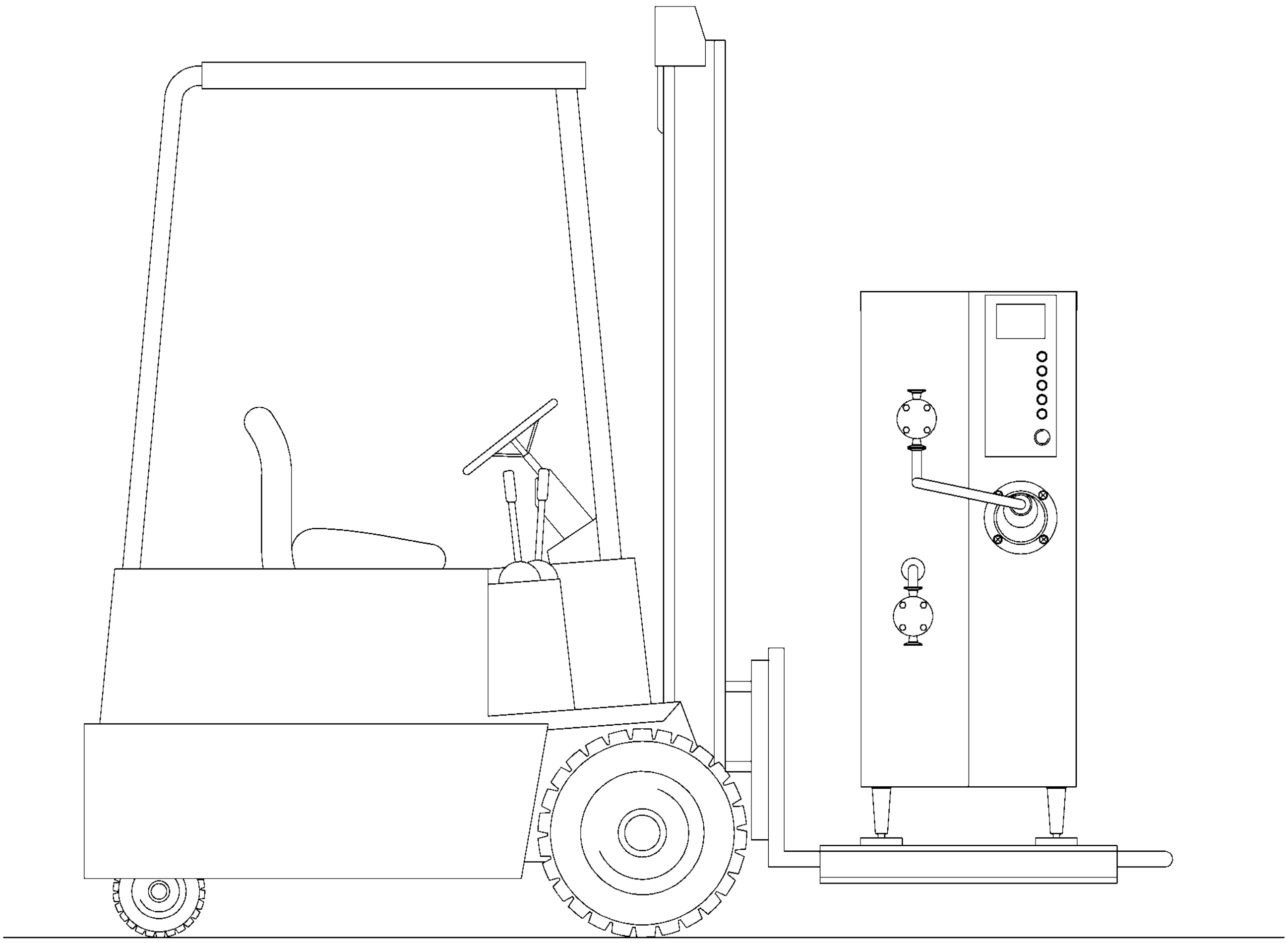


Fig. 4-2 – Positioning and installation

4.6 CONNECTIONS

4.6.1 COOLING WATER CONNECTION

Carry out the connection of the cooling water complying with the rules foreseen in the country where the freezer is installed.
The connection must be carried out by skilled technicians aware of the relative standard mentioned above.
Connect the mains water sending to the attachment positioned on the lower part of the machine (Fig. 4-3 pos. 1) and the return to that placed on the upper part (Fig. 4-3 pos. 2).
During the connecting procedure, prearrange the installation of proper intercepting valves (Fig. 4-3 pos. 3) for the following water isolation of the machine during maintenance procedures.
It is also advisable to prearrange a second valve (Fig. 4-3 pos. 4) next to the lower connection in order to allow a possibile drainage of the water container inside the freezer.
The pipeline diameter must be fit for the flow-rate required by the machine and must not be lower than that of the machine connections in any way (1” gas).
Before executing the connections, make sure that the pipelines are clear of sediments or dirt particles.
Also make sure that the mains water doesn’t carry particles that could reduce the thermic exchange capacity of the cooling circuit. If it wasn’t like this, install a filter upline before the supply in order to reduce the harmful particles entering the machine.
Between the two main fittings there is a third one (Fig. 4-3 pos. 5) to be used during the washing operations of the cooling circuit.
The machine is equipped with a pressure adjusting valve (Fig. 4-3 pos. 6) that adjusts the flow-rate of the water to the cooling circuit in an inversely proportional ratio to its temperature.
The cooling water temperature can therefore be supplied at different values without affecting the correct cooling.

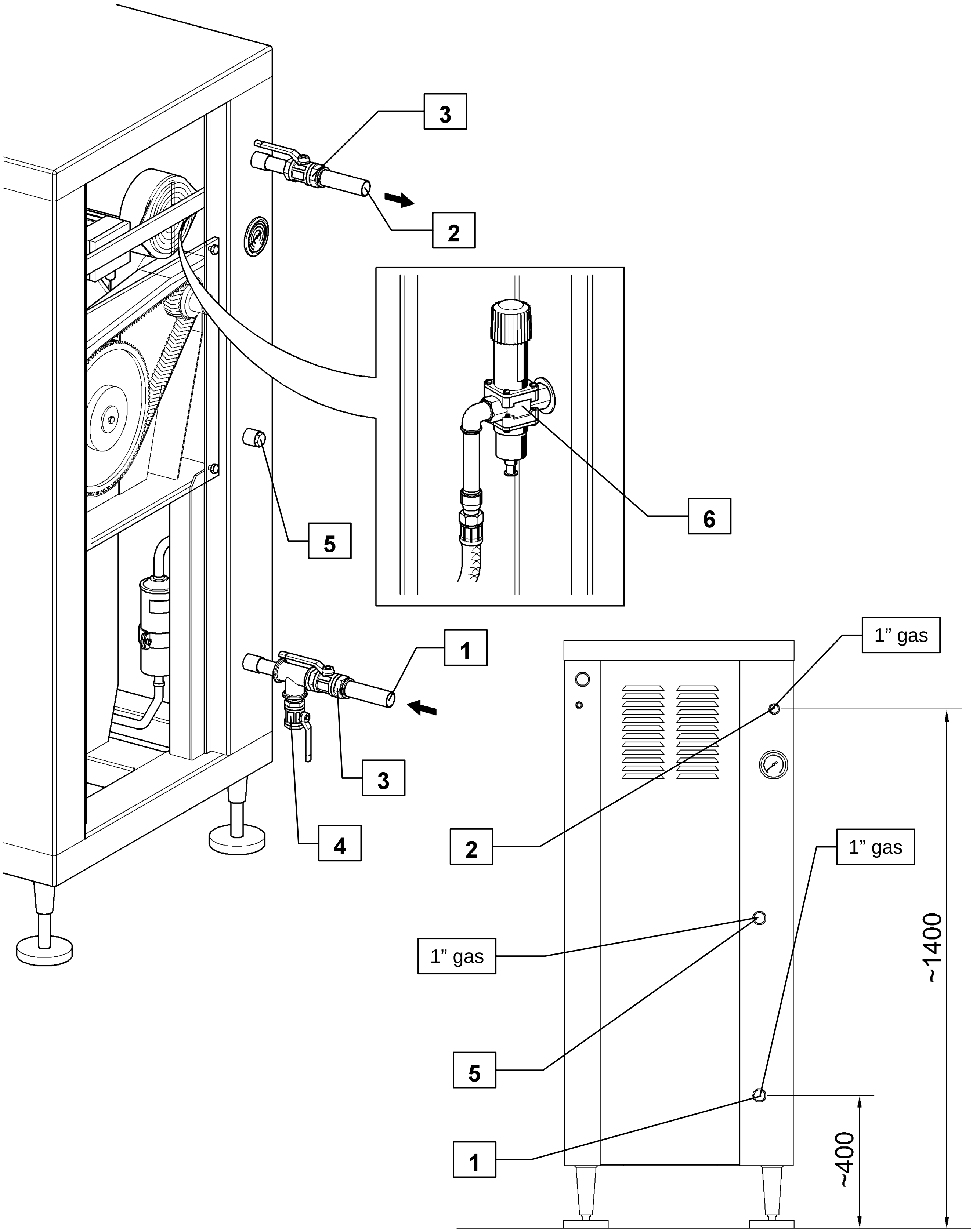


Fig. 4-3 – Cooling water connection

4.6.2 MIXTURE INLET AND ICE CREAM OUTLET CONNECTION

Carry out the connection of the mixtrure sending pipeline (supply on costumer charge) to the lower attachment (Fig. 4-4 pos. 1) of the inlet pump (Fig. 4-4 pos. 2).
During the connection mentioned above, prearrange the machine for the installation of a proper valve system for the simultaneous connection with the CIP washing pipeline.
The installation of such valve system allows to reduce to the minimum the downtimes between production and washing up, and viceversa.
The pipeline diameter must be proportional to the flow-rate required by the machine and must not be in any way lower than that of the machine attachments (1 ½” clamp).
Before carrying out the connections, make sure that the pipelines are clear of sediments or dirt particles that could pollute the product or damage the machine units.

NOTE: Make sure that the mixture supply vats are at a higher level than that of the connection with the freezer, or check that they have been equipped with a proper sending pump to guarantee the sufficient head on the inlet pump (Fig. 4-4 pos. 2).

For the right functioning of the machine and the guarantee of an optimum ice cream quality, it is necessary to check that there are no infiltrations in the mixture sending pipeline.
Connect the ice cream outlet pump (Fig. 4-4 pos. 3) with a stiff pipeline, which must be as short as possibile and whose diameter must be proportional to the machine capacity and must not be in any way lower than that of the attachment (1 ½” clamp).

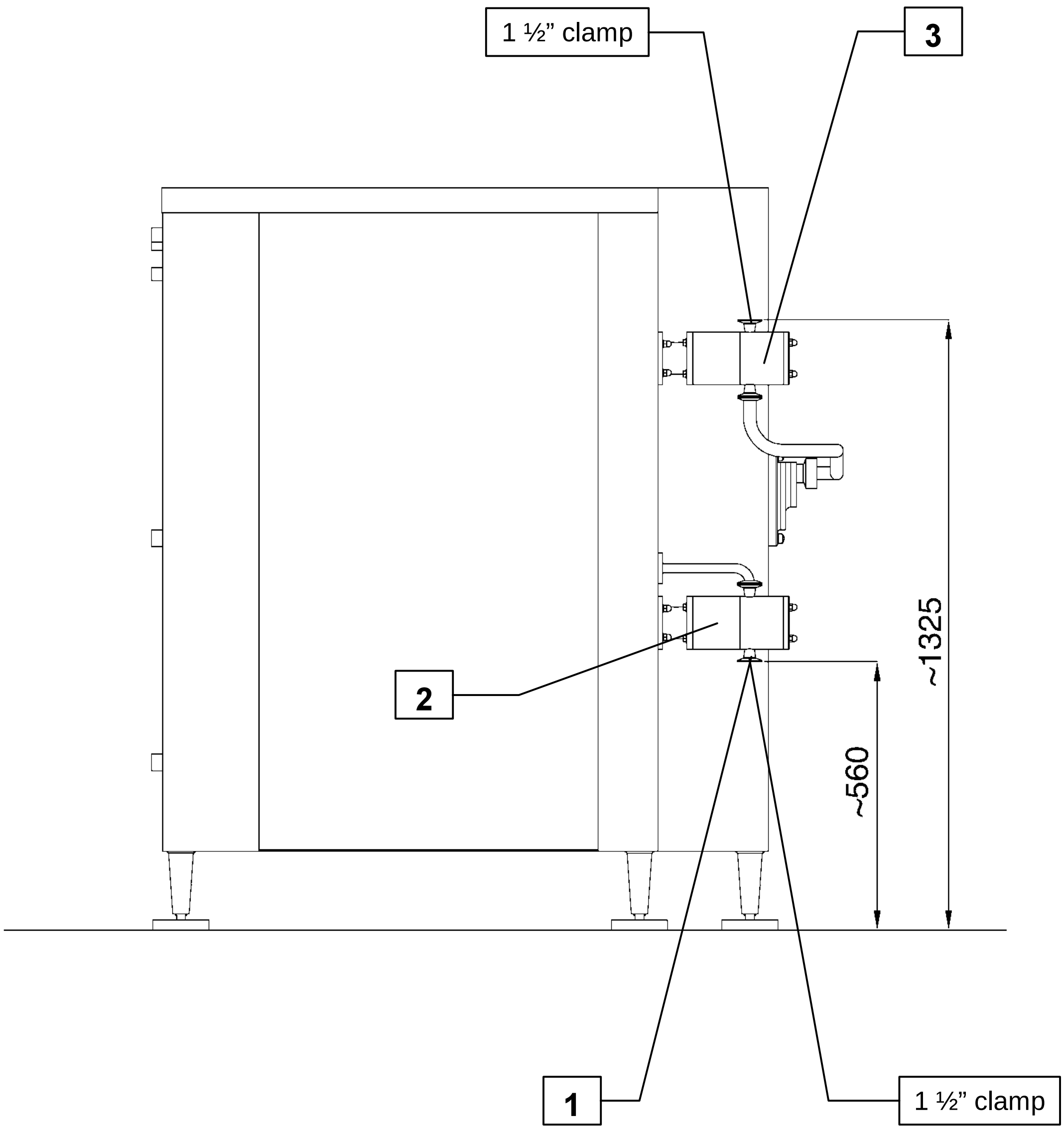


Fig. 4-4 – Ice cream inlet and outlet connection

4.6.3 COMPRESSED AIR CONNECTION

Carry out the pneumatic connection following eagerly the standard effective in the country where the machine is installed.
The connection must be done by skilled technicians aware of the relative standard described above. Proceed executing the connection of the supply pipeline (Fig. 4-5 pos. 1) with the compressed air coupling (Fig. 4-5 pos. 2) present on the rear part of the machine.
During the connection procedure, prearrange the machine for the installation of a proper intercepting valve and, if needed, of a drying/filtering set.
The supply pressure must be at least 5 bar. It is also advisable to carry out the connection thanks to a "quick" connection device for the possible physical detachment of the compressed air circuit with the machine.

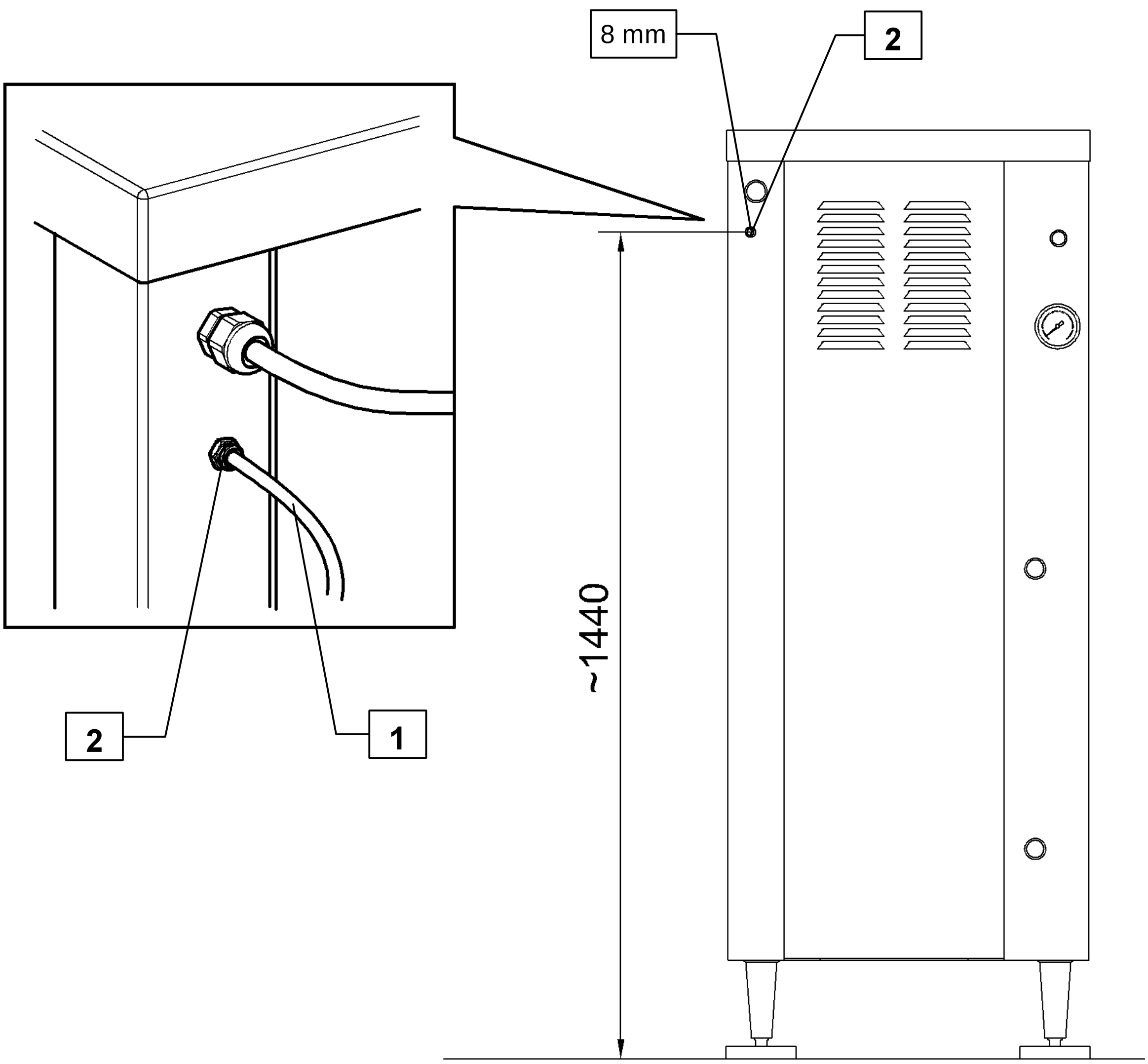


Fig. 4-5 – Compressed air connection

4.6.4 ELECTRICAL CONNECTION

Carry out the electrical connection following earnestly the standard in force in the country where the machine is being installed.
The connection must be carried out by skilled technicians aware of the relative standard described above.
Connect the machine with the factory mains supply by means of a proper disconnecting switch.
The voltage and frequency at which the machine is connected must correspond to those appearing on the techincal data card.
Execute an adequate ground connection complying with the safety rules in force.
In case the connecting cable supplied (Fig. 4-6 pos. 1) was not long enough to reach the connecting point, **DO NOT ABSOLUTELY USE** current extensions, yet replace the whole cable with an adequate one.
Whenever the display showed the message “Compressor protection” on first ignition and no part of the machine was working, it would take correcting the rotation sense of the stages exchanging one another the positions of two of the three wires of the freezer supply cable in the distribution board of the factory to which the machine is connected. Acting like this, the right sense of rotation of all the machine motors is assured.

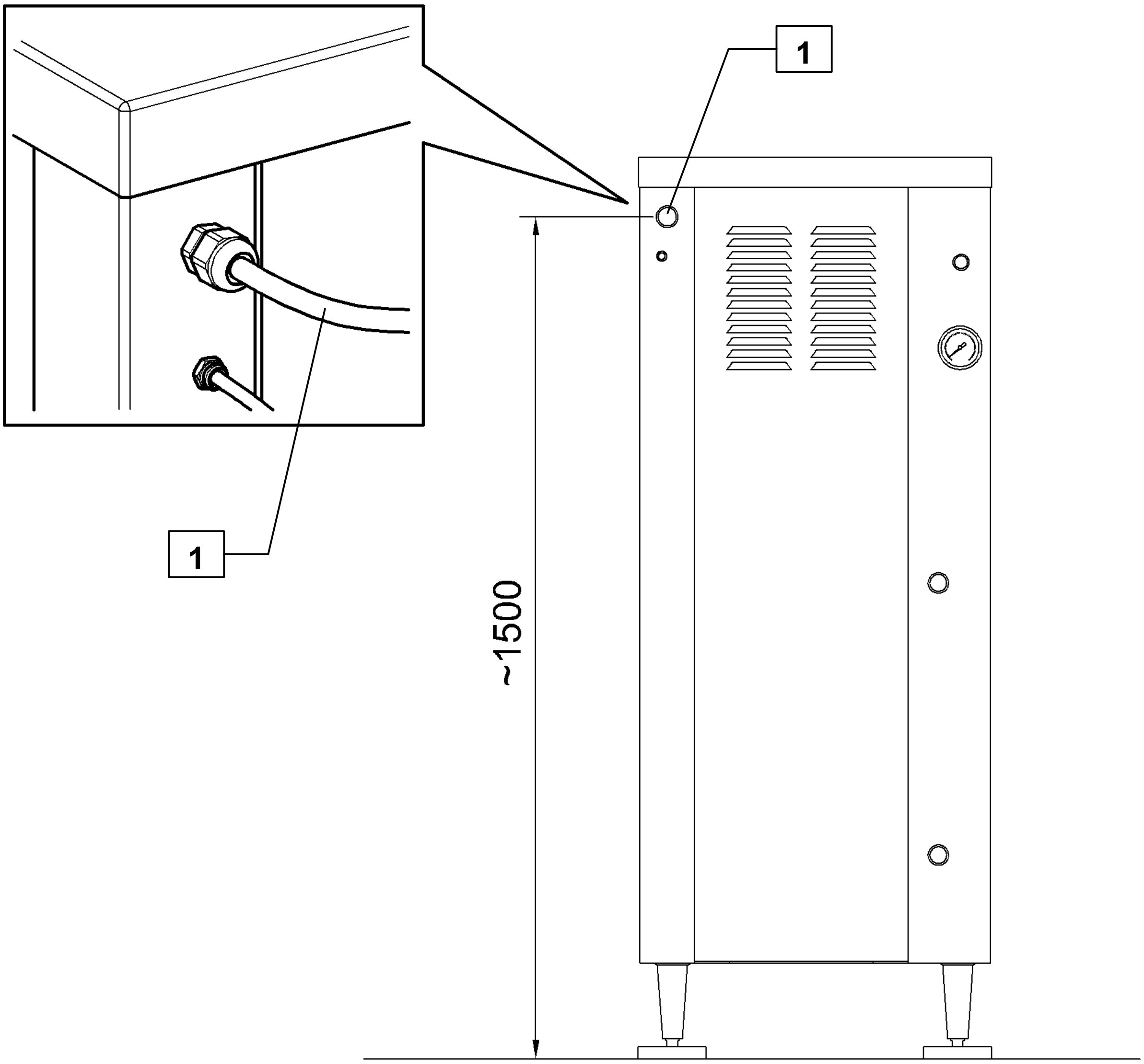


Fig. 4-6 – Electrical connection

4.7 END OF INSTALLATION CHECK

Some checks must be done at the end of the installation procedure, before going on with the settingup operations:

a) Supply the machine with mains water opening the valves prearranged on the sending and on the return. Check that the sending pressure is not that reported on the technical characteristics. Check that there are no leaks in both stiff and flexible pipelines and in the connection points between them and the machine. Command the freezing installation startingup to check the correct functioning of the pneumatic valve. This latter, indeed, will allow the water to flow freely inside the cooling circuit until the return connection outlet.

b) Discharge the condensate from the compressed air circuit. Supply the machine with compressed air opening the intercepting valve prearranged for that. Check that the sending pressure corresponds to that indicated on table “Techincal characteristics”. Check that no leaks are present in the pipelines and in the connection points between them and the machine.

c) Make sure that the voltage and the electric supply frequency of the machine correspond to the values indicated on the technical data card. Give tension to the machine closing the proper disconnecting switch installed upline the machine. Supply the machine turning the disconnecting switch (Fig. 4-7 pos. 1) mounted on the electrical board (Fig. 4-7 pos. 2). Check that the display (Fig. 4-7 pos. 3) lights up.

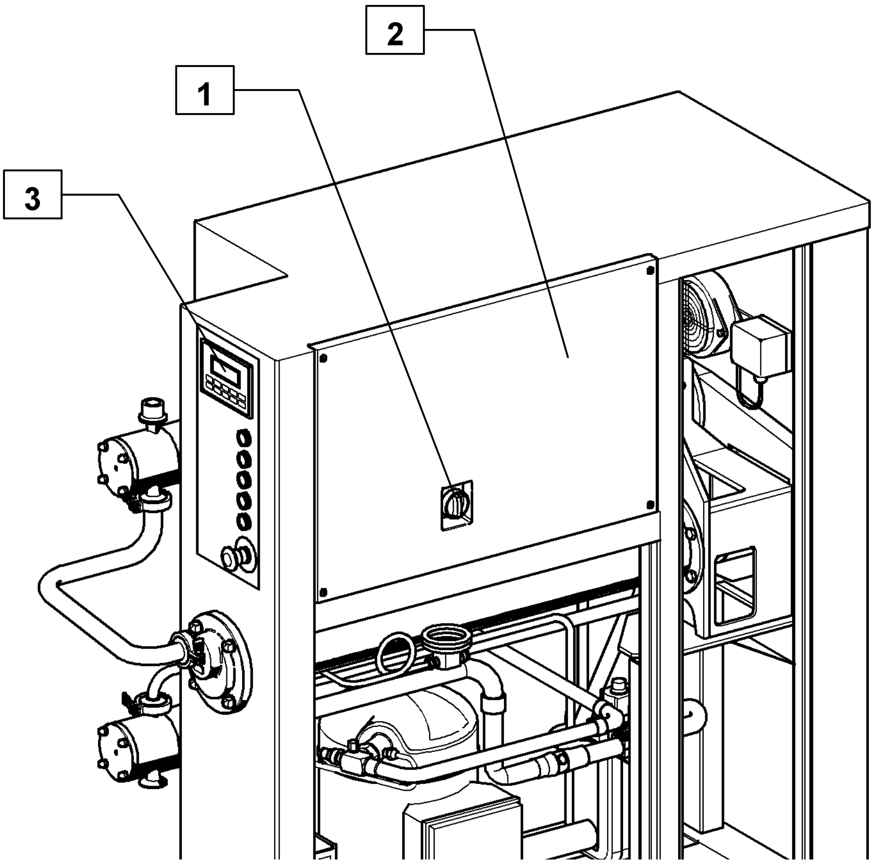


Fig. 4-7 – End of installation check

5. FUNCTIONING

5.1 PRELIMINARY CONTROLS

Before starting the production operations it is necessary to carry out some checks which aim to censure a safe and correct functioning of the machine:

a) Check that the machine is perfectly leveled and with a slight backwards gradient; if needed, use the proper levelling feet to get the desired adjustment.
b) Check that the general switch is turned on “1”.
c) Check that the cooling water and compressed air intercepting valves are open.
d) Check that the mixture supply vat is correctly connected to the machine and contains enough quantity of product to start the production; make sure that the intercepting valve is open.
e) Check that the CIP washing device (if present) is correctly connected to the machine and that the intercepting valve is closed.
f) Check that the emergency switch is not pushed down: should it be otherwise, turn it in clockwise direction to unlock it.
g) Check that the sumps (if any) removed during installation procedure have been mounted rightly back in their places.

5.1.1 OPERATIONS TO CARRY OUT AT FIRST START-UP

After a long period of inactivity or at first start-up, it is necessary to carry out a washing up of all the parts that will get in contact with the product before starting the production.
To execute correctly such operations, consult the chapter “Washing up and Maintenance”.

5.2 START-UP

- Switch the machine on turning the main switch (Fig. 6-1 pos. 1) on the control panel.
- The OP display (Fig. 6-1 pos. 2) lights up.
- Check on the display that no alarm is present (in case an alarm related to a unit controlled by push button is on, the corresponding button blinks quickly). (To restart production in case of an active alarm, it’s required to push the “Emergency Reset” pushbutton (Fig. 6-1 pos. 9).
- Command the filling up of the circuit with the mix using the CIP push button (Fig. 6-1 pos. 3).
- As soon as the product exit from the second pump is noted, push the CIP button again (Fig. 6-1 pos. 3) to switch it off.
- The complete start-up is obtained by pushing the following buttons in sequence:
  1) Pumps (Fig. 6-1 pos. 4); during start-up, the inlet pump (mix) will reach the planned speed. The outlet pump (ice cream) will keep a very low speed until the pressure inside the cylinder reaches 1 bar. At that moment, the pressure adjusting system will take the control over the outlet pump to bring and keep the pressure at the planned value. During the beginning stage, and until the system reaches the right running, the outlet ice cream flow-rate will be small.
  2) Cylinder (Fig. 6-1 pos. 5);
  3) Compressor (Fig. 6-1 pos. 6);
  4) Over-run Air (Fig. 6-1 pos. 7).
- During start-up procedure, some push-buttons might be blinking slowly, pointing out the controlled group planned delay, until the operative condition is reached.

5.3 PRODUCTION CHANGE

Should it be necessary to work with different ice cream flavours during production, proceed as described below:

a) Organize the daily production in order to produce first clear color ice cream and then the progressively darker ones.

b) Prearrange the defferent supplies simultaneously connected to the machine and intercept each one with a valve.

c) If the production and the connections are organized as described before, it is possible to turn from one production to another just exchanging the supply mixtures to the machine opening or closing the corresponding valves without interrupting the freezer functioning.

If, due to logistic or organizative reasons, it was not possibile to procede as formerly described, and so it were necessary a higher time to carry out the mixture change, the freezer should be shut-off proceeding as described below:

a) Stop the air introducton into the ice cream by pushing the button (Fig. 6-1 pos.7).

b) Stop the freezing compressor by pushing the proper button (Fig. 6-1 pos. 6).

c) Stop the whipping shaft pushing the button (Fig. 6-1 pos. 5).

d) Stop the pumps pushing the button (Fig. 6-1 pos. 4); this way, the inlet pump (mix) will immediately stop, whereas the outlet pump (ice cream), will go on working (the button pilot light is blinking) until the pressure inside the cylinder has lowered below 0.3 bar. Acting like this, the cylinder is not kept under pressure with pumps off.

e) Disconnect the mix supply to the freezer from the vat containing the mixture whose production is being interrupted and connect it to the container with the new mixture (darker) which is going to be produced.

To start again:

f) Insert in the OP the new recipe and confirm by ↵.

g) Start the whipping shaft up by pushing the button (Fig. 6-1 pos. 5).

h) Start the freezing compressor up by pushing the button (Fig. 6-1 pos. 6).

i) Start the pumps up by pushing the button (Fig. 6-1 pos. 4); during start-up procedure, the inlet pump (mix) will reach the planned speed. The outlet pump (ice cream) will keep a very low speed until the pressure inside the cylinder reaches 1 bar. At this point, the pressure adjusting system will take the control over the outlet pump to bring and keep the pressure at the planned value. During the first stage, and until the system reaches the right running, the outlet ice cream flow-rate will be small.

j) Start the air installation up by pushing the button (Fig. 6-1 pos. 7).

k) Wait for the mixture outlet.

l) Wait some minutes for the production to settle and, if necessary, adjust the overrun, the viscosity, the flow or the pressure of the ice cream in the frosting cylinder through the OP.

5.4 END OF PRODUCTION

a) Stop the air introduction by pushing the button (Fig. 6-1 pos. 7).
b) Stop the freezing compressor by pushing the button (Fig. 6-1 pos. 6).
c) Stop the pumps by pushing the button (Fig. 6-1 pos. 4).
d) Stop the whipping shaft by pushing the button (Fig. 6-1 pos. 5) waiting for the remaining ice cream to get out of the cylinder

5.4.1 CIP WASHING UP

A) Connect the pump inlet and the ice cream outlet to the pipelines for the CIP washing up.
B) Start the washing up operating the CIP pumps of the lab washing installation (not included in the GIF 600 supply) and operating the freezer CIP cycle with the button (Fig. 6-1 pos. 3).
C) IMPORTANT: the agent solutions used by the CIP, if left inside the machine, could damage the metal parts and the gaskets, so carry out a complete cold water rinsing of the machine at the end of the washing operations.
D) Rotate the general switch on the electrical board to “0” (zero).
E) Close the compressed air supply and the cooling water valves.

For further information about the washing up see chapter “CIP washing up” in this manual.

WARNING: Do not carry out CIP washing up without activating the CIP cycle with push button (Fig. 6-1 pos. 3): the washing flow would be inadequate.

5.4.2 MANUAL WASHING UP

In case a CIP washing installation was not available, proceed as described below:

A_1) Shut the machine off following the operations as from “a” to “d” in paragraph 5.4.

B_1) Close the mixture supply valve and open the hot water supply valve (if prearranged). The water maximum temperature must be 60 ÷ 65°C.

C_1) Operate the whipping shaft through the push button (Fig. 6-1 pos. 5).

D_1) Operate the pumps through the push button (Fig. 6-1 pos. 4).

E_1) Let the hot water circulate until complete removal of the coarsest sediments. Once this condition has been reached (the sediments removal span must last as short as possible), stop the whipping shaft and the pump pushing the buttons (Fig. 6-1 pos. 5,6).

F_1) Turn the machine off rotating the general switch (Fig. 6-1 pos. 1).

G_1) Disassemble the dasher as described in chapter “Dasher assembly and disassembly”.

H_1) Wash accurately all the components sinking them into a solution containing the right detergent, in the percentage suggested by the supplying company.

I_1) Rinse with much running water.

L_1) Mount the removed parts back exactly in the same position they had before. Special attention must be paid to the blades positioning (the sharp side must be facing the cylinder).

M_1) Make the inlet pump suck a sterilant solution contained in a tank placed at proper height until complete sanification is gotten.

N_1) At the end of the sanification, drain the solution and rinse it all using clean cold water.

O_1) Now the freezer is ready to start the production again.

5.5 EMERGENCY STOP

The emergency stop is controlled by pushing the red mushroom-shaped button (Fig. 6-1 pos. 8) placed on the OP. The machine immediately stops: use this command only in case of real sudden needs of machine stops, when there is the risk of injuring people or machines. Do not use as machine stop at the end of the production.
Before starting the production again, make sure there are the conditions to do it.
At restart of an emergency condition, the dasher motor will not immediately operate (blinking button), the compressor will work for 20 sec. with the hot gas valve open in order to avoid or remove any ice coat on the cylinder walls. At the 20 sec. expiry, the dasher will automatically start.

6. ADJUSTMENTS

6.1 VISUALIZATIONS

It is possibile to visualize on the OP display (Fig. 6-1 pos. 2) values needed to adjust correctly:

- the mix flow;
- overrun;
- viscosity;
- ice cream pressure;
- recipes.

6.2 MIX FLOW

To carry out the mix flow adjustment according to one's own requirements it is enough to go to the OP at page 2 "Mix flow".

Push the button to activate the insert mode. The datum to modify starts blinking.

Through the indicators modify the blinking value next to the word "New".
Once the desired value has been reached, push ↵ to make the edited value become the current one.

6.3 OVERRUN

To carry out the overrun adjustment according to one's own needs it just takes going to the OP at page 3 "Overrun".

Push the button to activate the insert mode. The datum to modify starts blinking.

Through the indicators edit the blinking value next to the word "New".
Once the desired value has been achieved, push ↵ to make the modified value become the current one.

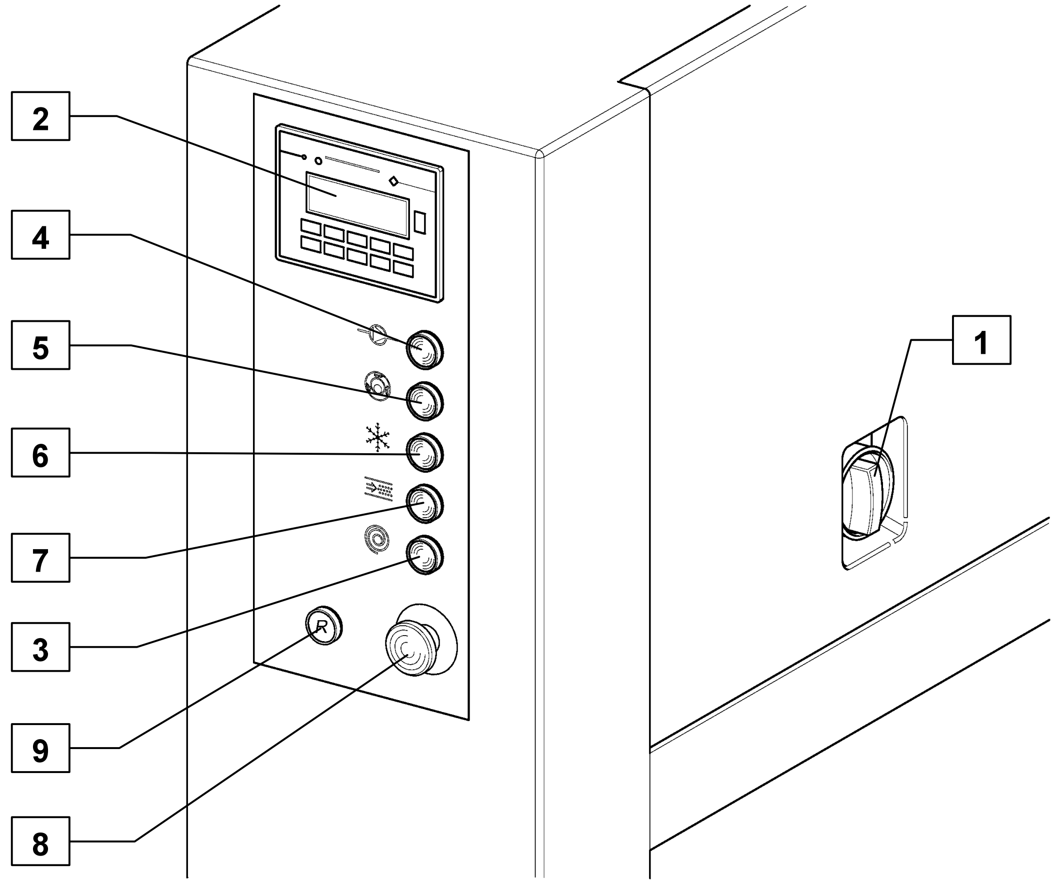


Fig. 6-1 – Adjustments

6.4 VISCOSITY

In order to obtain an ice crem with the desired viscosity, the freezing installation is prearranged for a partial blow-by of the cylinder hot gas (evaporator).
The control system is shown below.

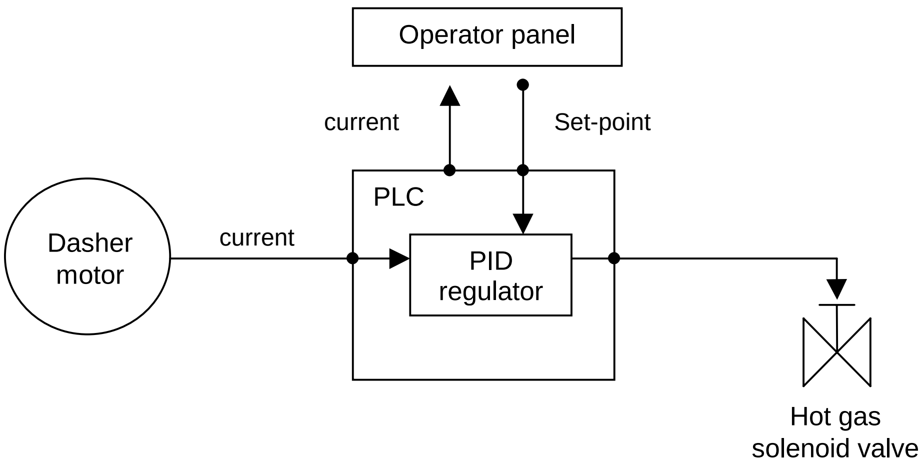
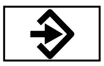


Fig. 6-2 – Viscosity

The current absorption by the dasher motor increases as the ice cream viscosity does.
The current is measured through an A/V converter, whose outlet is brought to the PLC. The PLC is charged to transfer the datum to the OP (see start page and viscosity page) and to elaborate it inside a PID regulator.
The desired viscosity value, is introduced into the OP (set-point) and transferred to the PLC.
The PID regulator, comparing the current data and the set-point, generates an impulsive outlet that controls the hot gas valve in order to keep the ice cream viscosity within the desired parameters.

Push the button  to activate the insert mode. The datum to modify starts blinking.

Through the indicators  edit the blinking value aside the word “New”.
Once the desired value has been reached, push ↵ to make the edited value become the current one.

6.5 ICE CREAM PRESSURE

If, due to particolar needs like a reduced viscosity at a low flow, the ice cream pressure should be reduced, it would take going to the OP at page 5 “Ice cream pressure”.

Push the button to activate the insert mode. The datum to modify starts blinking.

Through the indicators edit the blinking value next to the word “New”.
Once the desired value has been reached, push ↵ to make the edited value become the current one..

6.6 RECIPES

To carry out the recipe selection according to one’s own needs, it just takes going to the OP at page 6 “Recipe change and language change”.

Push the button to activate the insert mode. The datum to modify starts blinking.

Through the indicators edit the blinking value next to the word “New”.
Once the desired value has been reached, push ↵ to make the edited value become the current one.

By pushing the F2 key, the language on the OP will become english; by pushing the F3 key, it will turn back to italian (see paragraph 3.8.6).

7. CLEANING AND MAINTENANCE

To guarantee a high quality level of the product and a good machine functioning, it takes carrying out regular cleaning and washing operations.
Such operations must start with a hot water pre-washing to remove the coarsest dirt, followed by a basic washing for the remaining fats and by an acid washing for the calcareous incrustations.
At the end, it is advisable to execute a general una disinfection to eliminate the bacteria and a cold water rinsing.
The washing frequency must be checked experimentally according to the work conditions and to the used products.

WARNING: Choose the detergents minding their employ ease and the use safety for the operators and for the materials with which the machine is made.
As an example, we show in the following pages a list of the suggested detergents available in many world's countries.

WARNING: The following instructions just aim to give the operator a general guide to carry out the washing operations. The operator then, depending on his experience and by means of proper equipment will evaluate the right procedure to follow.
Sidam does not recognize any responsibility for damages that can derive from ineffective washings or sanifications of the machine.

7.1 CIP WASHING

It is possible to carry out a washing up of the freezer by using the C.I.P. system.

The C.I.P. is a method to wash the machine without disassembling all the parts that have come into contact with the mix.

The C.I.P. cleaning is recommended as it provides a better cleaning than the hand one and reduces the damages to the polished surfaces and wearing parts.

To carry out the C.I.P. washing:

1) Connect the C.I.P. sending pipeline to the mix inlet (Fig. 7-1 pos. 1) and the ice cream offload line (Fig. 7-1 pos. 2) to the blow-by tank return one.
2) Rinse thoroughly with water to remove as much of mix as possible. The water used should be cold at first, then heated up to 32 °C (90 °F) or 38 °C (100 °F) to melt the ice cream in the freezer.
3) Prepare a solution with water and detergent in a proper container (see also paragraph 7.2). It is of main importance not to use agent detergents, as they could damage the cylinder hard chrome plating. Make sure that the detergent has melt out before making the solution circulate. Use a minimum of 250 liters (65 gallons) of solution.
4) Make sure the time set on the “CIP” page is correct (see page “CIP cycle duration set-up” paragraph 3.8.7.
5) Push the C.I.P. button.
6) Let the solution circulate, starting from 38 °C (100 °F) and rinsing it up to 60 °C (140 °F), in order to heat gradually up the freezer parts.
7) After having circulated the cleaning solution, rinse thouroughly, first with hot water and then with each time warmer water. Use the same C.I.P. pump for rinsing. It is important that all the celaning solution gets removed.
8) Turn the pump off, cut the water out and disconnect the inlet and outlet lines.

The mix sending and the freezer should be sanitized just before the production stage.

After the sanitation, do not disassemble the machine parts to avoid contamination.

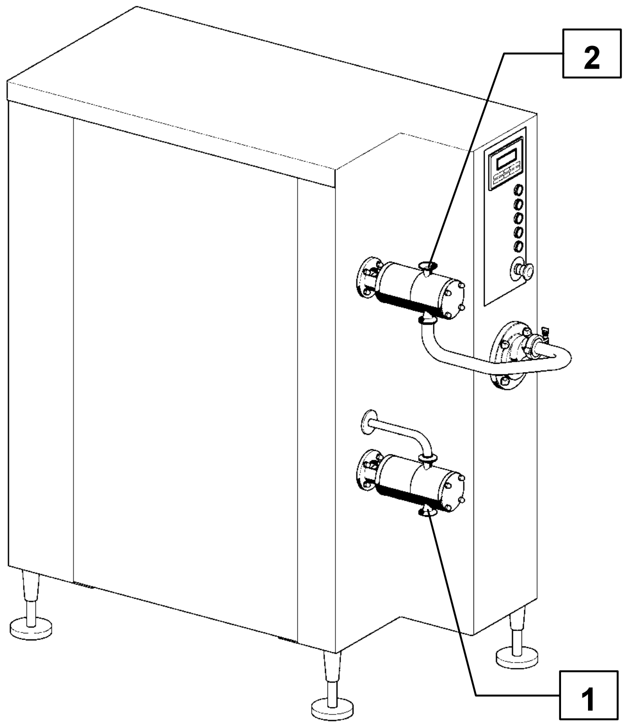


Fig. 7-1 – CIP washing

7.1.1 OUTER WASHING PROGRAM

The washing up of the outer parts of the machine must begin with a hot water pre-washing (max. 50°C) to remove the coarsest dirt, followed by a cleaning washing which is let operate for about 10 minutes.
Rinse it all with water and proceed with a following acid descaling washing which is let operate for at least 15-20 minutes.
Eventually, rinse with water again, carry out a general disinfection and a further rinsing with cold water.

Suggested detergent:

Detergent Washing:
Frothing alkaline detergent or gel with high fats emulsifying power.
Concentration between 2 ÷ 10% depending on the dirt and on the water hardness.

Descaling Washing:
Acid descaling agent with low viscosity containing a mixture of dampening and emulsifying agents.
Concentration between 2 ÷ 3%.

Disinfectant Washing:
Disinfectant diluted with water.
Concentration between 1 ÷ 1,2%.

WARNING: Do not use high pressure water jets.

WARNING: The liquid offloads have to be treated according to the standard in force in the country where the machine is installed.

7.2 RECOMMENDED DETERGENTS

SIDAM will not be responsible for Your use of detergents.
Refer to the manufacturer who can inform about correct use, removal, etc..
The detergent used must be fit for the blow-by cleaning and must be chosen according to the water hardness and local conditions.
The following table reports the detergents suggested by Henkel-Ecolab.
These detergents have been tested and used by various european Companies in the ice cream industry.
SIDAM recommends the use of these detergents or of other brands correspondent products.

DETERGENT	DESCRIPTION	CONC. (%)	TEMP. (°C)	TIME (MIN.)
P3-mip LF	Alkaline cleaner with surfactants	1.0-2.0	60-80	10-40
P3-tresolin ST	Neutral cleaner	0.5-2.0	20-50	10-30
P3-steril	Cleaner with disinfecting qualities	0.5-2.0	20-50	10-30
P3-horolith CIP (P3-horolith MSW)	Acid cleaner with surfactants	0.5-1.5	60-80	10-30

7.3 STANDARD MAINTENANCE

Daily maintenance

At the end of the day, it is necessary to clean and sanitize the machine in accordance with what is reported in the cleaning section.

Weekly maintenance

1) Extract and check the dasher (see relative paragraph) at least weeekly (make sure You are using the proper supplied tool not to scratch the cylinder chrome plate)
2) Inspect the chrome in the tube. The tube should be smooth and bright. If there are any rough areas, marks or evidence of deterioration of the plating, find the problems and correct it.
3) Check blades. Inspect the scraper blades weekly of after every 40 operating hours. More frequent inspection is needed if the product are sherbets or low fat mixes. Worn or rough blades will eventually gauge the chrome plating in the freezing tube. It is a good practice to keep a complete set of spare blades and to change them regularly.
4) Replace the seals in the pumps and dasher shafts. It may be necessary to replace these seals more frequently than once a week if the freezer is in continuous operation. The life expectancy of the O-rings is 100 hours.

Monthly maintenance

1) Check the stretch of the frosting cylinder shaft handling belt. The belt must not be too stretched. If the belt has been stretched or is worn, replace it with en equivalent one.
2) Rotating the corresponding stretching screws (Fig. 7-2 pos. 1), stretch the belt to an extent that the flexion is about 6mm applying a 10 kg force.

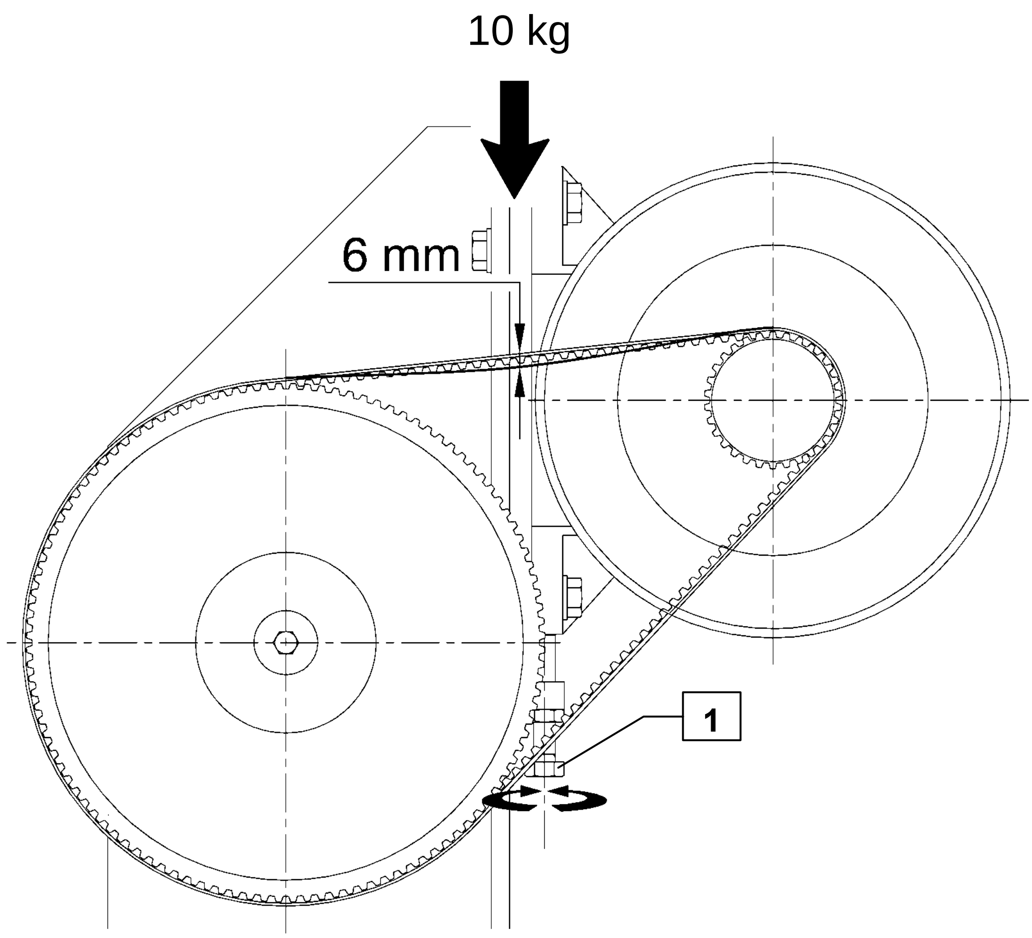


Fig. 7-2 – Standard maintenance

Plate condenser maintenance

TYPES OF WATER

The water can be classified as:

Mains water. Usually optimal, but it is not used in the condensers due to its high cost.

It is instead used for the reinstatement in the evaporation towers.

Town water. It usually has a low biologic content, but the concentration of corrosive or encrusting salts can be very high. The solid particles content can be very high too.

A pre-treatment may be needed.

Tower water. The water circulates in an open circuit between the condenser and the evaporation tower.

The water is normally 15-20 °C hotter than the town water in the same area. The salt content can be 10 times higher than the reinstatement water one, which is usually mains water.

In areas with polluted water, this can recollect dust and corrosive gasses.

PLATE CONDENSER CLOGGING

The clogging causes two main effects:

Increases the load losses;

Decreases the thermic exchange.

Some substances cause only the first effect, some others just the second one; others cause both.

LOAD LOSSES INCREASE

Particles in water, fibres, leaves and wood pieces coming from the evaporation tower can clog the exchanger entry.

The load loss grows, even though this does not affect directly the exchanger thermic yield, yet indirectly due to the flow variation.

Usually, particles like sand pass through the exchanger if their diameter is lower than about 1 mm.

PREVENTION AND WASHING

There are basically two methods to prevent the load losses increase:

Countercurrent flow:

The flow in the exchanger is inverted.

This method is acceptable if the water does not contain too thin particles that can nest inside the exchanger. The GIF 600 is fit for countercurrent washing.

Filter:

A filter with an 0.5-1.5 mm link width is installed in the circuit of the evaporation tower, better before the pump, which has to be guarded too.

The link width depends on the water quality.

A very narrow link is not necessarily the best solution: even though this would keep the exchanger clean, the problem would simply be transferred to the filter, which would need frequent openings and cleanings.

On the other hand, a too wide link would transfer the trouble to the exchanger.

Therefore, if the filter is easy to be inspected and the condenser is supposed to operate many hours a day, it is advisable to use a narrow link; if the condenser can stay in stand-by for long periods and the filter is not easy to be inspected, rather use a larger link. Anyway, it is always better to use a link as narrow as possible.

INCRUSTATION ON THE EXCHANGE SURFACE

It happens when the exchanger interior surface is gradually coated with a limestone layer.
The thermic yield gets worse but the load loss is not affected by that, at least at the beginning.
The various types of cloggings due to the evaporation towers open circuit can be classified as follows.

Viscous products:

Oils and greases can enter the circulation and lay on the exchanger surface.

Limestone:

Some inorganic salts have an inverted solubility curve, that is the solubility in water decreases as the temperature increases.
Therefore, when the colder water gets in touch with the condenser surface, these salts lay on the surface.
Some salts, like the anhydrite ($CaSO_4$), are very difficult to melt, whereas others, like the calcium carbonate ($CaCO_3$) are easily melted with an acid solution.

Seaweeds:

During some periods of the year, mainly in summer, the water can include seaweeds.
If the seaweeds have big dimensions, they can be stopped by the filter, otherwise they can reach the exchanger.
Apart from the yield decrease, the seaweeds deposit can act to start corrosion.
If the evaporation tower is not treated with a seaweed-killer, the tower open frame eases the seaweeds proliferation; the seaweeds cannot develop in a closed circuit, as they need light to grow.

Mushrooms and bacteria:

Differently from the seaweeds, they can develop everywhere and cannot be stopped by filters, so it is impossible to stop their growth if the conditions are favorable for them.
Some bacteria can be fed with sulfate present in the water, turning them into sulphuric acid, which causes corrosion.
Others absorb iron, melted or in oxid shape, forming a viscous film.
Some others absorb compounds of azote and phosphorus, forming a slush upon the exchanger surface.
As the condenser is the hottest point in the system, its surface is a proper place for the bacteria to nest.
The water can seem normal if inspected, even though it contains a bacteria load, and that makes this kind of clogging very hard to locate.
The mushrooms produce an effect similar to the bacteria, but they are usually harder to eliminate.

Sand deposits, etc.:

Sand, dust, etc. can lay by the exchanger entry, but usually at very low speed of water.

PREVENTION AND CLEANING

The water treatment is a complex topic, specially the biological contamination control. Some products are toxic, and so they are subjected to regulations and controls by the law, all of this makes necessary the consultation of a specialist in water treatment.

Cleaning liquids can be corrosive or dangerous anyway.

Therefore, it is better to use commercial products instead of chemical basic products.

The commercial products very often contain inhibitors to prevent or reduce the corrosion, apart from mixtures of different compounds to attack a wide range of microorganisms.

They are also kitted with proper instructions, safety precautions and sometimes warranty.

CONDENSER WASHING

For the cleaning/washing of the cooling water circuit proceed as follows:

a) Shut the cooling water intercepting valves off (Fig. 7-2 pos. 1 and 2).
b) Remove the closing hexagon plugs (Fig. 7-2 pos. 3 and 4).
c) Link the sending scales-removing tube to the connection (Fig. 7-2 pos. 3) and the return tube to the connection (Fig. 7-2 pos. 4) using a proper equipment with close circuit washing pump.
d) Proceed with the cooling water circuit washing: first feed with detergents fit for removing the fat remaining parts, then with organic acids compatible with copper (formic, citric, acetic acid, etc.).
e) Eventually, rinse it all with cold water and reset the circuit closing the inlet and the outlet with the proper plugs (Fig. 7-2 pos. 3 and 4).

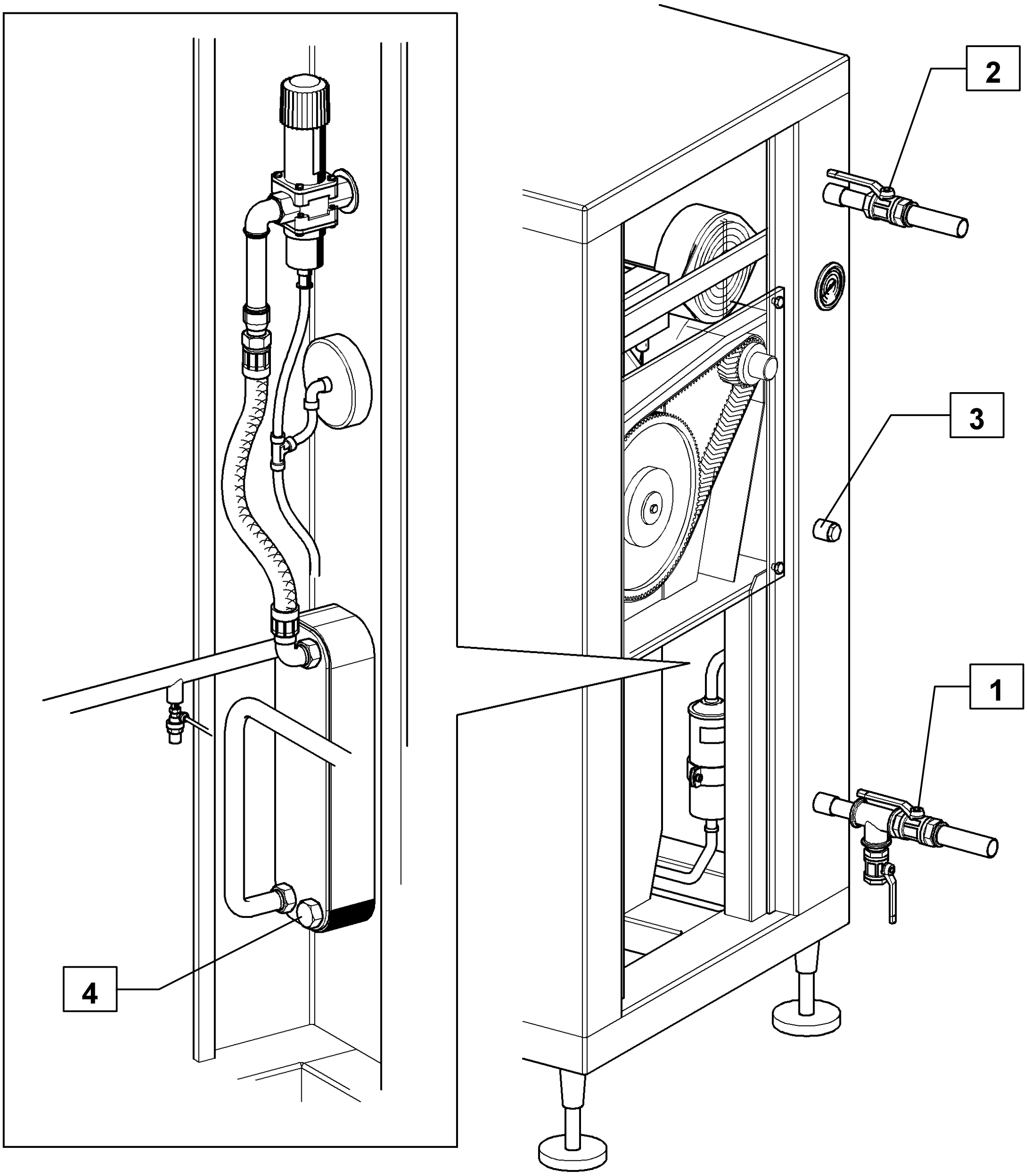


Fig. 7-3 – Condenser washing

7.4 PUMPS ASSEMBLY-DISASSEMBLY

NOTE: The SIDAM pumps are designed with very low tolerances and high degrees of engineering efficiency. During assembly, never force the mating parts.

<u>Pump disassembly</u>

1) Loosen the nut (Fig. 7-4 pos. 3) and screw three turns out the backlash adjusting handwheel (Fig. 7-4 pos. 2).
2) Remove the 4 fixing screws (Fig. 7-4 pos. 1) of the pump on the freezer.
3) Remove the pump and place it on an easy prearranged work plan.

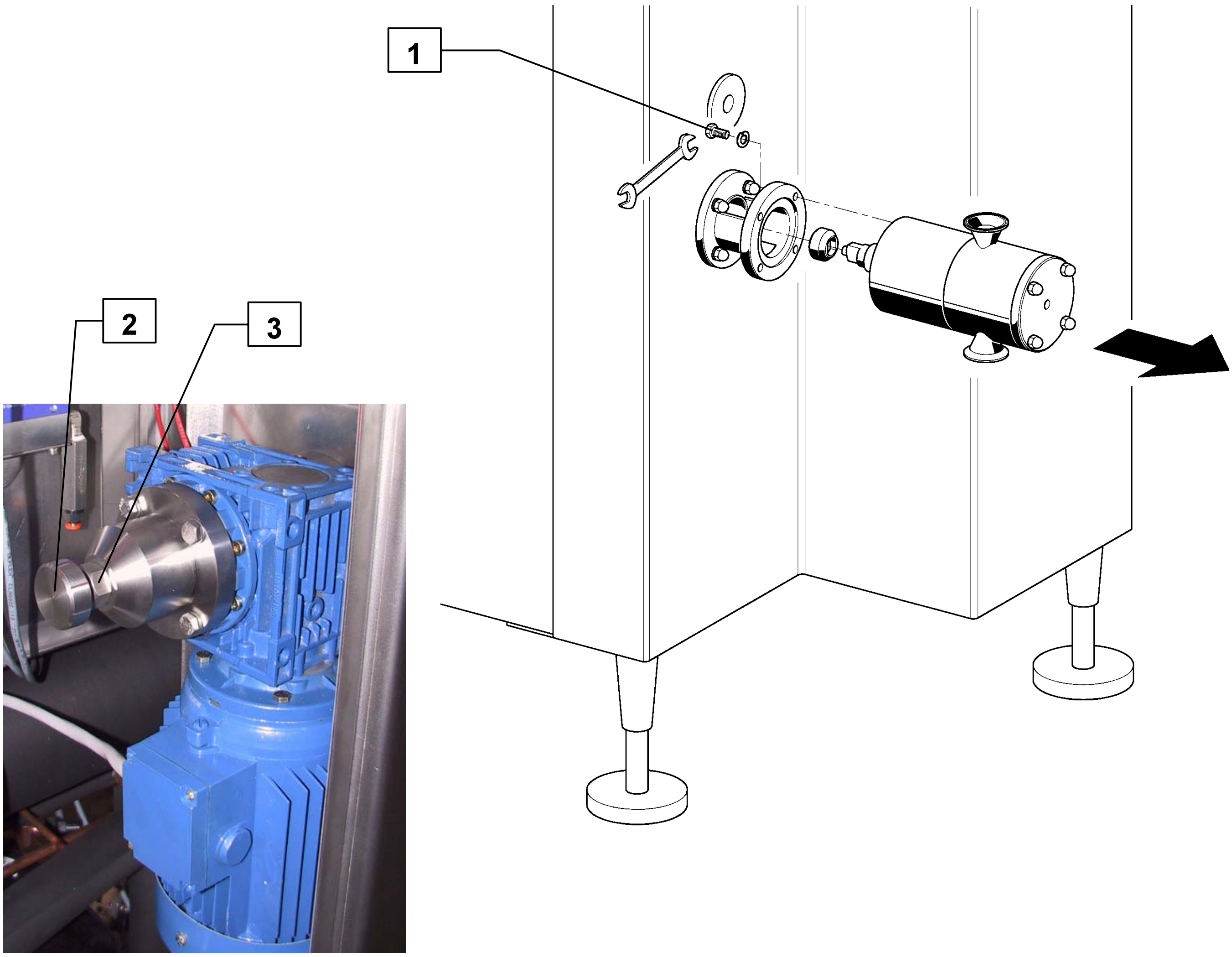


Fig. 7-4 – Pumps assembly-disassembly

4) Screw out the 4 nuts (Fig. 7-5 pos. 1), remove the washers (Fig. 7-5 pos. 2) and slide the lid off (Fig. 7-5 pos. 3).

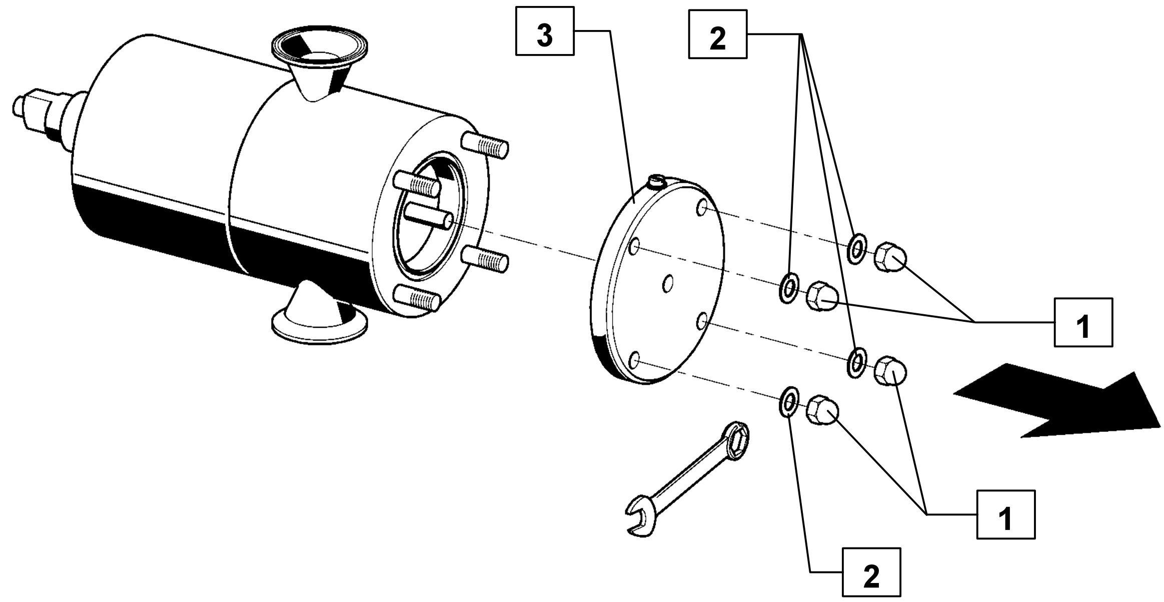


Fig. 7-5 – Pumps assembly-disassembly

5) Using a plastic/wooden hammer (Fig. 7-6 pos. 1) as indicated by the drawing, remove the pump body (Fig. 7-6 pos. 2) from the base (Fig. 7-6 pos. 3).

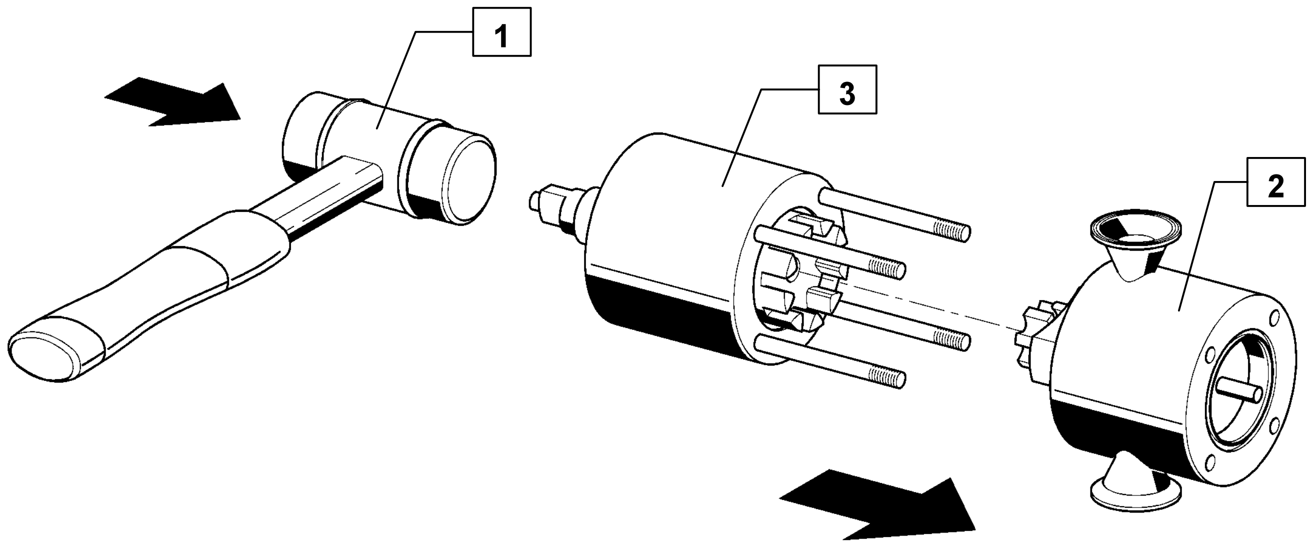


Fig. 7-6 – Pumps assembly-disassembly

6) Disassemble the various sets (Fig. 7-7 pos. 1-2-3) controlling their efficiency and wear.
7) Replace the O-ring gaskets (Fig. 7-7 pos. 4).

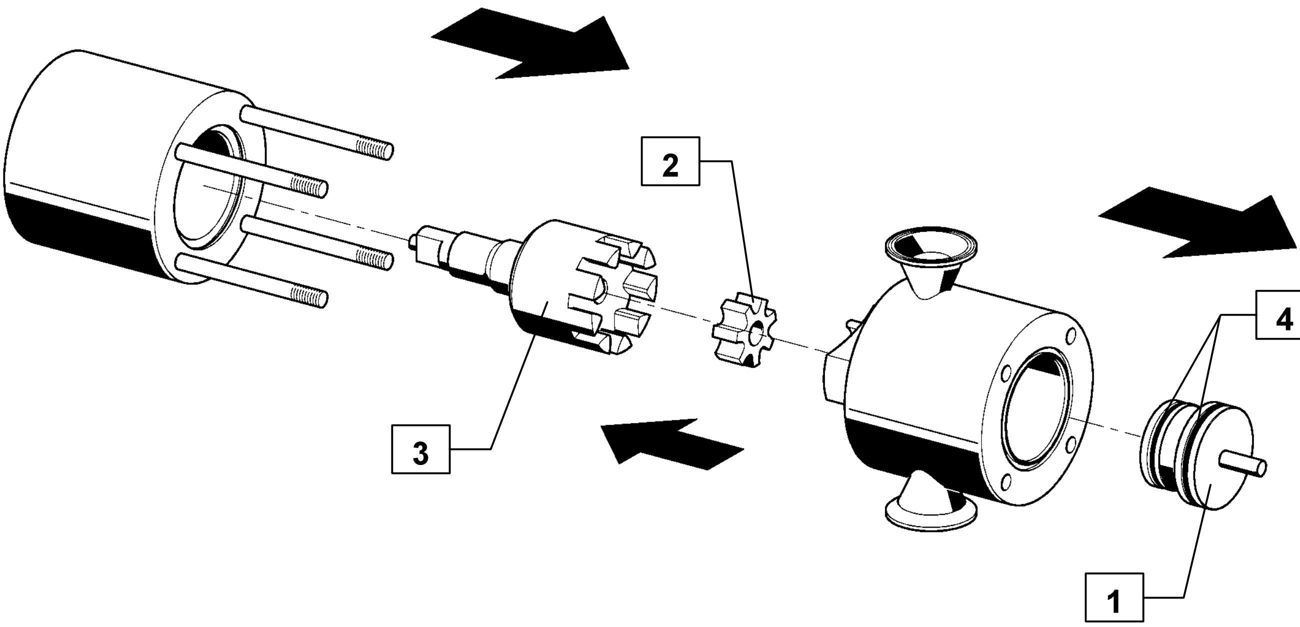


Fig. 7-7 – Pumps assembly-disassembly

Pump assembly

8) Eventually, mount it all back following backwards the operations as above.
9) Pay attention to the pumps, which must be installed on the machine rests with the “0” pointers facing the frosting cylinder as shown in the drawing (see Fig. 7-8) (Mix pump pointer up, ice cream pump pointer down).

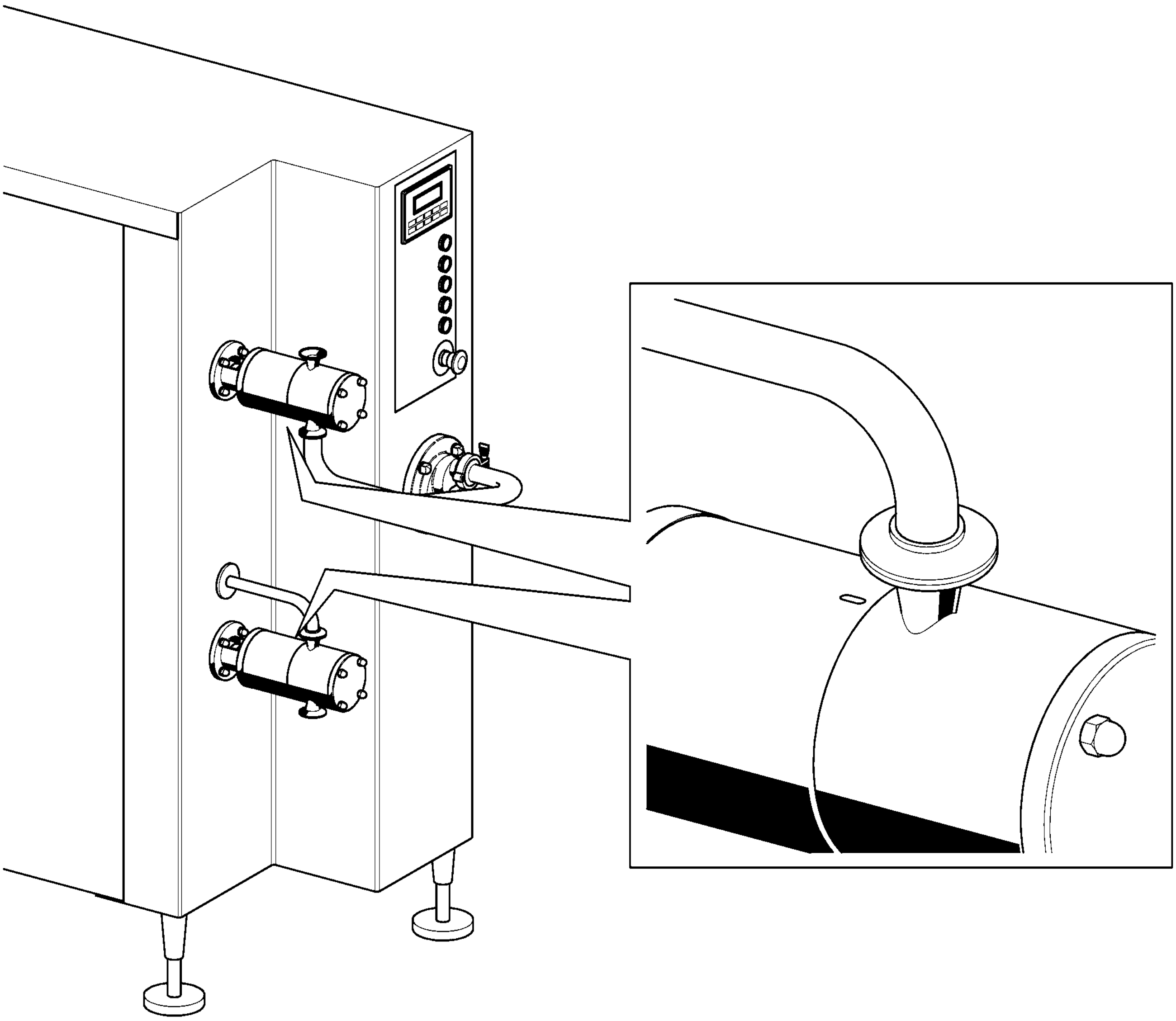


Fig. 7-8 – Pumps assembly-disassembly

10) At the end of the assembly of the pump, adjust the rotor axial slack proceeding as described below:
  - Rotate manually in clockwise sense the handwheel (Fig. 7-9 pos. 1) up to the end of the run and tighten hard manually.
  - Loosen rotating in counterclockwise sense up to one notch on the handwheel (Fig. 7-9 pos. 2) to provide some slack.
  - Tighten with a fork-wrench the counter-nut (Fig. 7-9 pos. 3) on the handwheel thread taking care not to let the handwheel rotate.

NOTE: Carry out this operation at the beginning of every productive season.

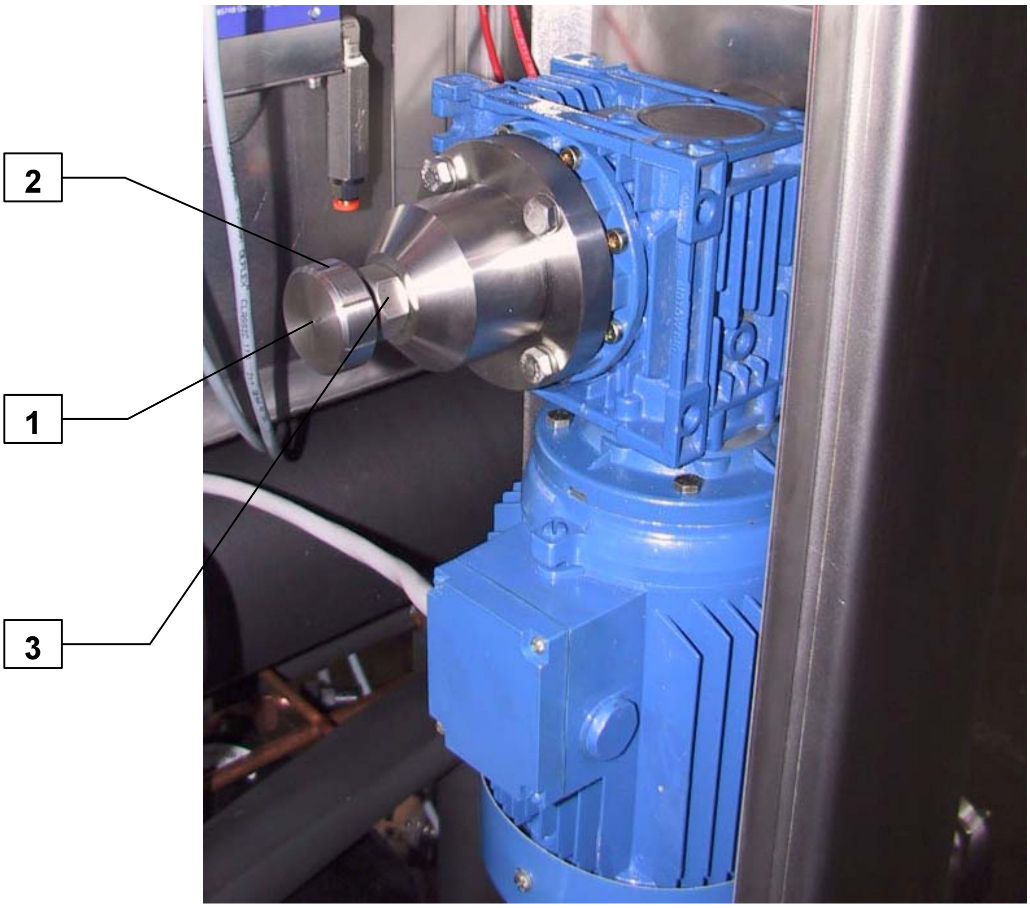


Fig. 7-9 – Pumps assembly-disassembly

7.5 DASHER ASSEMBLY-DISASSEMBLY

WARNING: wear anti-slide resisting gloves and always use the cleat when removing, disassembling, assembling, transporting or installing the dasher. The blades have a sharp edge which can come out to be dangerous if not handles with precaution.

Dasher disassembly

1) Screw out the flange (Fig. 7-10 pos. 2) locking screws (Fig. 7-10 pos. 1).
2) Extract the flange (Fig. 7-10 pos. 2) or the whipper (Fig. 7-10 pos. 3).

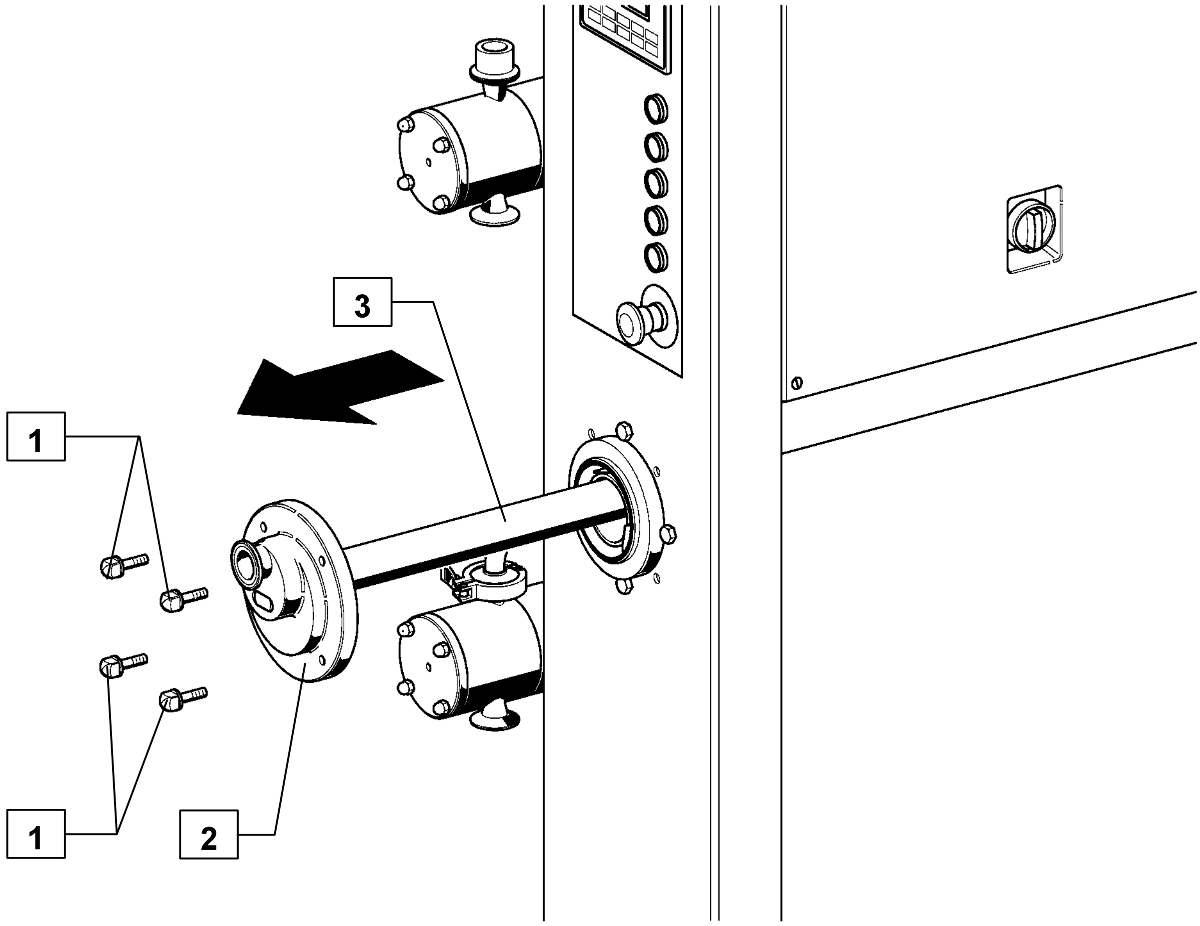


Fig. 7-10 – Dasher disassembly

3) Insert the cleat (Fig. 7-11 pos. 1) in the dasher keeping this latter slightly lifted (Fig. 7-11 pos. 2).

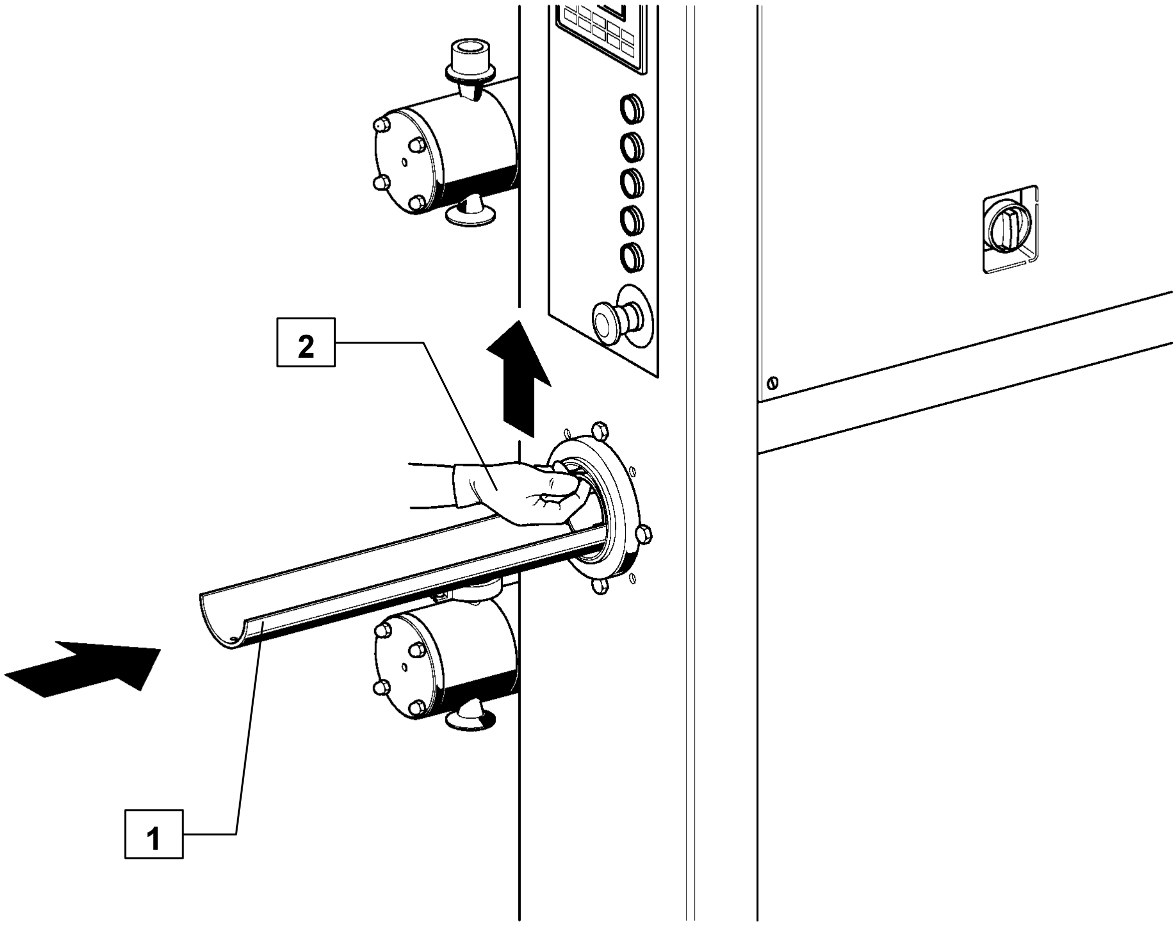


Fig. 7-11 – Dasher disassembly

4) Extract the dasher (Fig. 7-12 pos. 1) from the cooling cylinder using the proper cleat (Fig. 7-12 pos. 2) and the extracting tool (Fig. 7-12 pos. 3).

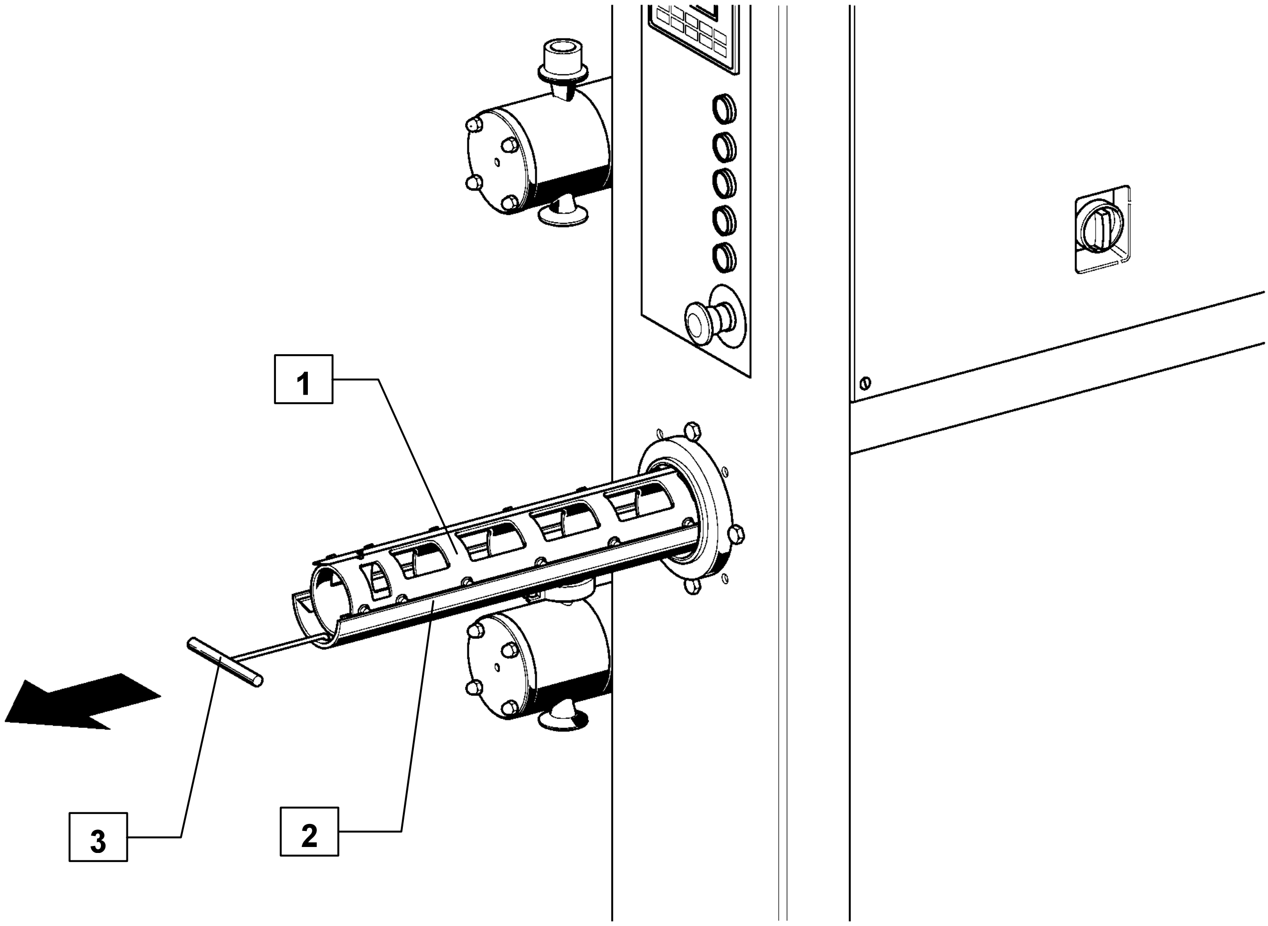


Fig. 7-12 – Dasher disassembly

5) Remove the shaft (Fig. 7-13 pos. 1) from the flange (Fig. 7-13 pos. 2) replacing the O-ring gasket (Fig. 7-13 pos. 3) and the brasses (Fig. 7-13 pos. 4 e 5).

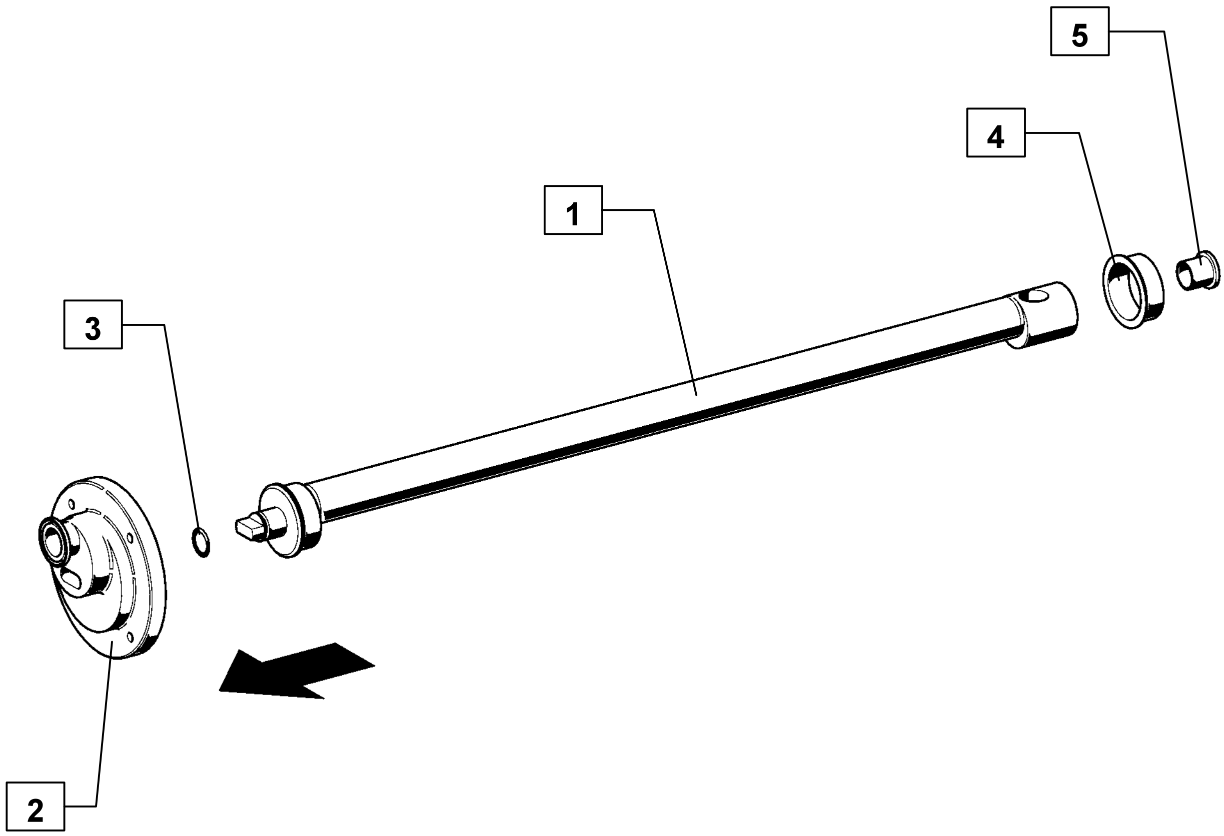


Fig. 7-13 – Dasher disassembly

6) Lay the dasher (still on the cleat) on a fit work plan and remove the blades.
7) Remove and replace the gasket (Fig. 7-14 pos. 1) positioned on the rear part of the dasher (Fig. 7-14 pos. 2) taking care not to squash or cut it. It is a good habit to lubricate the gasket with some vaseline.

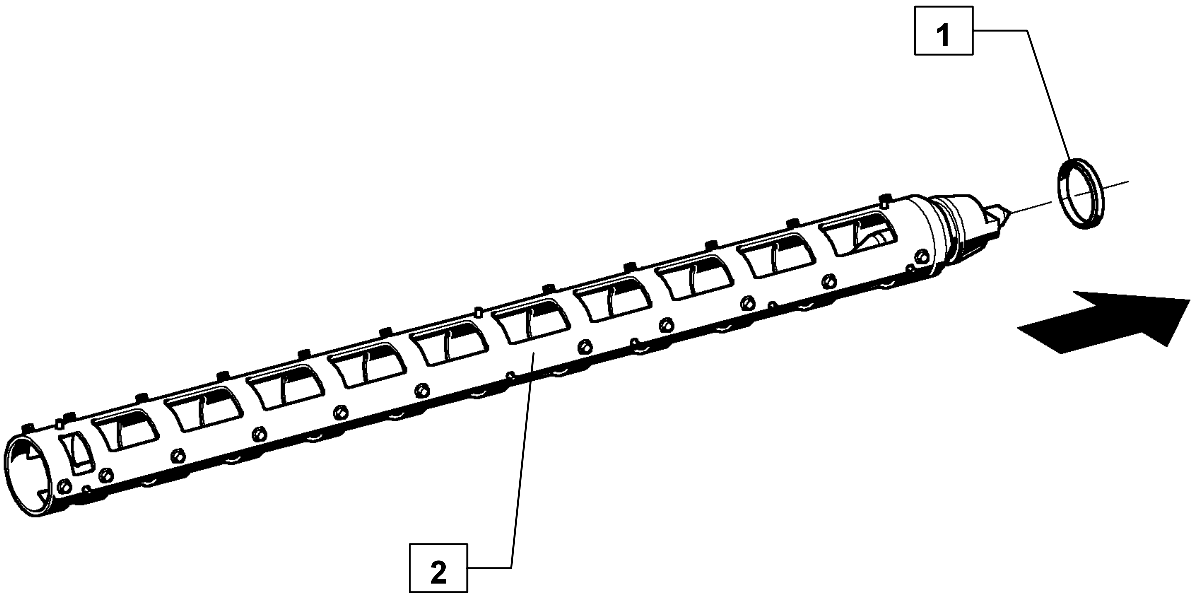


Fig. 7-14 – Dasher disassembly

Dasher assembly

1) Mount the blades (Fig. 7-15 pos. 1) back on the dasher and insert this latter back inside the cooling cylinder using the cleat (Fig. 7-15 pos. 2) and the extracting tool (Fig. 7-15 pos. 3).

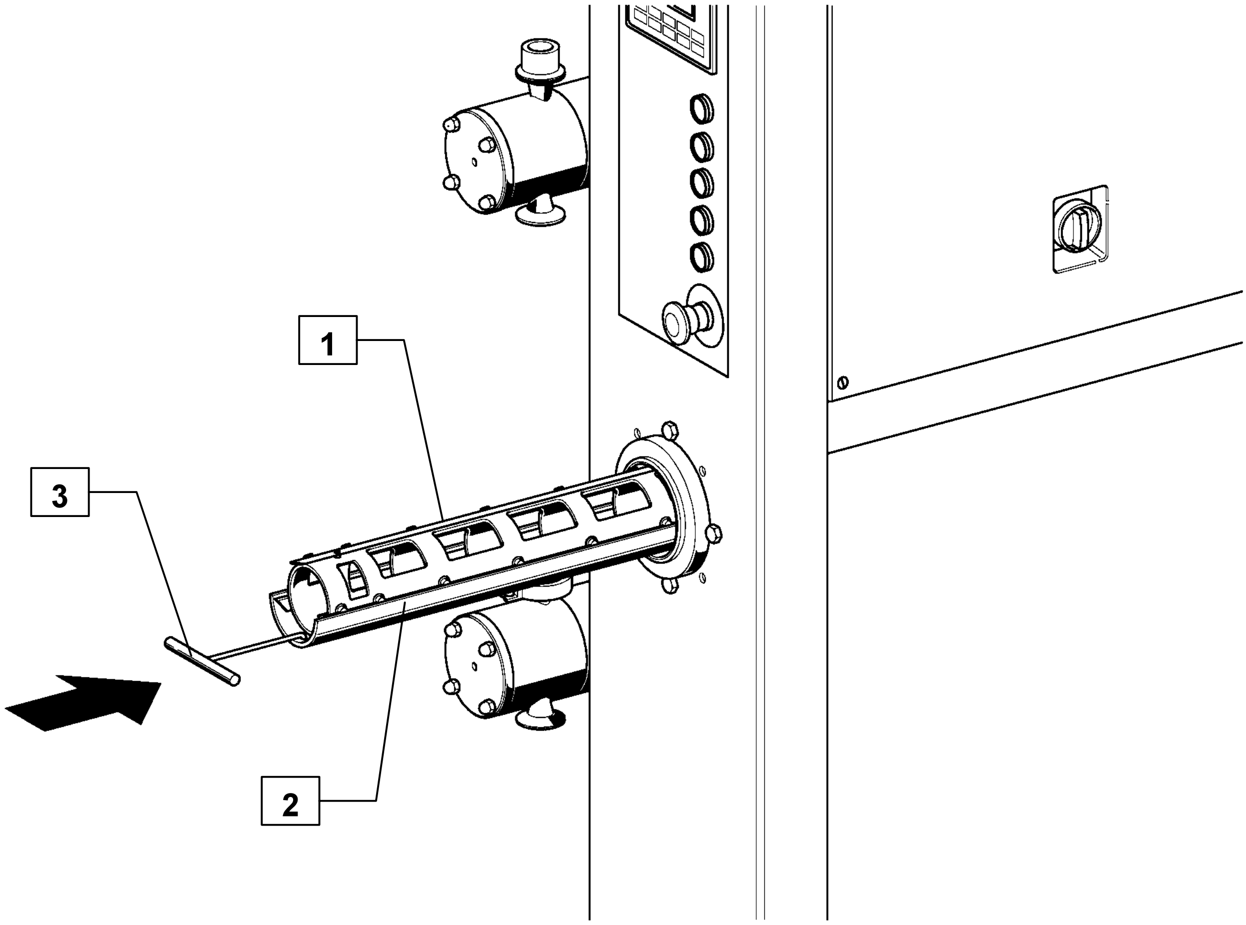


Fig. 7-15 – Dasher assembly

2) After having isterted the dasher, rotate it up to perfect coupling with the rear motor drive (Fig. 7-16 pos. 1).

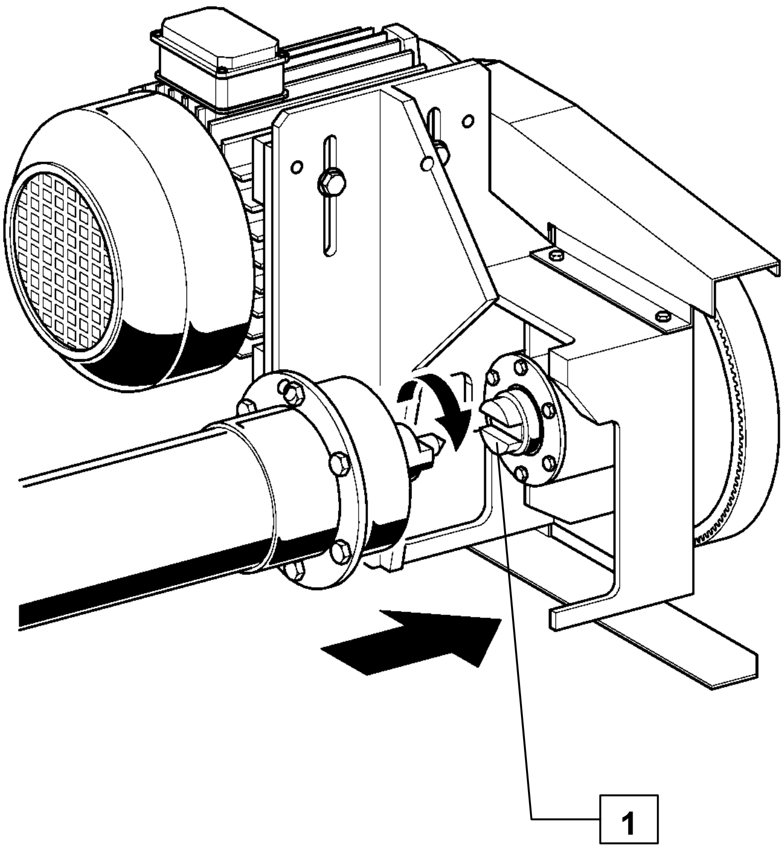


Fig. 7-16 – Dasher assembly

3) Eventually, with the dasher positioned, extract the cleat (Fig. 7-17 pos. 1) keeping the dasher in position slightly lifted.

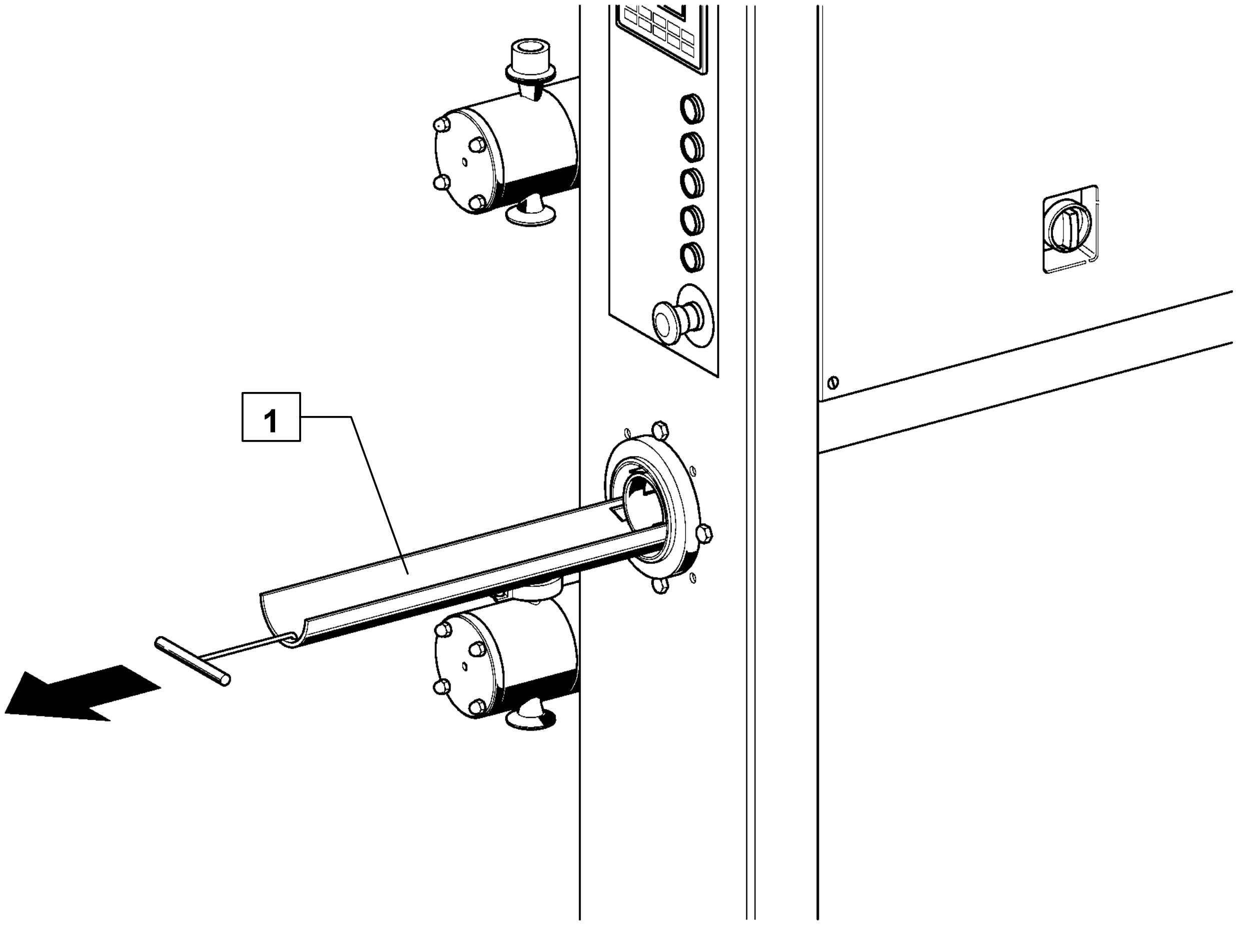


Fig. 7-17 – Dasher assembly

4) Before close the dasher back with the propro flange, make sure the blades are placed inside the cylinder as shown in the picture below (vedi Fig. 7-18).

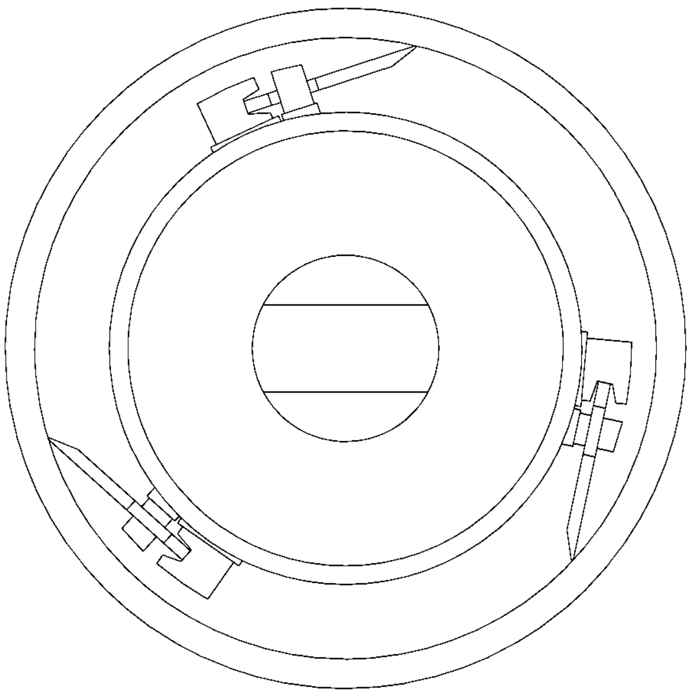


Fig. 7-18 – Dasher assembly

7.6 BLADES MAINTENANCE (FIG. 7-20)

Since the blades scrape the cooling cylinder, the edge gets worn, and featheredge is formed.
A blade is in good conditions when the transversal profile is as shown in the drawing.
A blade is not in fine conditions when the edge width in the area leaning onto the cylinder surface is more than 0,5 mm or when the wear has caused the forming of featheredge.
We recommend to replace the worn-out blades with original spare ones and not to reset the correct profile in a handicraft way.
To renew the worn-out blades, turn to a specialized workshop that make the job with machines and equipment fit for an accurate working without deforming the piece.

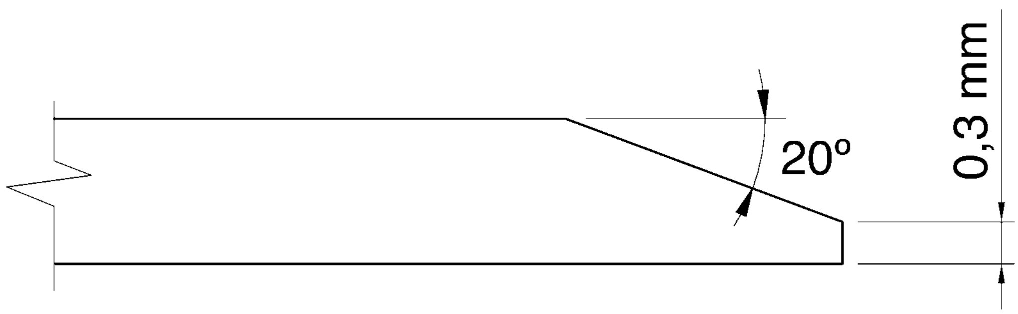


Fig. 7-20 – Blades maintenance

NOTE: A blade can be sharpened up to a minimum width of 27 mm. A too narrow blade does not get correctly in touch with the wall and will not scrape in an efficient way. Replace the blade if the total width is less than 27 mm.

8. TROUBLE SHOOTING

Causes of an imperfect functioning could be:

1) **Machine does not ignite**
   - The general switch is in position “0” or troubled. Rotate to position “1” or replace.

2) **Supply air pressure not included in the required values range.**
   - Check if the machine is supplied with compressed air at the required pressure.
   - Check that no pressure drops are in the pneumatic installation.
   - Check that the pressure adjusting switch is not badly adjusted or damaged.

3) **The pumps stop or do not ignite**
   - Troubled control push-button. Replace it.
   - Inverter overcurrent protection. Wait 20 seconds and re-activate the pump.
   - Inverter is broken of in emergency state. Disconnect the general switch and turn it back on after some minutes.

4) **The whipping shaft stops or does not ignite**
   - Thermic protection tripped. Reset the thermic protection.
   - Troubled control push-button. Replace it.
   - Troubled motor. Repair or replace it.

5) **The freezing compressor does not ignite**
   - Thermic protection tripped. Reset.
   - Troubled control push-button. Replace it.

6) **Condensation pressure off the allowed range**
   - The calibration value in the factory is 15 bar (Fig. 8-1 pos. 1). Check that the pointer of the condensation manometer is inside the green area of the scale. If it was not like this, check that all the cocks on the line that brings water to the freezer are open and that the water reaches regularly the machine. Check the water temperature (it should be > 5, < 31°C) and, if necessary, adjust the pressure adjusting valve (Fig. 8-1 pos. 2) acting with the handwheel (Fig. 8-1 pos. 3) placed on the top of the valve to bring the pressure to 15 bar.

NOTE: The freezing installation is accurately calibrated during the factory test. Therefore, we recommend not to adjust it. However, if the adjustment was necessary, turn to a refrigeration-wise technician, expert in low temperature industrial installations.

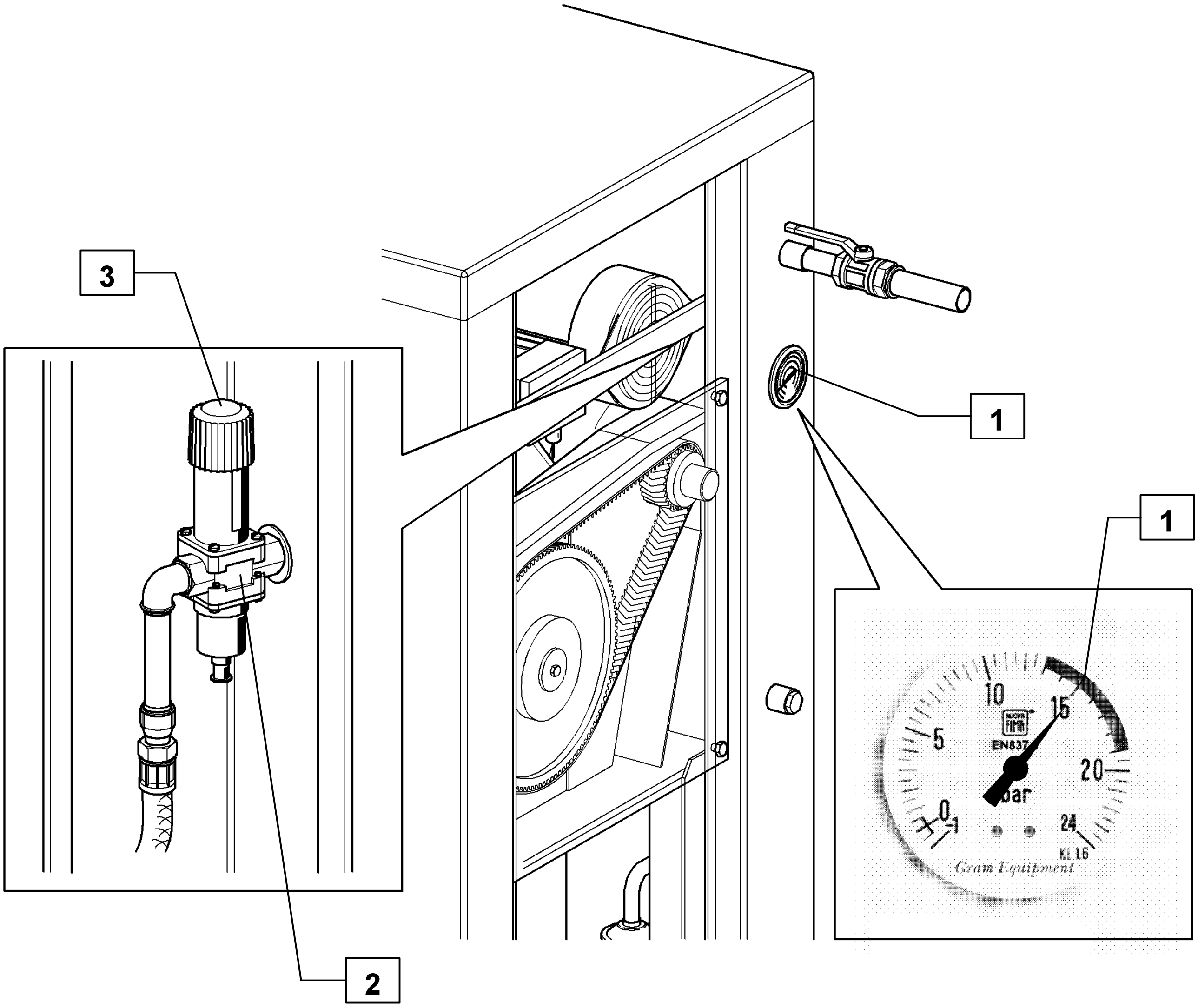
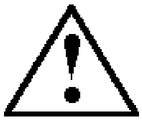


Fig. 8-1 – Trouble shooting

8.1 OVERLOAD PILOT LIGHTS

If a drive stops, the corresponding pilot light on the control panel switch on and the freezer must be inspected to find the source of such a stop.
When the compressor stops, it is also necessary to check the gas pressure switch and the electronic protection: they could have the contacts open or could be broken down.
Such operations must be done before acting on the wiring plant.



WARNING: Be very careful to the wiring diagram when working at the electric plant.

9. SCHEMES AND SPARE PARTS

9.1 LIST OF SCHEMES

N. PROG.	CODE	DESCRIPTION	ENCLOSED N°
1		WIRING DIAGRAM	1
2		PNEUMATIC DIAGRAM	2

9.2 ASSEMBLY DRAWINGS

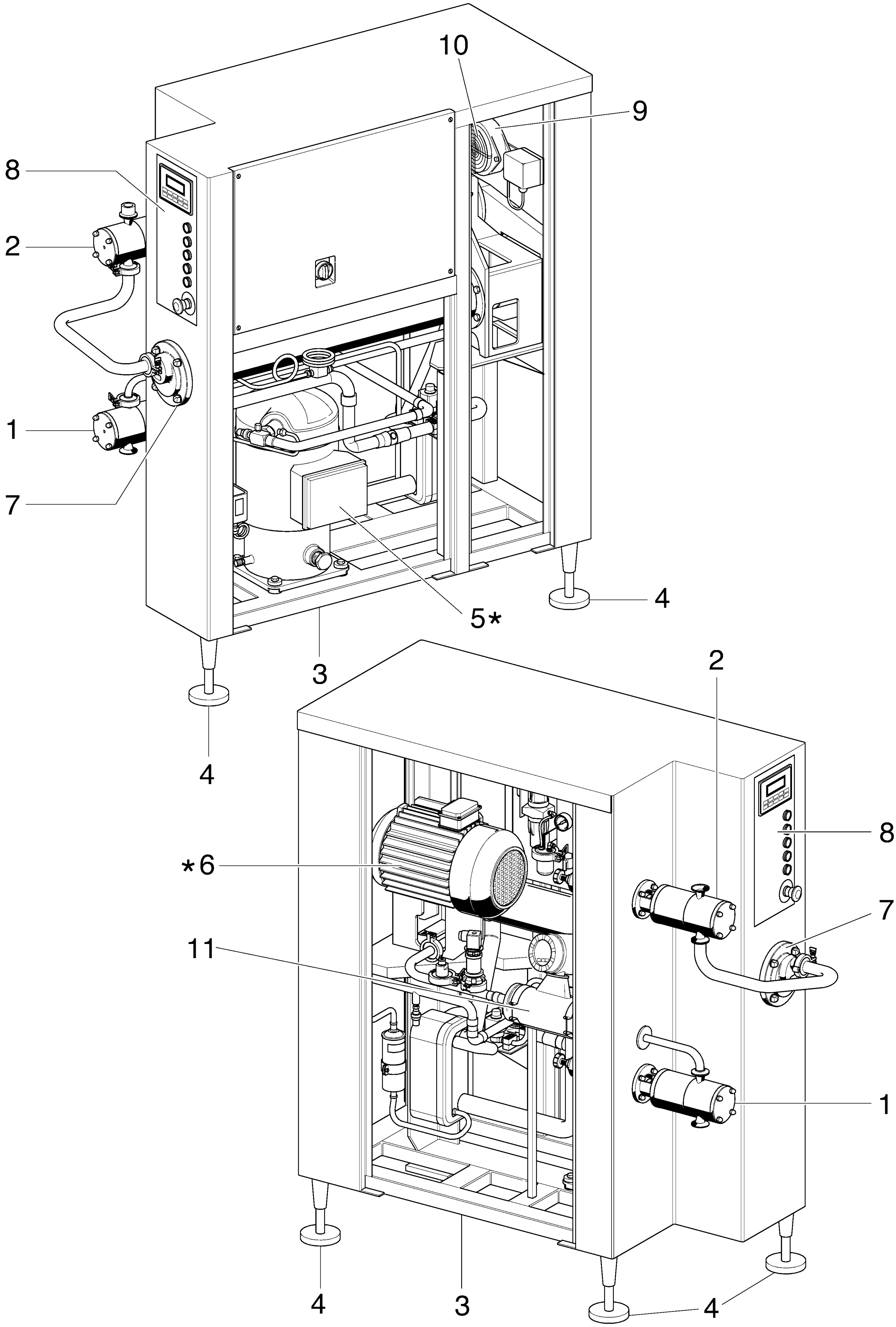
N. PROG.	CODE	DESCRIPTION	N. ATTACHED SHEETS
1	T08620100	GENERAL ASSEMBLY	1
2	T08620200	DASHER GROUP	1
3	T08620300	PUMPS	1
4	T08620400	FREEZING SYSTEM	1
5	T08620500	PNEUMATIC SYSTEM	1

Drwng. Nr. T8620100

POS.	CODE	DESCRIPTION
1	5000346	MIX DELIVERY PUMPS
2	5000346	ICE CREAM DELIVERY PUMP
3	1100171	FRAME FOR FREEZER
4	1650001	ADJUSTABLE SUPPORT FEET
5	*	FREEZING COMPRESSOR
6	*	DASHER MOTOR
7	5000343	FREEZER CYLINDER
8	/	CONTROL PANEL
9	4010375	FAN MOTION
10	4010376	GRATE
11	907629900	CORIOLIS MASS FLOW MEASURING SYSTEM

* = See “Voltage Versions Table” page 9-8

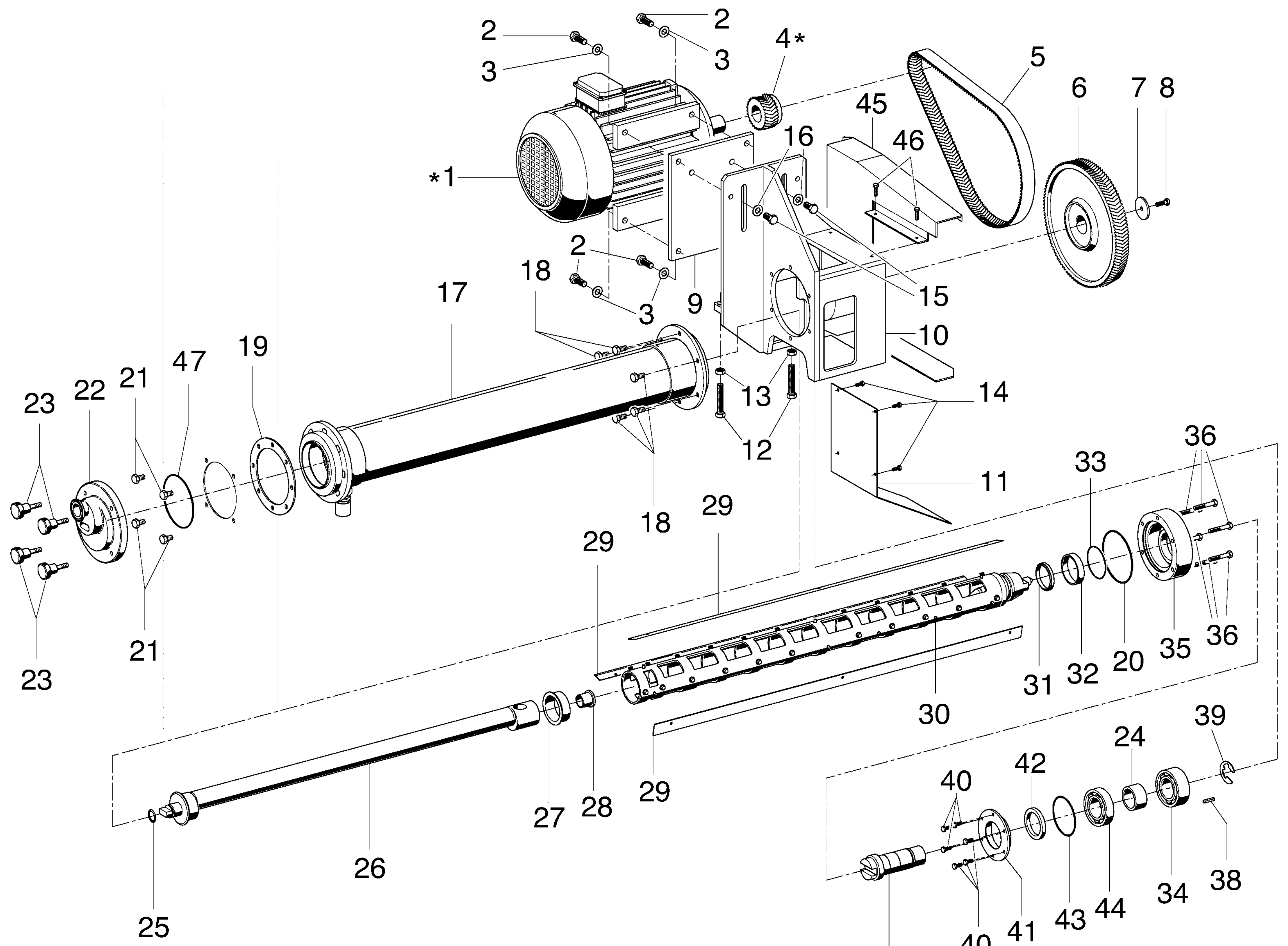
∗ = See “Voltage Versions Table” page 9-8



Drwng. Nr. T8620200

POS.	CODE	DESCRIPTION
1	*	ELECTRIC MOTOR
2	2015731	INOX TE SCREW M12x30
3	2032114	NOTCHED WASHER Ø14
4	*	MOTOR PULLEY
5	4290118	TIMING BELT
6	1700078	OPERATION PULLEY
7	1790020	SEAL WASHER OPERATION PULLEY
8	2015674	INOX TE SCREW M8x20
9	1660116	DASHER MOTOR SUPPORT PLATE
10	1300047	DASHER DRIVE BOX
11	1490011	ANTI-CONDENSATE GUARD SHEET
12	2015738	TE SCREW M12x90
13	2020212	INOX HEXAGONAL NUT M12
14	2015641	INOX TE SCREW M6x12
15	2015727	INOX TE SCREW M12x22
16	2032114	NOTCHED WASHER Ø14
17	1200034	FREEZER CYLINDER ØI =100
18	2015711	INOX TE SCREW M10x20
19	1450010	FREEZER CYLINDER GASKET
20	2164462	OR 4462 GASKET
21	2015710	INOX TE SCREW M10x16
22	1370147	FREEZER CYLINDER LID
23	1950050	SPECIAL FIXING SCREW
24	1350040	DASHER TRACTION BEARINGS SPACER
25	2164087	OR 4087 GASKET
26	1020026	ECCENTRIC DASHER GIF 600
27	1130071	ECCENTRIC FRONT BUSH
28	1130070	ECCENTRIC BACK BUSH
29	1330013	SCRAPE BLADE GIF 600
30	1330014	CYLINDER DASHER
31	2141063	DEM 63 GASKET
32	1130073	WEAR RING DASHER
33	2163275	OR 3275 GASKET
34	4140217	3209 A – 2RS BEARING
35	1370148	FREEZER CYLINDER BOTTOM
36	2015679	INOX TE SCREW M8x50
37	1050064	DASHER TRACTION SHAFT
38	2060130	FEATHER 12x8x30
39	2070045	ELASTIC RING SEEGER E 45
40	2015643	INOX TE INOX M6x16
41	1370149	BEARINGS LID
42	4141525	GROMMET SM 55-72-8
43	2164300	OR 4300 GASKET
44	4140218	RADIAL BALL BEARING 6209-2RS
45	1230336	PLEXIGLASS TIMING CASE
46	2015601	TE SCREW M4x10
47	2164475	OR 4475 GASKET

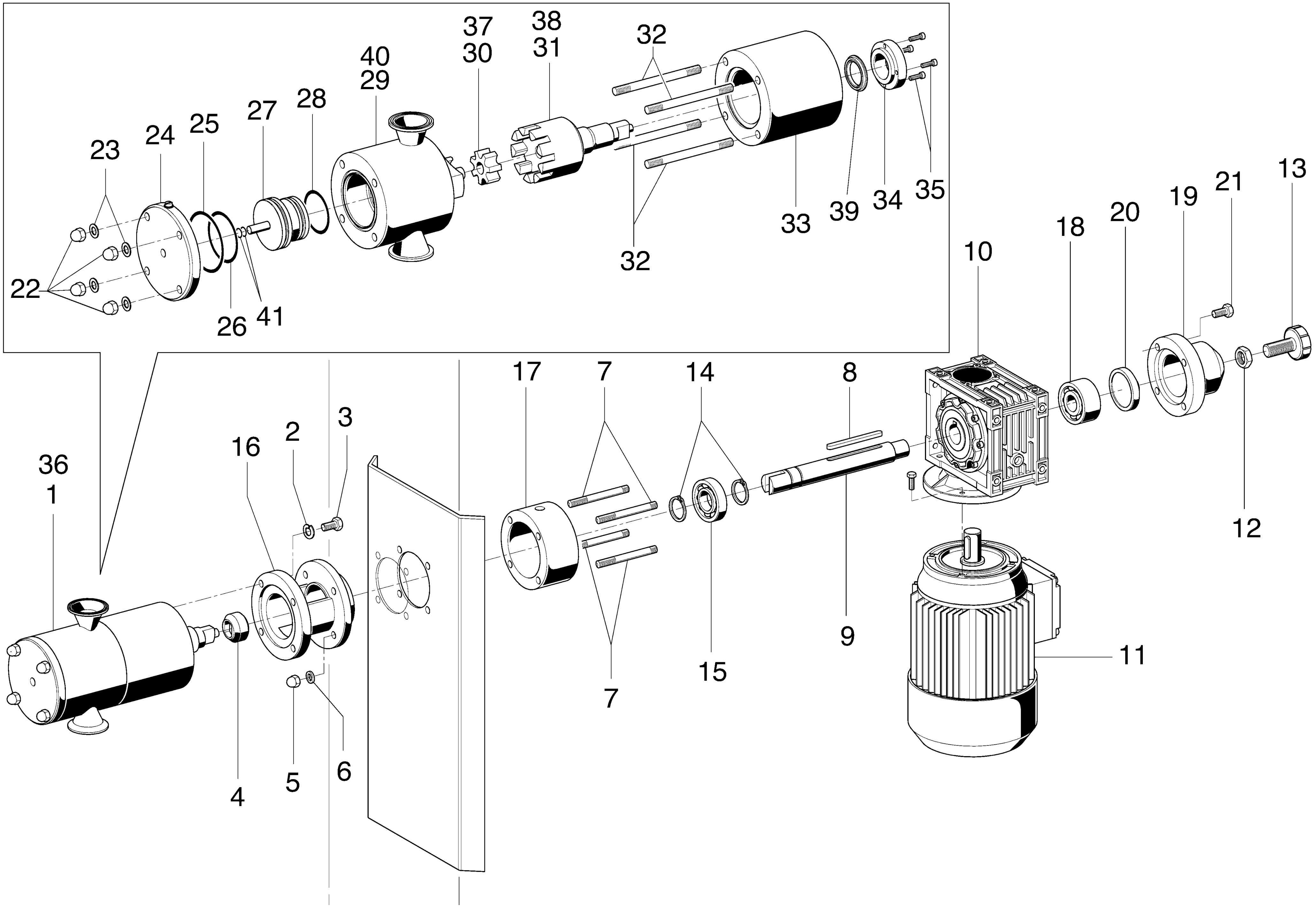
* = See “Voltage Versions Table” page 9-8



∗ = See “Voltage Versions Table” page 9-8

Drwng. Nr. T8620300

POS.	CODE	DESCRIPTION
1	781720597	MIX COMPLETE PUMP
2	2031024	INOX PLAIN WASHER Ø 8x24
3	2015675	INOX TE SCREW M8x25
4	1550019	PUMP SHAFT PRESSURE SLEEVE
5	2020108	CAP NUT INOX M8
6	2033005	GROVER INOX M8
7	2099004	STUD BOLT M8x85
8	2060062	INOX FEATHER 8x7x80
9	1050066	PUMP TRACTION SHAFT
10	4021063	REDUCTION GEAR
11	4021061	ELECTRIC MOTOR
12	2020217/1	LOW HEXAGONAL NUT M16x1,5
13	1320021	PUMP ADJUSTMENT KNOB
14	2070025	INOX EXTERNAL SEEGER E 25
15	4140110	RADIAL BALL BEARING
16	1880003	PUMP SUPPORT GIF 600
17	1350042	PUMP REDUCTION SPACER
18	4140220	BEARING 3304 – A – 2RS1
19	1300048	PUMP ADJUSTMENT BODY
20	1790022	CAP PRESSURE
21	2015675	INOX TE SCREW M8x25
22	2020108	HEX-CAP NUT INOX M8
23	2031024	WASHER
24	7811712262	LID
25	2163250	OR 3250 GASKET
26	2164212	OR 4212 GASKET
27	781712233	CIP PISTON
28	2164162	OR 4162 GASKET
29	781712736	MIX PUMP FRONT BODY
30	781713080	COIL FOR MIX PUMP
31	781712487	ROTOR FOR MIX PUMP
32	2099005	STUD BOLT M8x125
33	7811712266	PUMP BACK BODY
34	781712005	FLANGE
35	2015014	TCEI SCREW M4x25
36	G781720600	ICE CREAM COMPLETE PUMP
37	781712525	COIL FOR ICE CREAM PUMP
38	781712400	ROTOR FOR ICE CREAM PUMP
39	2160049	VARISEAL GASKET
40	781712707	ICE CREAM PUMP FRONT BODY
41	2160112	OR 112 GASKET



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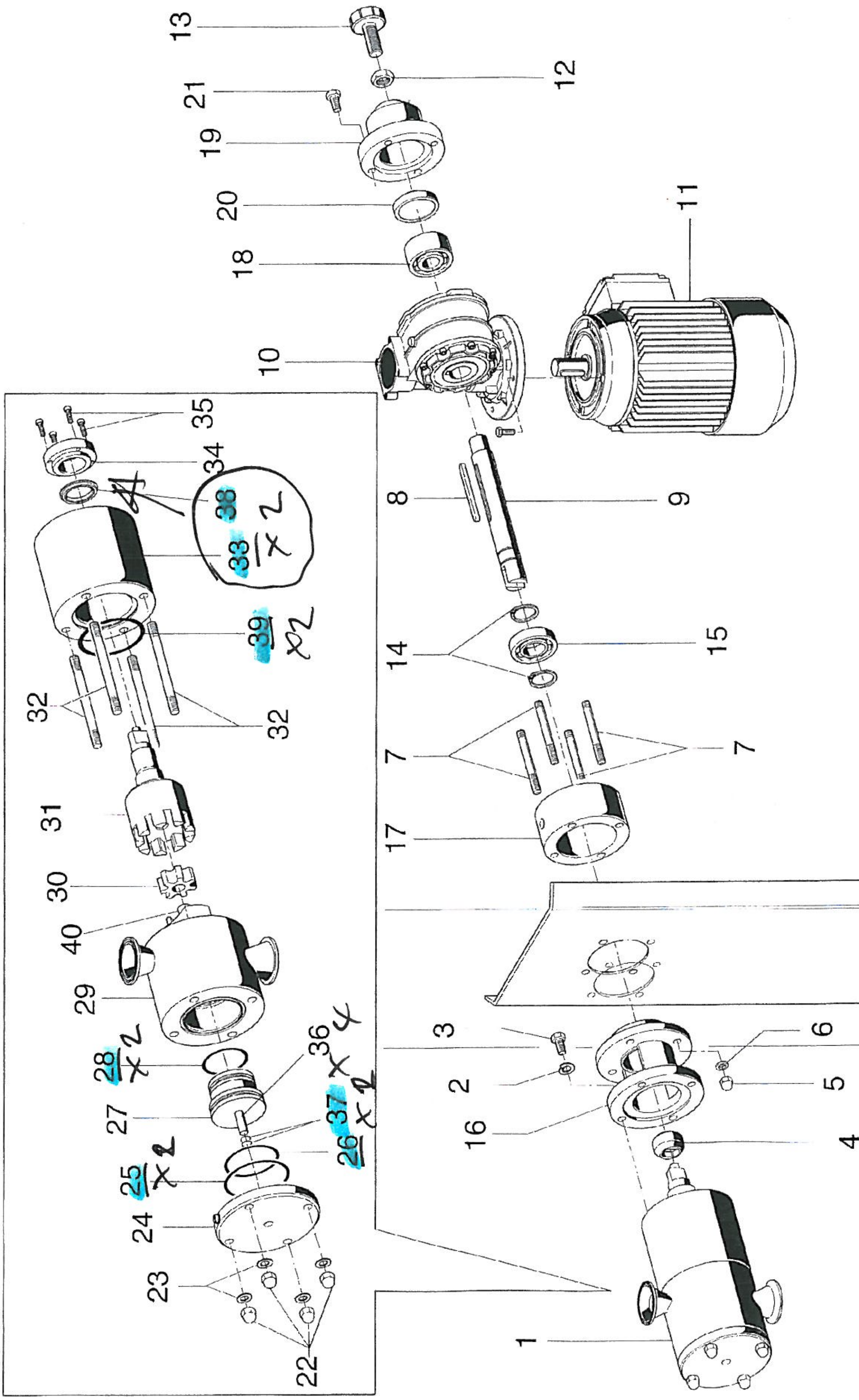
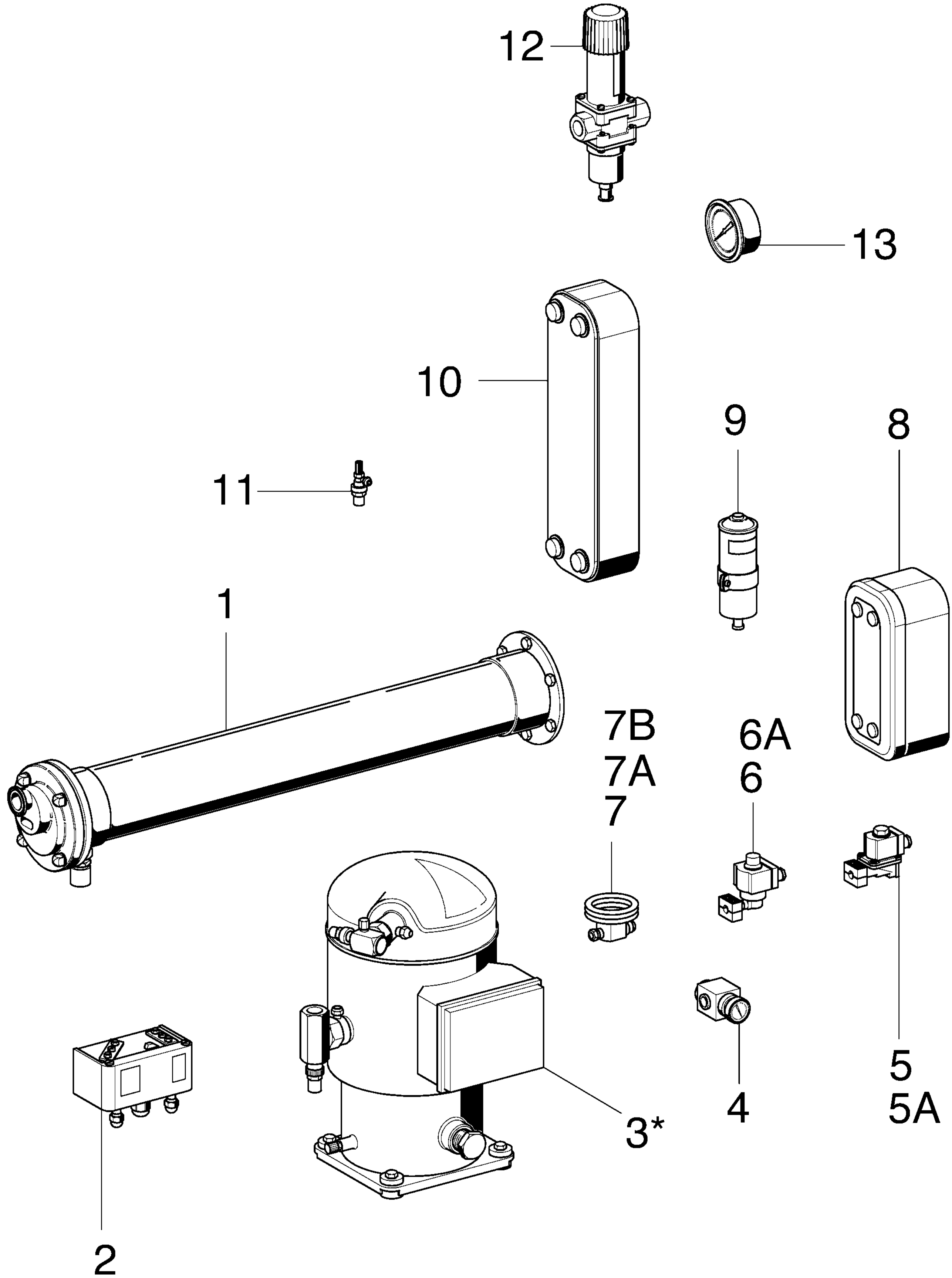
Drwng. Nr. T8620301



Drwng. Nr. T8620400

POS.	CODE	DESCRIPTION
1	5000343	FREEZER CYLINDER
2	4061781	PRESSURE SWITCH
3	∗	COMPRESSOR
4	4061820	LIQUID LAMP
5	4061805	LIQUID VALVE BODY
5A	4061992	LIQUID VALVE COIL
6	4061764	HOT GAS VALVE BODY
6A	4080363	HOT GAS VALVE COIL
7	4061898	THERMOSTATIC VALVE BODY
7A	4061877	THERMOSTATIC POWER ELEMENT
7B	4061868	THERMOSTATIC VALVE HOLE
8	4010042	HEAT EXCHANGER
9	4061099	FILTER
10	4010041	EXCHANGER
11	4080285	FAUCET
12	4061984	PRESSURE ADJUSTING VALVE
13	4110215	MANOMETER

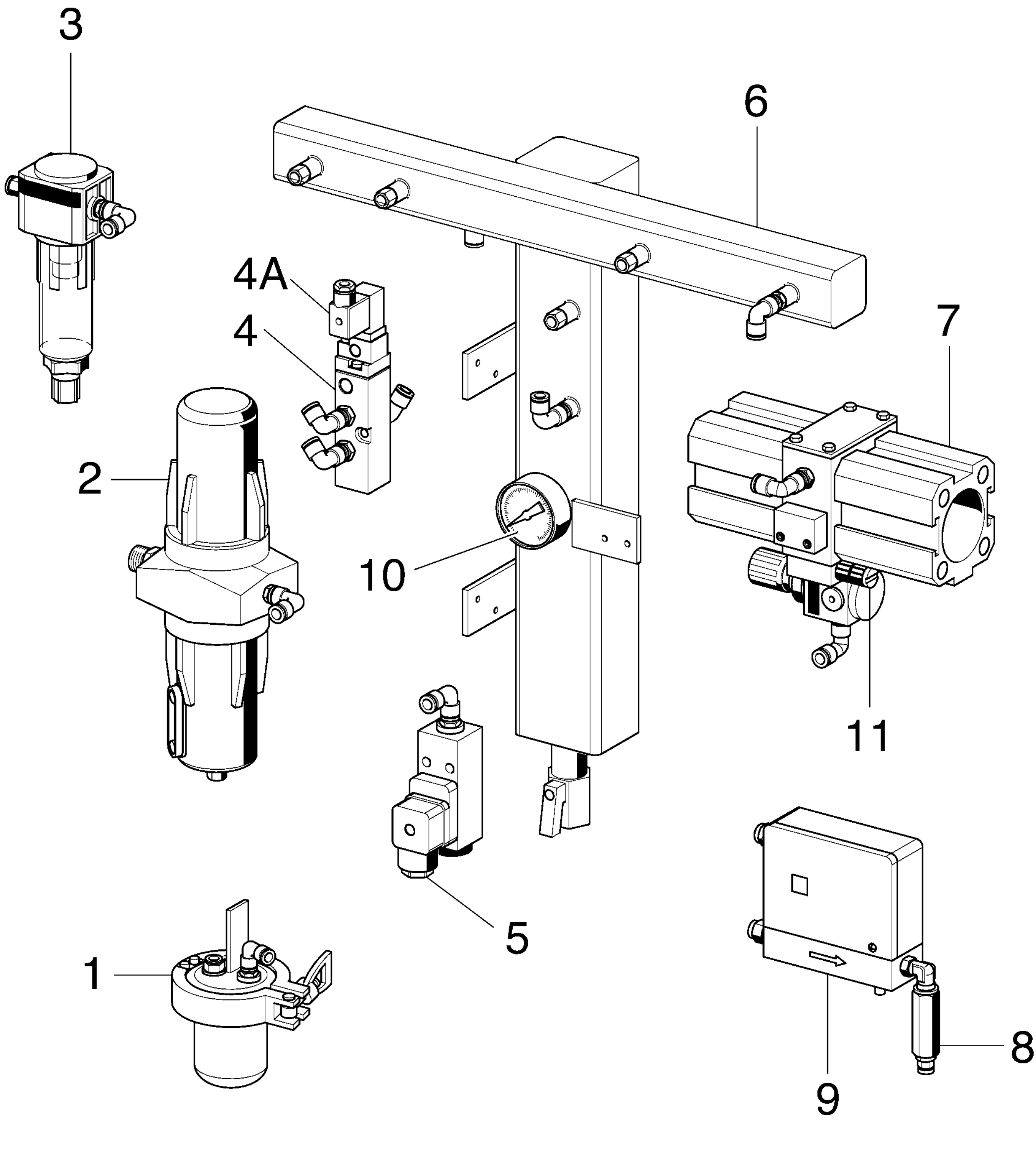
∗ = See “Voltage Versions Table” page 9-8



∗ = See “Voltage Versions Table” page 9-8

Drwng. Nr. T8620500

POS.	CODE	DESCRIPTION
1	5000348	STERILIZABLE FILTER
2	4060901	SEPARATING-THE-OIL FILTER/ACTIVED CARBON
3	4060821	SEPARATING-THE-OIL FILTER
4	4060621	CIP SOLENOID VALVE
4A	4061181	COIL
5	4060563	PRESSURE SWITCH
6	1810027	SUPPORT
7	4060819	PRESSURE MULTIPLIER WITH REDUCTION GEAR
8	4080375	CHECK VALVE
9	4060886	SANITARY AIR CONTROL VALVE
10	4110225	MANOMETER
11	4061009	SILENCER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VOLTAGE VERSIONS TABLE	
	THREE-PHASE 480 V - 60 Hz
COMPRESSOR	4010076
DASHER MOTOR	4021060
PINION	1700080

9.3 EQUIPPED SPARE PARTS

CODE	DESCRIPTION	QUANTITY
4170001	CLAMP 1” ½	2
2180012	CLAMP GASKET 1” ½	4
1130070	ECCENTRIC BACK BUSH	1
1130071	ECCENTRIC FRONT BUSH	1
2164462	OR 4462 CYLINDER LID	2
1130073	DASHER SEAL WEAR RING	1
2163275	OR 3275 FOR CYLINDER HEAD	1
2141063	SEAL GASKETS DASHER DEM 63	2
4170353	STUB PIPE CLAMP DN 32	2
4160710	RUBBER HOLDER CLAMP 1” ½	2

10. GUARANTEE AND SERVICE

10.1 GUARANTEE CONDITIONS

Sidam guarantees the regular working of all machines sold as new for the term of twelve months from the delivery date, provided that the Buyer discloses the working defects within 8 days from their discovery.
The term of twelve months above mentioned must be considered on the shift of work.
Such a guarantee will entitle the Buyer to free replacement - in the shortest possible time - of those parts which should prove to be faulty because of bad material or bad workmanship.
Our guarantee is to be so interpreted that we deliver, free of charge, replacement parts or repairs parts which within the period stipulated, due to faulty constructions, second rate materials, or bad workmanship, prove unfit for use.
All charges in connection with our fitter's intervention are at the Purchaser's account. Freight, duty, etc. For replacement parts are not included in our guarantee and must be paid by the Customer.
The parts replaced are our property and must be returned by the Purchaser, freight paid, if required by Sidam.
No free replacement will be made for those pieces rended defective through lack of skill of workers, through deterioration caused by lack of lubrication through normal wear and tear, through irrational use of the machines or through wrong assembly in case the latter is not carried out by Sidam.
We shall not be responsible and shall not pay compensation for stoppage of the plant, loss of profit, or loss of any other kind.
The Buyer who defaults in his payments loses his right to any guarantee.
The sale of motors, separately or together with the machines, does not imply in any way Sidam's responsibility. Wiring and electrical equipment are always excluded from the guarantee.

10.2 SPARE PARTS ORDERING PROCEDURE

Change a component in a favourable moment it means to maintain the plant working in best conditions and at the same time to avoid worst damages.

You can follows three kinds of orders:

A.- REQUEST OF MECHANICAL OR COMMERCIAL SPARE PARTS WHICH ARE BROKEN OR WORN.

↓

PROCEDURE A

- **IDENTIFY IF IT IS POSSIBLE THE PART BROKEN OR WORN ON THE PLANT.**
- **IDENTIFY TO WHICH PART OF THE MACHINE THE PIECE BROKEN OR WORN BELONGS.**
- **WHEN YOU HAVE IDENTIFY THE GROUP YOU HAVE TO FULL FILL THE FORM AS FOLLOWS:**

B.- REQUEST OF MECHANICAL OR COMMERCIAL SPARE PARTS MORE WORN.

↓

PROCEDURE B

- **IDENTIFY THE PARTS WHICH ARE MORE WORN.**
- **IDENTIFY TO WHICH PART OF THE MACHINE THE PIECE BROKEN OR WORN BELONGS USING YOUR INSTRUCTION MANUAL.**
- **WHEN YOU HAVE IDENTIFY THE GROUP YOU HAVE TO FULL FILL THE FORM AS FOLLOWS:**

PROCEDURE <u>A/B</u>

SPARE PARTS REQUEST FORM
Please photocopy this form, fulfil it and sent by mail or fax to:

Spett.le
SIDAM S.r.l.
Via Fabio Filzi 37
20032 CORMANO (MI)
ITALY

Tel. ++39-2-61554.1 (r.a.)
Fax. ++39-2-61.50.926
E-Mail: lubia@sidam.it
Internet: www.sidam.it

Customer……………………………………………Tel………………………..Fax……………

City……………………………………………Country……………………..

Machine model…………………………………

Serial no.……………………………………...

Group no.	Position	Description	Q.ty
T86201000	1	MIX DELIVERY PUMP	1

Best Regards,

(Stamp and Signature)

PROCEDURE A/B

SPARE PARTS REQUEST FORM
Please photocopy this form, fulfil it and sent by mail or fax to:

Spett.le
SIDAM S.r.l.
Via Fabio Filzi 37
20032 CORMANO (MI)
ITALY

Tel. ++39-2-61554.1 (r.a.)
Fax. ++39-2-61.50.926
E-Mail: lubia@sidam.it
Internet: www.sidam.it

Customer……………………………………………Tel……………………….Fax……………

City……………………………………………Country……………………..

Machine model……………………………………

Serial no……………………………………...

Group no.	Position	Description	Q.ty

Best Regards,

(Stamp and Signature)

11. ENCLOSED

11.1 WIRING DIAGRAM

11.2 PNEUMATIC DIAGRAM

11.3 ELECTRICAL BOARD OPERATING AND MAINTENANCE MANUAL

11.4 MATERIAL LIST

11.5 CERTIFICATE TEST/MEASURE CERTIFICATE

11.6 CORIOLIS MASS FLOW MESURING SYSTEM

WIRING
DIAGRAM

ENCLOSE 1

Sidam

FREEZER GIF 600 UL
U.S.A.

a	CONSTRUCTOR	SAI S.r.l.	i	RATING CURRENT AND RATING POWER	28A 19kW	DATE	REV.	NOTES
b	IDENTIFICATION CODE	QE-0433/+Q2	k	RESISTANCE TO SHORT CIRCUIT	50kA	25/09/2002	0	ISSUE
c	U.S.A. REGULATION	UL-508A	l	PROTECTION DEGREE	NEMA 1			
d	CURRENT	A.C. 60Hz	m	PROTECTIVE MEASURES TO PERSON	NEMA 1			
e	OPERATING RATING VOLTAGES	480Vac +-10%	n	SERVICE CONDITIONS	10 °C, +35 °C			
f	INSULATION RATING VOLTAGES	1000V	o	GROUNDING TYPE	TN			
g	AUXILIARY CIRCUITS RATING VOLTAGES	230Vac, 115Vac 24Vdc	p	DIMENSIONS (h x l x d)	410x710x12			
h	OPERATING LIMTS		q	WEIGHT	20kg			

SAI
SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION Header		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS /	FOGLIO SHEET	1
Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002		SUCCESS. NEXT	2

DATI PER ARCHIVIAZIONE/FILING DATA
A433--01

LISTA FOGLI \ INDEX

Foglio Sheet	Descrizione Description	Revisione \ Revision 0	1	2	3	4	5	6	7	8	9	Foglio Sheet	Descrizione Description	Revisione \ Revision 0	1	2	3	4	5	6	7	8	9
1	Header	X																					
2	Index	X																					
25	Sections and colours of conductors	X																					
26	Legend blocks	X																					
28	Description of terminal strips	X																					
41	General layout	X																					
51	Plate layout	X																					
92	Main fuses section switch	X																					
109	Safety relay	X																					
110	Auxiliary power supply	X																					
141	Rack configuration	X																					
143	Cards power supply	X																					
201	Digital inputs	X																					
202	Digital inputs	X																					
203	Digital inputs	X																					
211	Digital outputs	X																					
212	Digital outputs	X																					
213	Digital outputs	X																					
214	Digital outputs	X																					
221	Analog input/output	X																					
222	Analog signals	X																					
241	Dasher motor	X																					
242	Compressor motor	X																					
243	Pump 1 motor	X																					
244	Auxiliary motor	X																					
245	Pump 2 motor	X																					
701	Terminal strip X1	X																					

SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Index

Sidam

CLIENTE/CUSTOMER	DISEGNO/DRAWING	SCALA/SCALE	DISEG/DFTM	CONTR/CHKD	PRECED. PREVIOUS		FOGLIO SHEET	
SIDAM S.r.l.	/	/	MVO	SBO		1		2
		REV. 0		DATA/DATE 25/09/2002			SUCCESS. NEXT	25

DATI PER ARCHIVIAZIONE/FILING DATA
A433--01

MINIMUM SECTION OF CONDUCTORS

MOTORS	14 AWG
CARD PLC	18 AWG
AUXILIARY	16 AWG
ANALOG	18 AWG

COLOUR OF CONDUCTORS

BLACK	=	POWER CIRCUIT
YELLOW/GREEN	=	GROUND
RED	=	AUX CIRCUITS
WHITE	=	A.C. AUX CIRCUITS (COMMON)
BLUE	=	24V D.C.
BLUE/WHITE	=	24V D.C. (COMMON)
YELLOW	=	LIVE TENSION WITH GENERAL BREAKER IN OFF POSITION

SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Sections and colours of conductors

Sidam

CLIENTE/CUSTOMER: SIDAM S.r.l.

DISEGNO/DRAWING: /

SCALA/SCALE: /
DISEG/DFTM: MVO
CONTR/CHKD: SBO
REV.: 0
DATA/DATE: 25/09/2002
PRECED. PREVIOUS: 2
FOGLIO SHEET: 25
SUCCESS. NEXT: 26

DATI PER ARCHIVIAZIONE/FILING DATA: A433--01

Simbolo	Descrizione	Nome Blocco
	DELAY COIL	C1046
	SECTIONABLE DISCONNECT SWITCH WITH FUSES	C4033
	CON – CONTACTOR	V1031
	CR – CONTROL RELAY	V1033
	SOL – SOLENOID	V1094
	POTENTIOMETER	V1105
	FLASHING LAMPS	V1120
	T – TRANSFORMER	V1135
	OL – OVERLOAD RELAY	V1201
	M – MOTOR	V1205
	SOL – SOLENOID	V2094

Simbolo	Descrizione	Nome Blocco
	LT – PILOT LIGHT	V2117
	BUZZER	V2141
	PB – PUSHBUTTON	V2211
	PB – PUSHBUTTON	V2212
	PB – CLOSED EMERGENCY STOP	V2219
	LS – OPEN LIMIT SWITCH	V2256
	LS – CLOSED LIMIT SWITCH	V2257
	SS – OPEN SELECTOR SWITCH	V2261
	FU – FUSE BLOCKS	V3092
	DISC – DISCONNECT SWITCH	V4005
	CB – CIRCUIT BREAKER 1 POLE	V4044

Simbolo	Descrizione	Nome Blocco
	CB – CIRCUIT BREAKER 2 POLES	V4046
	CB – CIRCUIT BREAKER 3 POLES	V4048
	GFC – GROUND-FAULT CIRC. INTER.	V4062
	POWER FUSE	BLK25
	SAFETY RELAY	BLK39
	LT – PILOT LIGHT	BLK42
	PLUG	XPIN
○	TERMINAL BOARD	MORS-N2
⌀	MORSETTO JUNCTION BOX	MORS-S2
⊕	TERMINAL CONTROL DESK	MORS-D2
◐	INTERFACE TERMINAL	MORS-F2

SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Legend blocks

Sidam

CLIENTE/CUSTOMER
SIDAM S.r.l.

DISEGNO/DRAWING
/

SCALA/SCALE /
DISEG/DFTM MVO
CONTR/CHKD SBO
REV. 0
DATA/DATE 25/09/2002
PRECED. PREVIOUS 25
FOGLIO SHEET 26
SUCCESS. NEXT 28

DATI PER ARCHIVIAZIONE/FILING DATA
A433--01

DESCRIPTION OF TERMINAL STRIPS AND IDENTIFICATION OF ZONES

X N NNNNNN N N

- Main code
- Voltage level
- Zone
- Progressive number
- Type number

Example: X1MWBO11

X 1 MWBO 1-9 1

- Main code
- Voltage level
- Zone
- Progressive number
- Type number

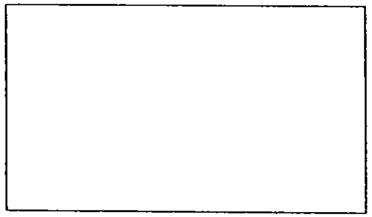
Category 0 (nominal voltage)
< 50Vac o < 120 Vdc)
Category1 (nominal voltage)
from 50 1000Vac o
from 120Vcc to 1500Vdc

0 ZONE

1-9	1	Primary voltages and transformer
1-9	2	220Vac
1-9	3	110Vac
1-9	4	24ac
1-9	5	24dc
1-9	6	24STAB.
1-9	7	Analog I/O
1-9	8	
1-9	9	
	0	Free contacts
	A	Amplifiers, Namur, Thermistor
	S	Terminal strips, Instruments on field, Rotronic

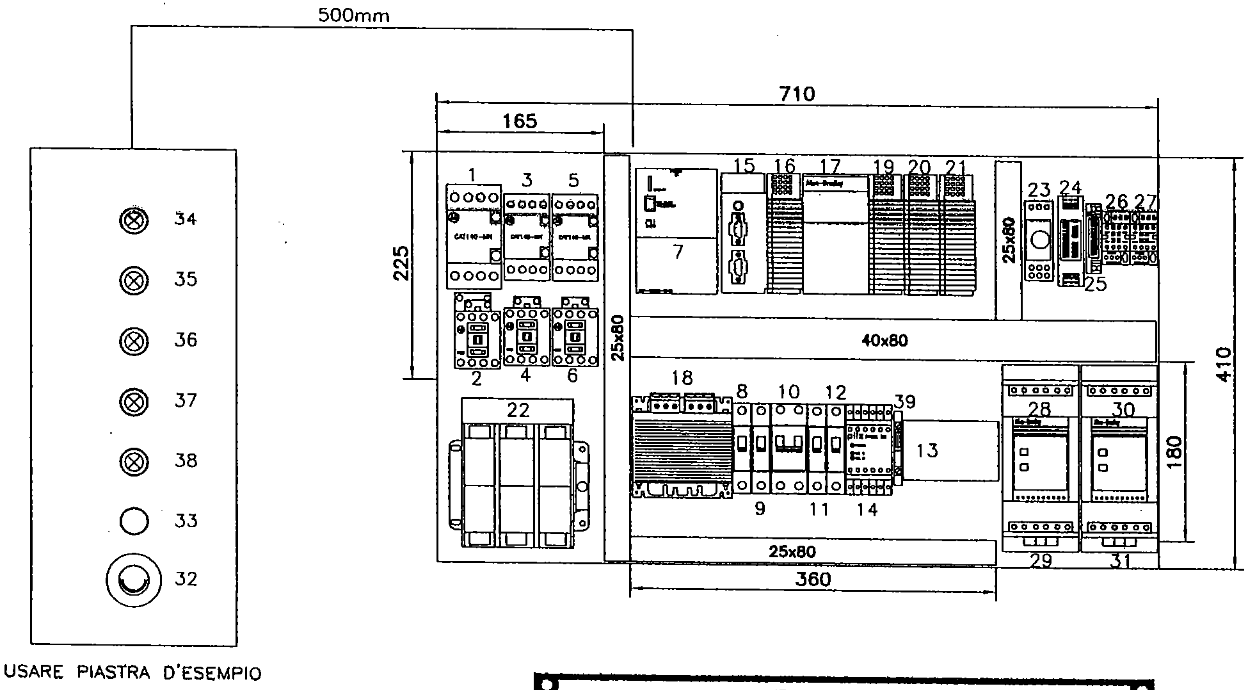
SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION Description of terminal strips	SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS	26	FOGLIO SHEET	28
Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002		SUCCESS. NEXT	41
				DATI PER ARCHIVIAZIONE/FILING DATA A433--01			

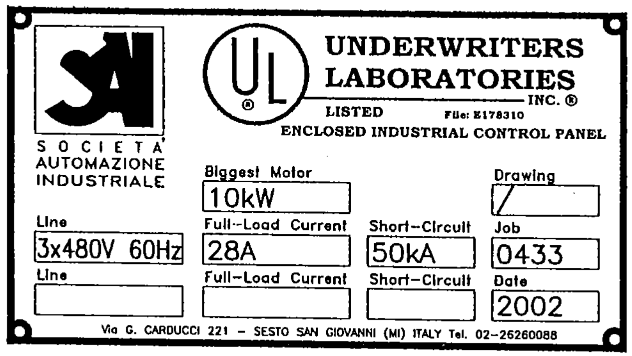


Board: "QE–0433/+Q2"
Drawing: /
Dim: 410x710x12 (h x l x p)
Weight: 20Kg

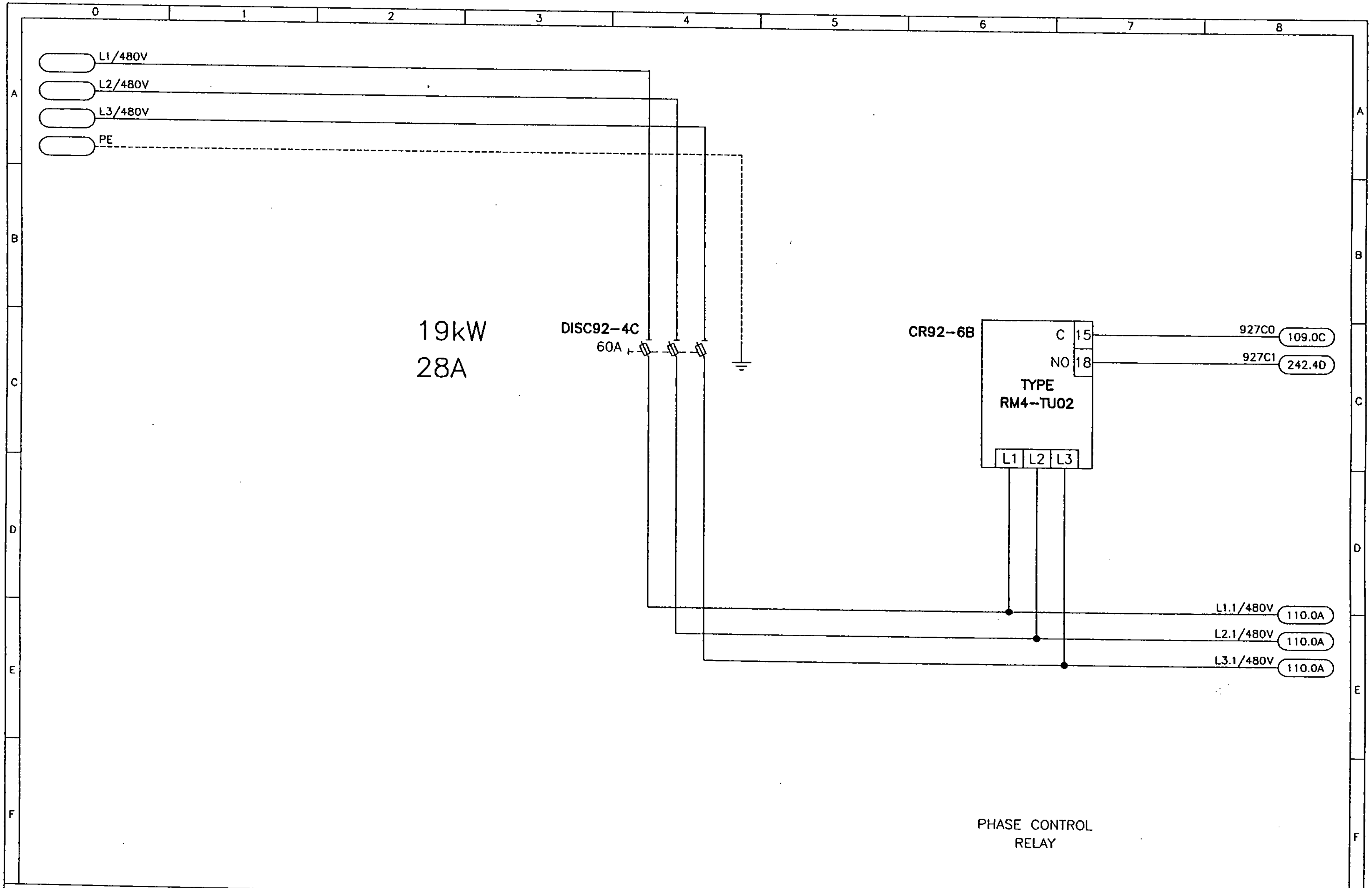
SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION General layout		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS	28	FOGLIO SHEET 41
	Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002			SUCCESS. NEXT 51
						DATI PER ARCHIVIAZIONE/FILING DATA A433--02		



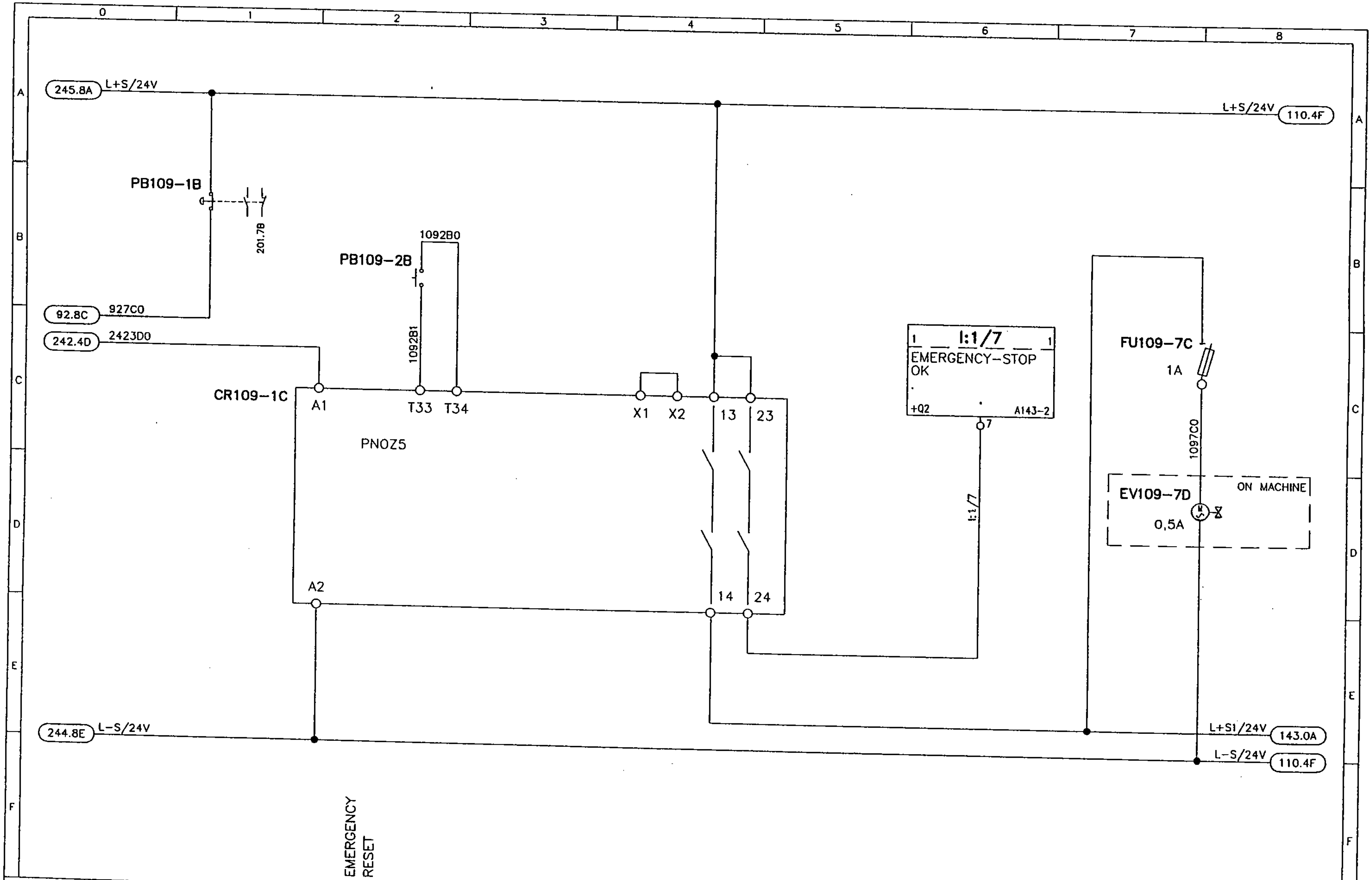
1 = CB242-1B
2 = CON242-5E
3 = CB241-1B
4 = CON241-4E
5 = CB243-3A
6 = CON244-1E
7 = PWS110-5C
8 = CB110-5B
9 = CB110-5E
10 = CB110-1B
11 = CB110-1D
12 = CB110-2D
13 = X1
14 = CR109-1B
15 = A143-1
16 = A143-2
17 = PWS143-3B
18 = T110-1C
19 = A143-3
20 = A143-4
21 = A143-5
22 = DISC92-4C
23 = CR92-6B
24 = CT241-2B
25 = CR211-3E
26 = CR211-5E
27 = CR244-7E
28 = DR243-2C
29 = L243-3C
30 = DR245-2C
31 = L245-3C
32 = PB109-1B
33 = PB109-2B
34 = PB202-1B
35 = PB202-3B
36 = PB202-5B
37 = PB202-7B
38 = PB203-1B
39 = FU109-7C



SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION Plate layout		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS 41	FOGLIO SHEET 51
	Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002		SUCCESS. NEXT 92
		Non è permesso consegnare a terzi o riprodurre questo documento nè, utilizzare il contenuto o renderlo comunque noto a terzi senza la nostra autorizzazione esplicita. Ogni infrazione comporta il risarcimento dei danni subiti. Copying of this document, and giving it to others and the use or communication of the contents thereof, are forbidden without express autority. Offenders are liable to the payment of damages.				DATI PER ARCHIVIAZIONE/FILING DATA A433--02	



SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION Main fuses section switch		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS	51	FOGLIO SHEET 92
	Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002			SUCCESS. NEXT 109
					DATI PER ARCHIVIAZIONE/FILING DATA A433--03			



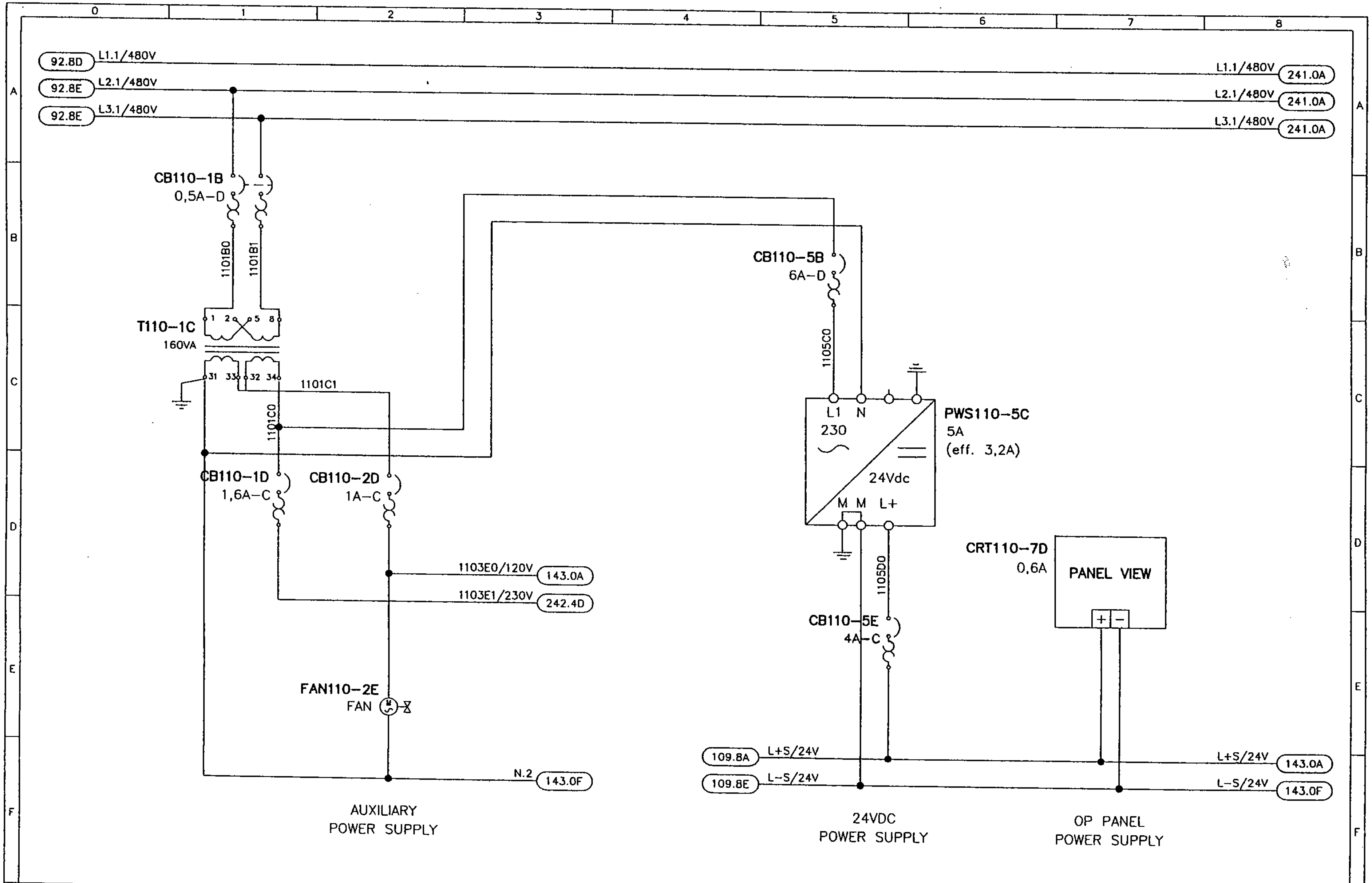
SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Safety relay

Sidam

CLIENTE/CUSTOMER	DISEGNO/DRAWING	SCALA/SCALE	DISEG/DFTM	CONTR/CHKD	PRECED. PREVIOUS	FOGLIO SHEET
SIDAM S.r.l.	/	/	MVO	SBO	92	109
		REV. 0		DATA/DATE 25/09/2002		SUCCESS. NEXT 110

DATI PER ARCHIVIAZIONE/FILING DATA
A433--03



SAI SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION Auxiliary power supply			SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS 109	FOGLIO SHEET 110
	Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0		DATA/DATE 25/09/2002		SUCCESS. NEXT 141
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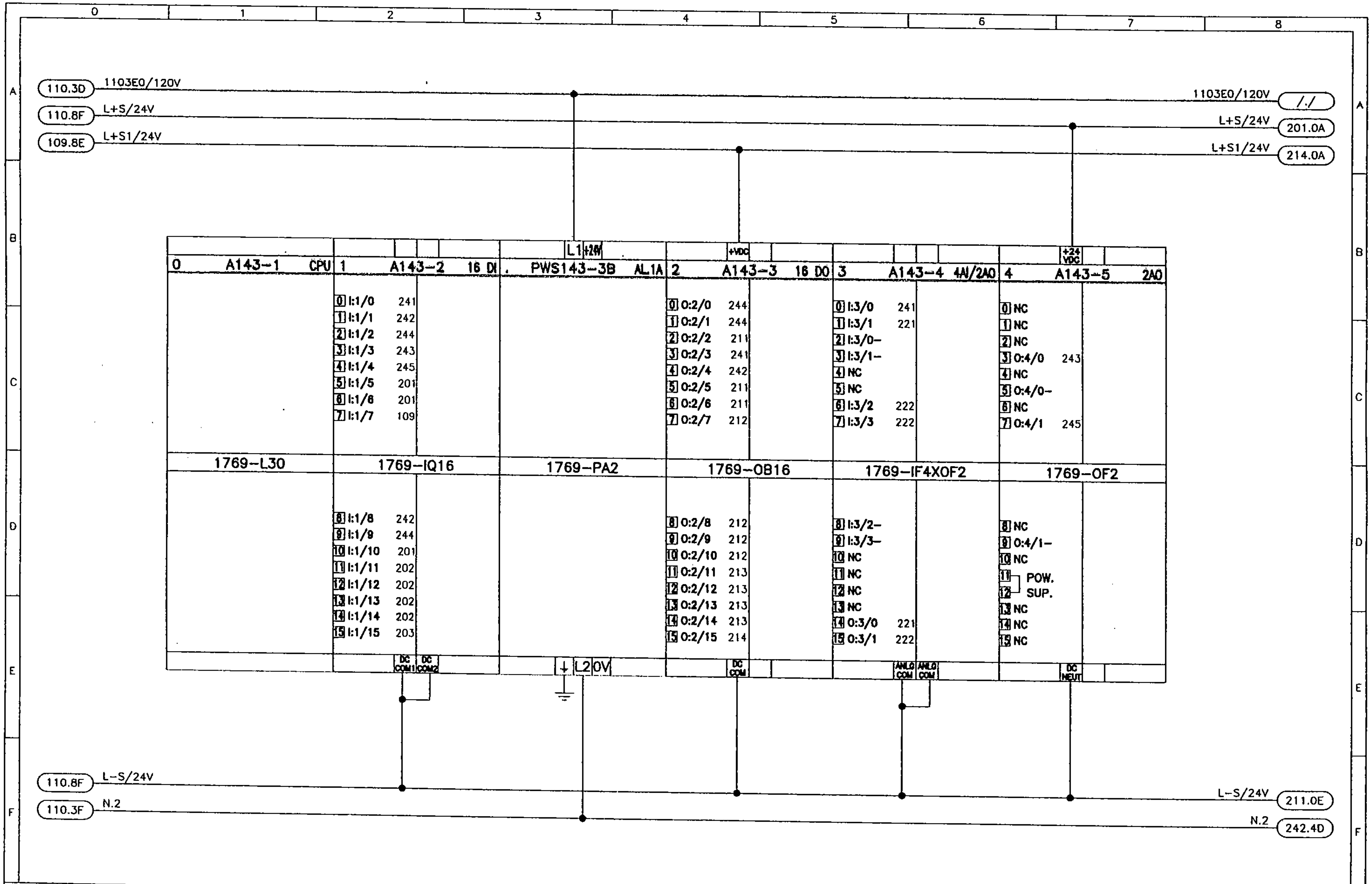
0	1		2	3	4
CPU	DI 16	POWER SUPPLY	DO 16	AI 4 AO 2	AO 2
1769-L30	1769-IQ16	1769-PA2	1769-OB16	1769-IF4XOF2	1769-OF2

SOCIETA' AUTOMAZIONE INDUSTRIALE

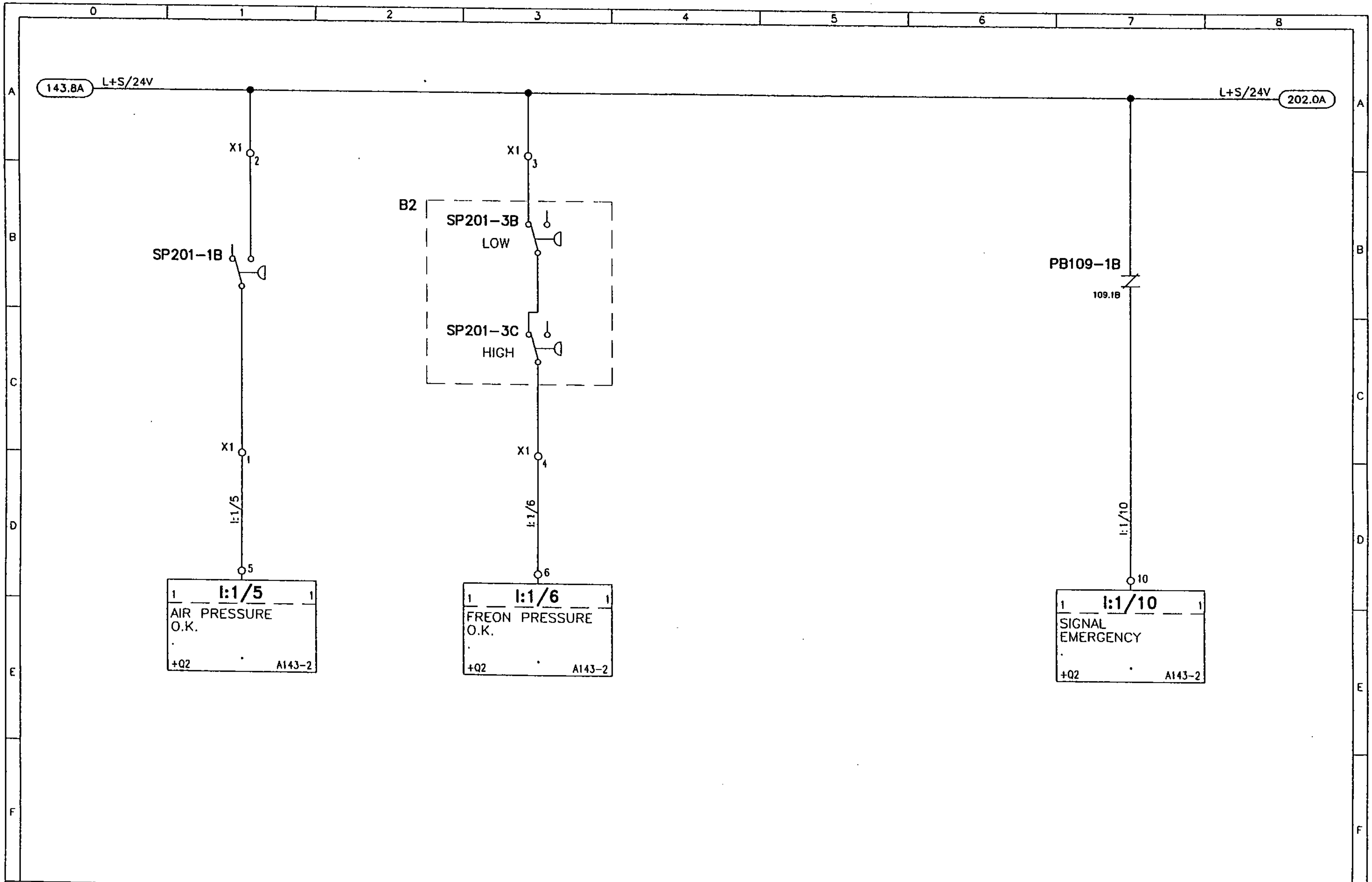
DESCRIZIONE/DESCRIPTION: Rack configuration	SCALA/SCALE: /	DISEG/DFTM: MVO	CONTR/CHKD: SBO	PRECED. PREVIOUS: 110	FOGLIO SHEET: 141
Sidam	CLIENTE/CUSTOMER: SIDAM S.r.l.	DISEGNO/DRAWING: /	REV. 0	DATA/DATE: 25/09/2002	SUCCESS. NEXT: 143
				DATI PER ARCHIVIAZIONE/FILING DATA: A433--04	



SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION Cards power supply		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS 141	FOGLIO SHEET 143	
Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002		SUCCESS. NEXT 201	

DATI PER ARCHIVIAZIONE/FILING DATA
A433--04



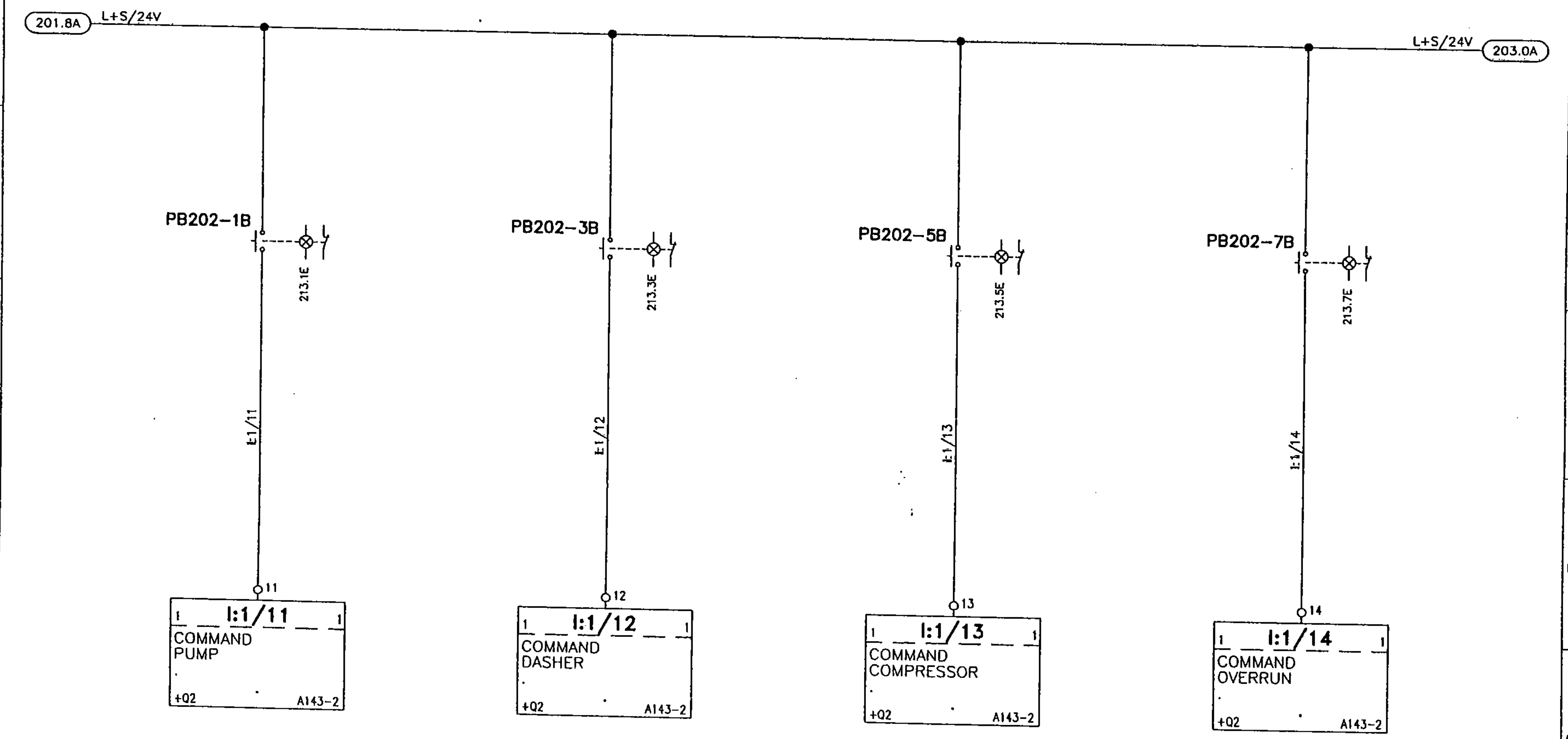
SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Digital inputs

Sidam

CLIENTE/CUSTOMER	DISEGNO/DRAWING	SCALA/SCALE	DISEG/DFTM	CONTR/CHKD	PRECED. PREVIOUS	FOGLIO SHEET	SUCCESS. NEXT
SIDAM S.r.l.	/	/	MVO	SBO	143	201	202
		REV. 0		DATA/DATE 25/09/2002			

DATI PER ARCHIVIAZIONE/FILING DATA
A433--05

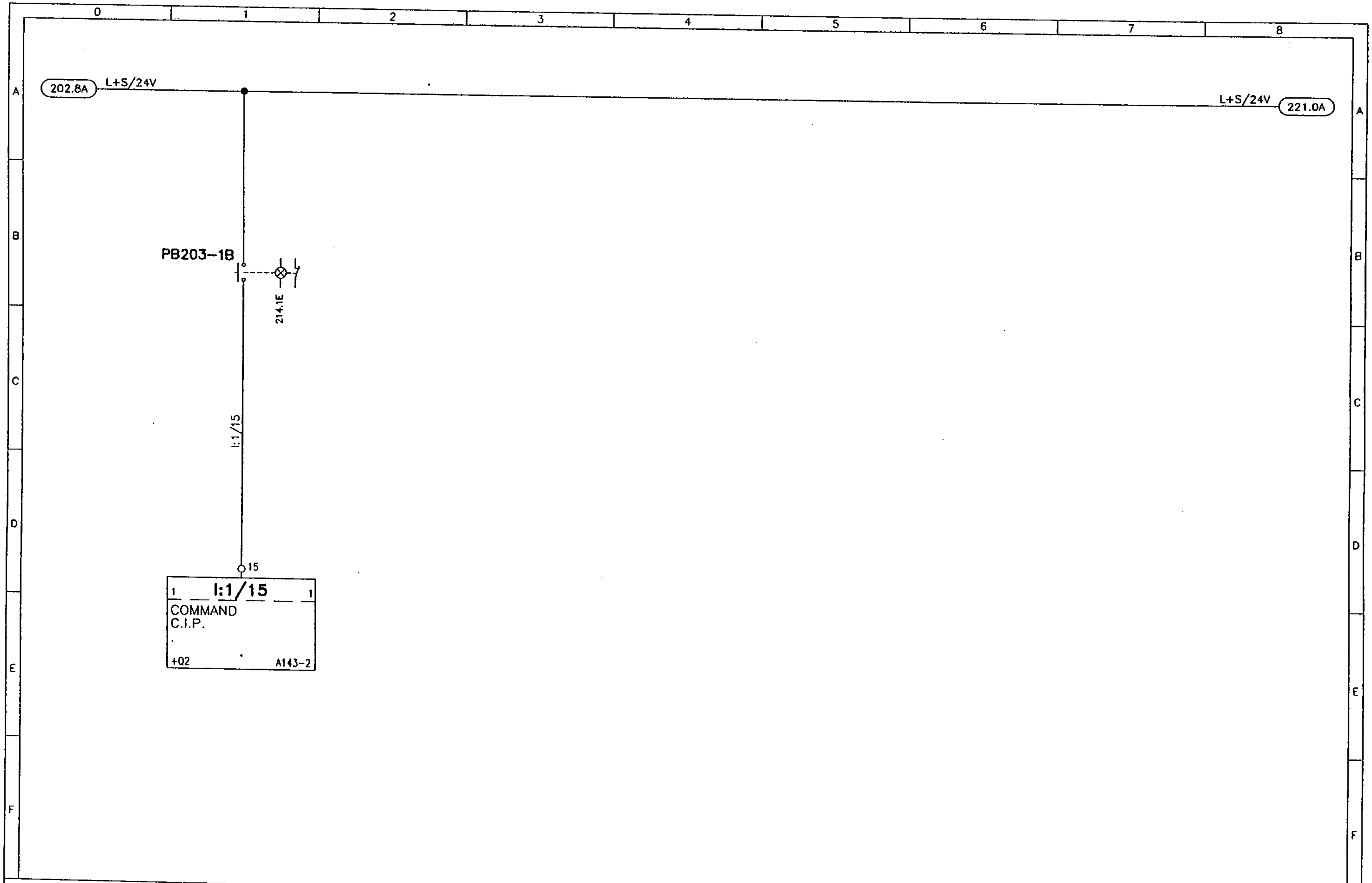


SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION	SCALA/SCALE	DISEG/DFTM	CONTR/CHKD	PRECED. PREVIOUS	FOGLIO SHEET	SUCCESS. NEXT
Digital inputs	/	MVO	SBO	201	202	203

Sidam

CLIENTE/CUSTOMER	DISEGNO/DRAWING	REV.	DATA/DATE	DATI PER ARCHIVIAZIONE/FILING DATA
SIDAM S.r.l.	/	0	25/09/2002	A433--05

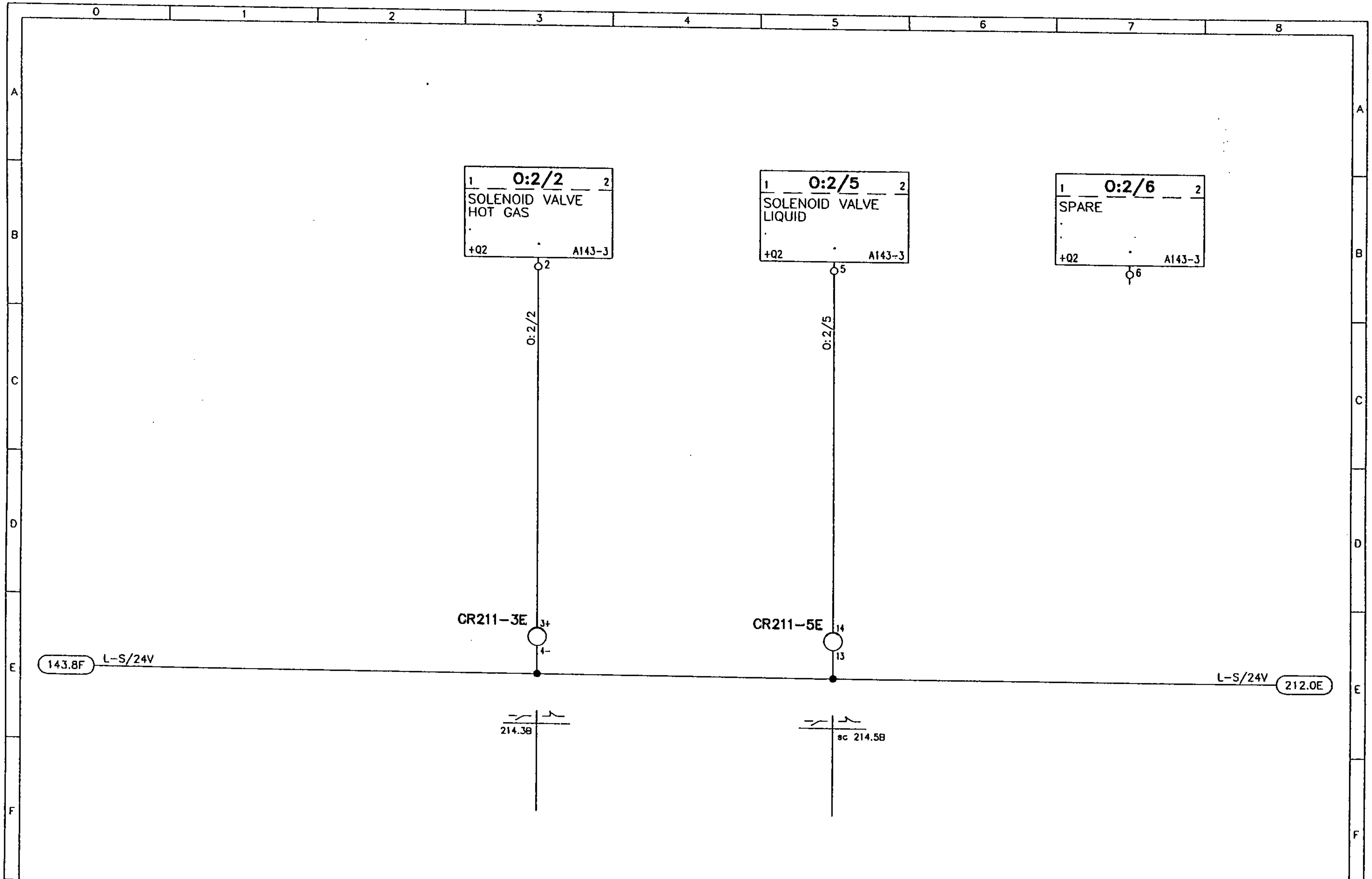


SOCIETA' AUTOMAZIONE INDUSTRIALE

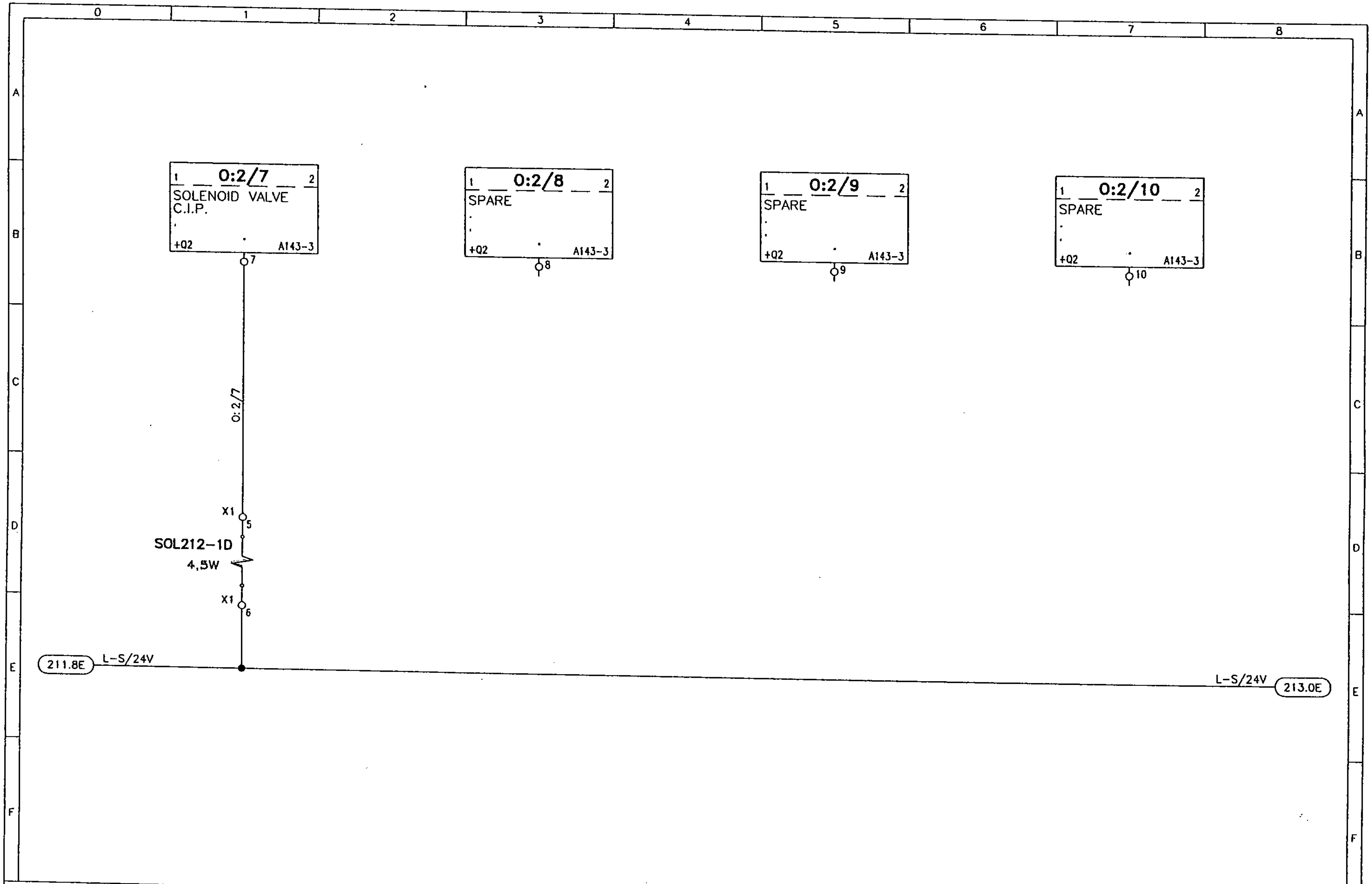
DESCRIZIONE/DESCRIPTION	SCALA/SCALE	DISEG/DFTM	CONTR/CHKD	PRECED. PREVIOUS	202	FOGLIO SHEET	203
Digital inputs	/	MVO	SBO				
CLIENTE/CUSTOMER: SIDAM S.r.l.	DISEGNO/DRAWING: /	REV. 0	DATA/DATE: 25/09/2002			SUCCESS. NEXT	211

Sidam

DATI PER ARCHIVIAZIONE/FILING DATA
A433--05

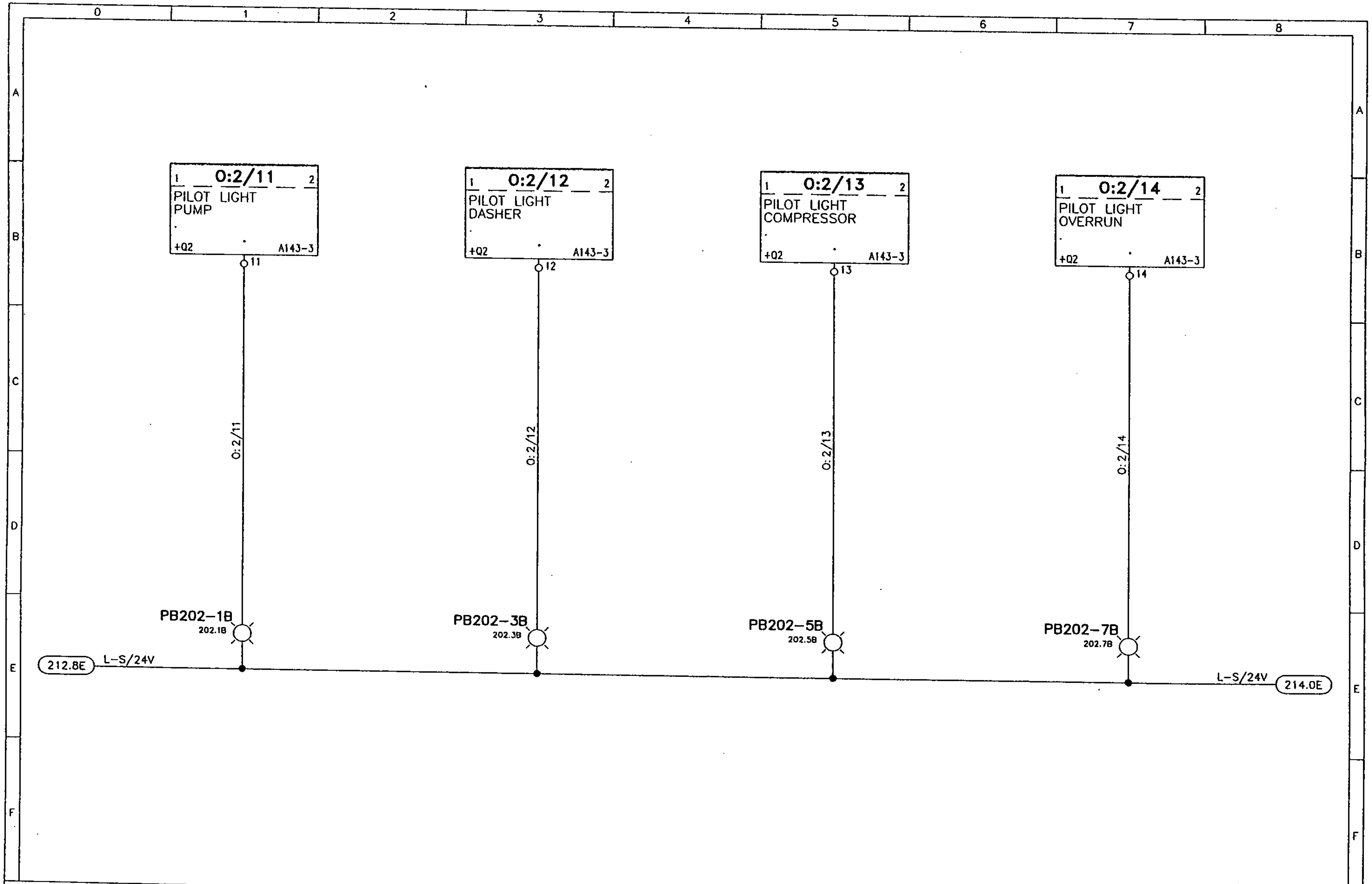


SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION Digital outputs		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS 203	FOGLIO SHEET	211
	Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002		SUCCESS. NEXT	212
						DATI PER ARCHIVIAZIONE/FILING DATA A433--05		

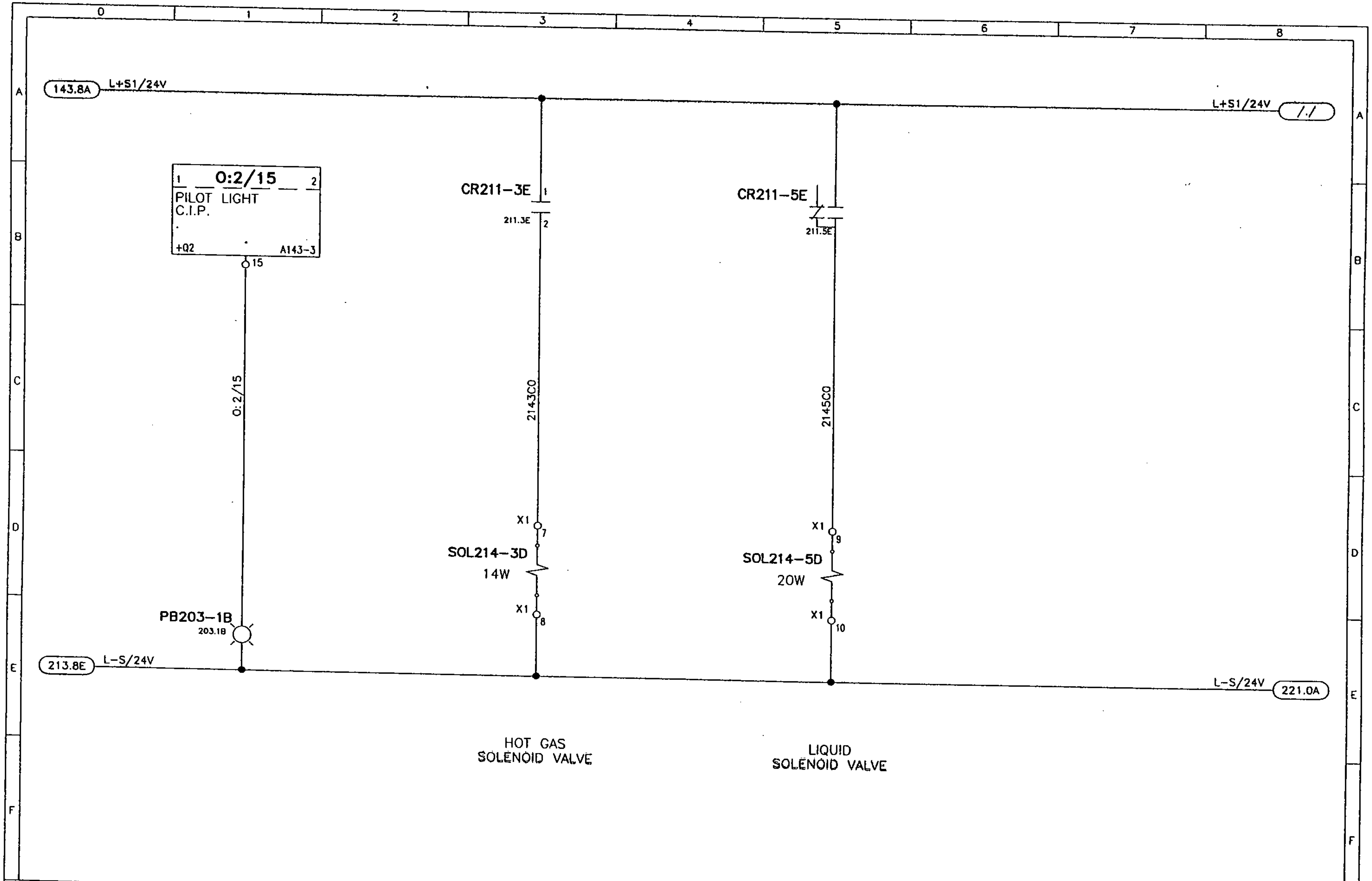


SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION Digital outputs	SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS 211	FOGLIO SHEET	212
Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002	SUCCESS. NEXT	213
				DATI PER ARCHIVIAZIONE/FILING DATA A433--05		

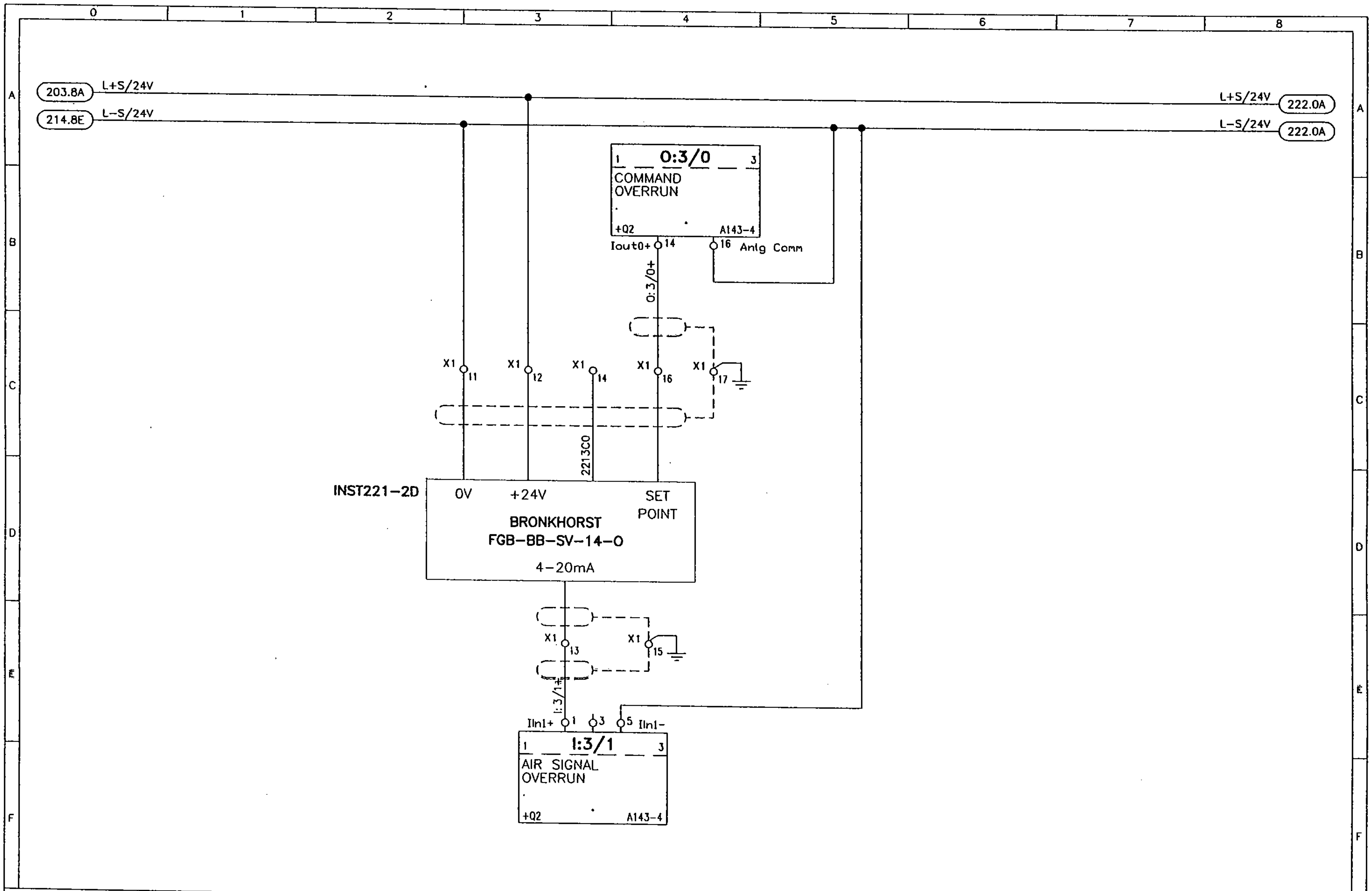


SAI — SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION: Digital outputs		SCALA/SCALE: /	DISEG/DFTM: MVO	CONTR/CHKD: SBO	PRECED. PREVIOUS: 212	FOGLIO SHEET: 213	
	Sidam	CLIENTE/CUSTOMER: SIDAM S.r.l.	DISEGNO/DRAWING: /	REV. 0	DATA/DATE: 25/09/2002		SUCCESS. NEXT: 214	
						DATI PER ARCHIVIAZIONE/FILING DATA: A433--05		



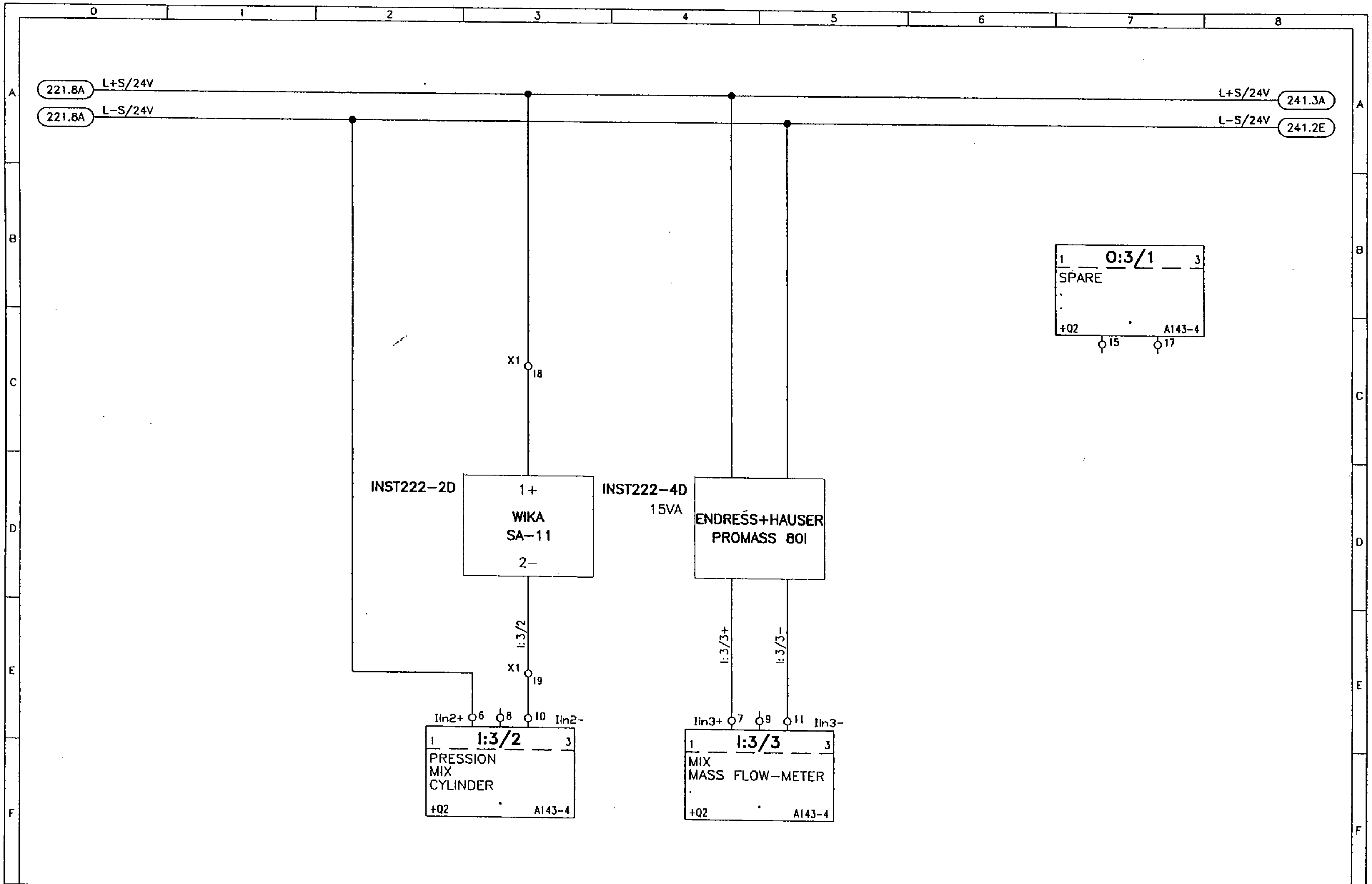
'SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION Digital outputs		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS	213	FOGLIO SHEET 214
Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002			SUCCESS. NEXT 221
					DATI PER ARCHIVIAZIONE/FILING DATA A433--05		

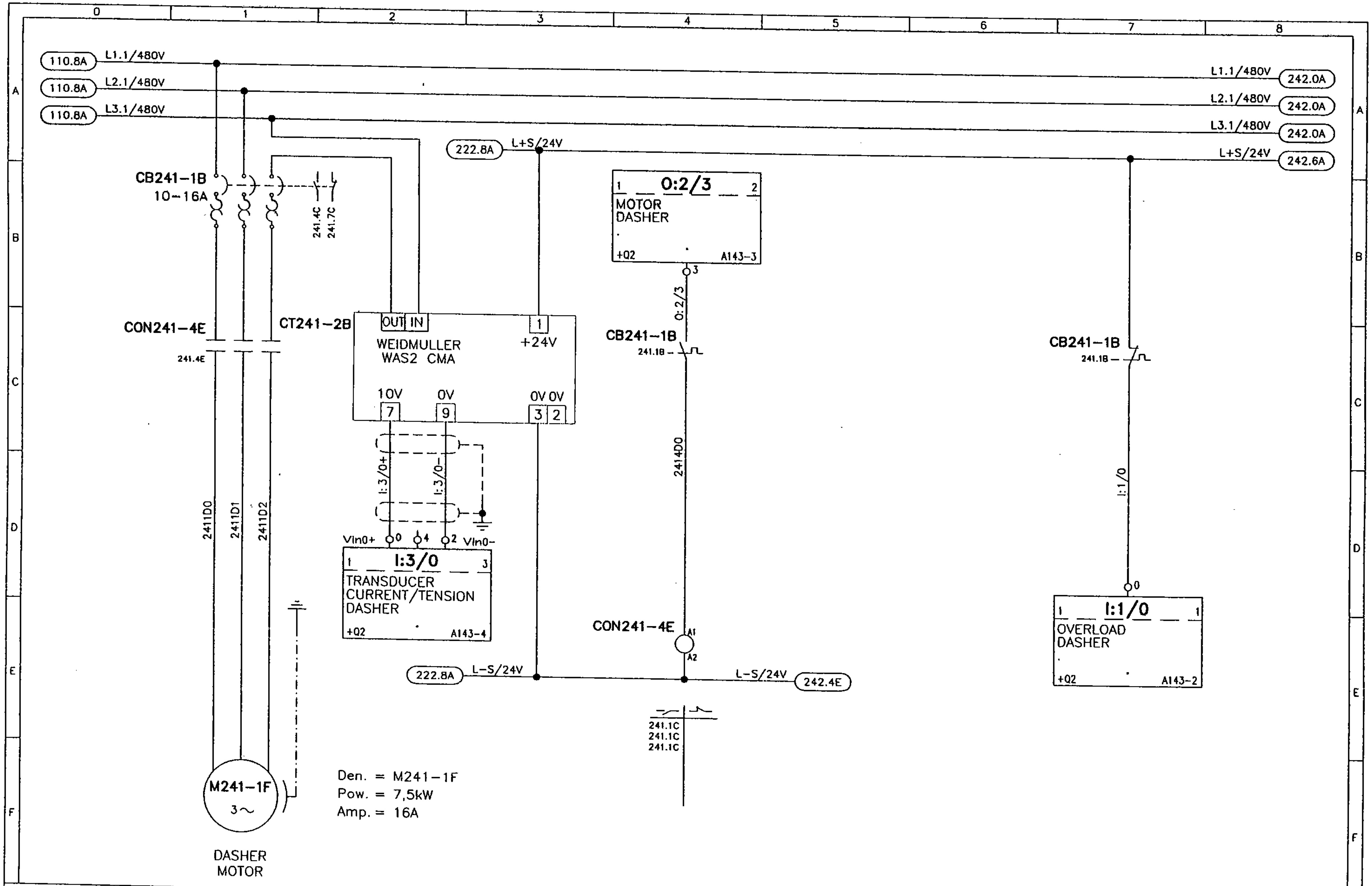


SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION Analog input/output			SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS 214 · FOGLIO SHEET 221
	Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0		DATA/DATE 25/09/2002	SUCCESS. NEXT 222

DATI PER ARCHIVIAZIONE/FILING DATA
A433--05



SAI — SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION Analog signals	SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS	221	FOGLIO SHEET 222
	Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002		SUCCESS. NEXT 241
					DATI PER ARCHIVIAZIONE/FILING DATA A433--05		



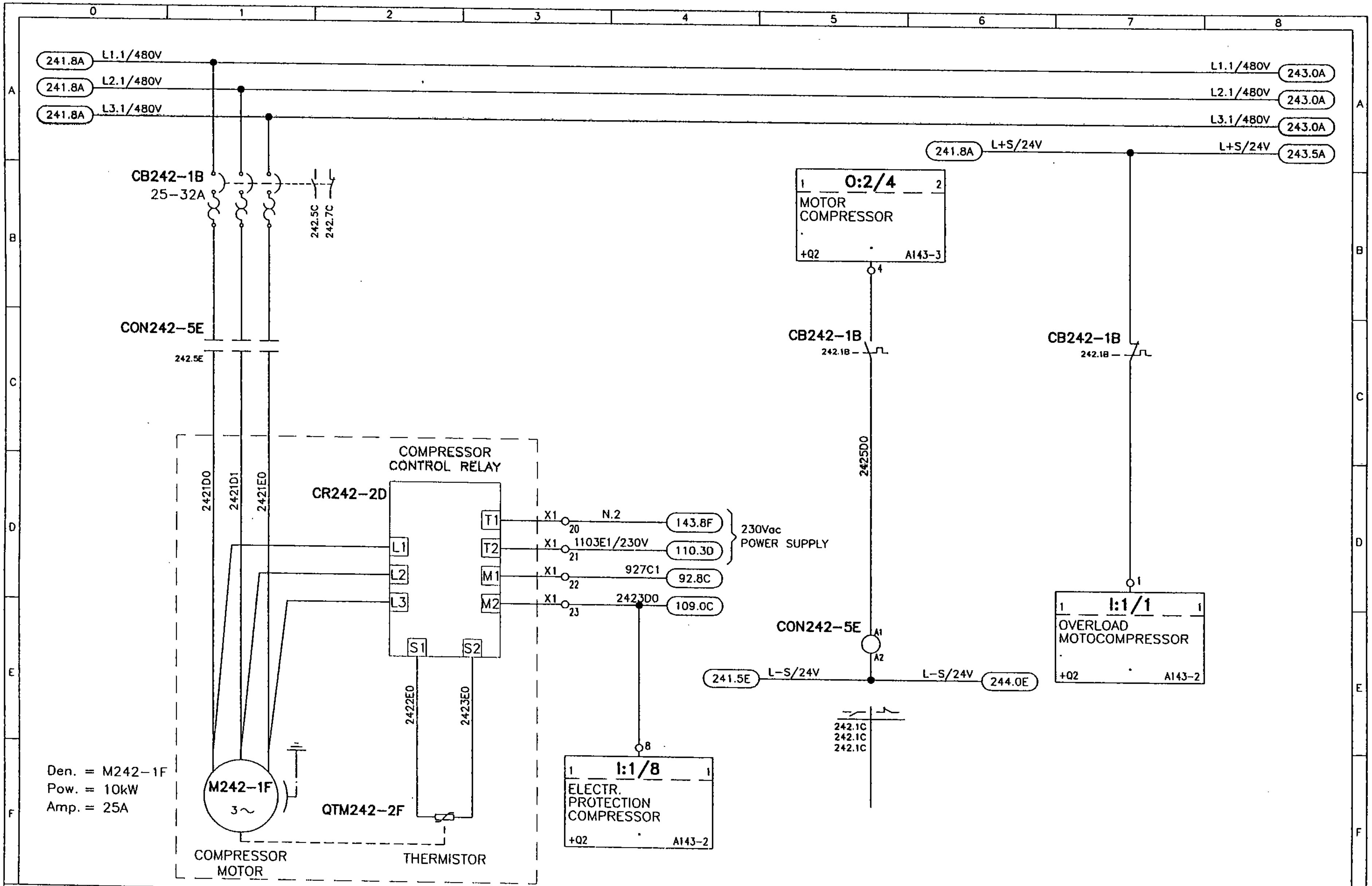
SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Dasher motor

Sidam

CLIENTE/CUSTOMER	DISEGNO/DRAWING	SCALA/SCALE	DISEG/DFTM	CONTR/CHKD	PRECED. PREVIOUS	FOGLIO SHEET
SIDAM S.r.l.	/	/	MVO	SBO	222	241
		REV. 0		DATA/DATE 25/09/2002	SUCCESS. NEXT	242

DATI PER ARCHIVIAZIONE/FILING DATA
A433--05



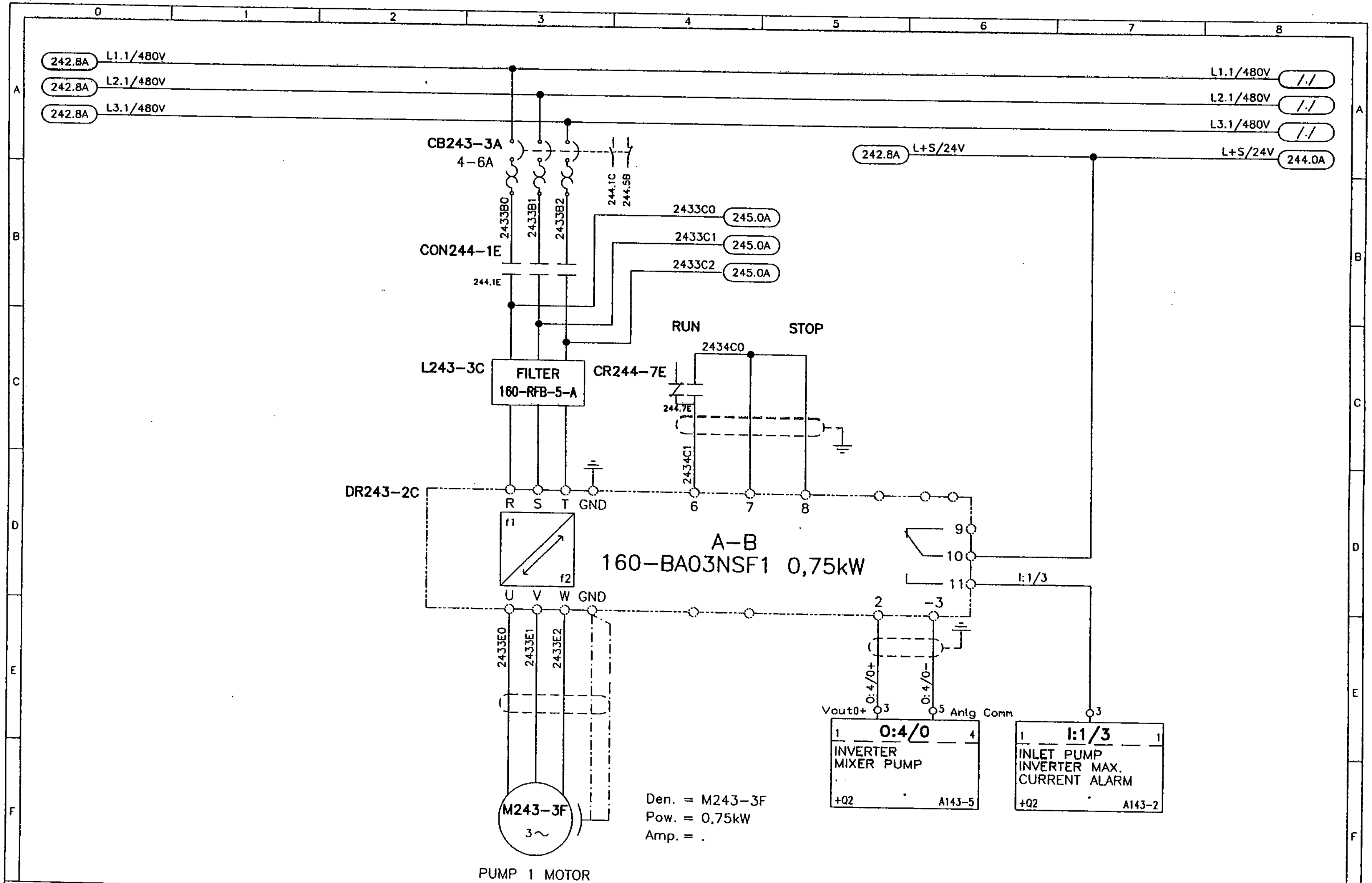
SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Compressor motor

Sidam

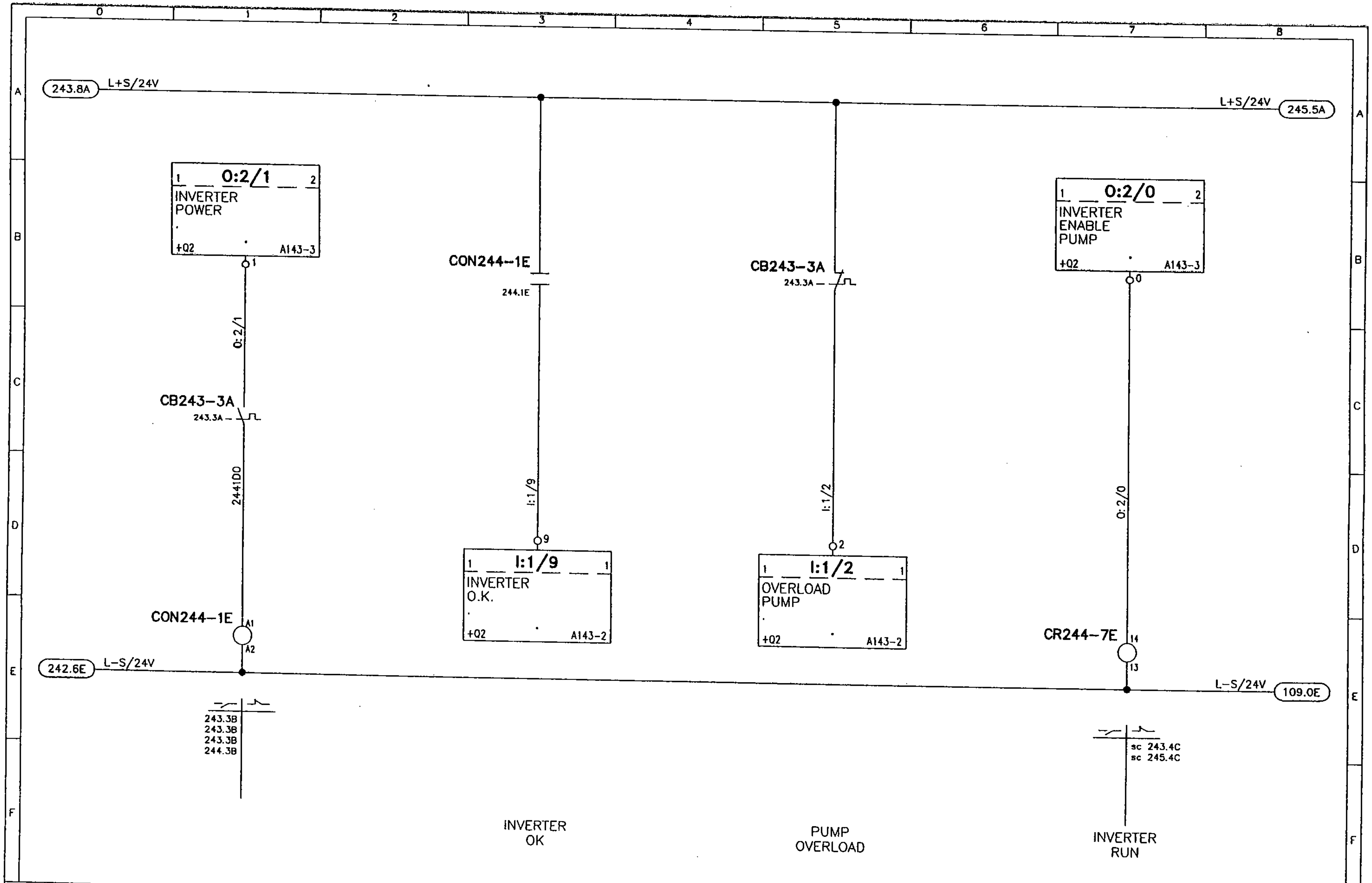
CLIENTE/CUSTOMER	DISEGNO/DRAWING	SCALA/SCALE	DISEG/DFTM	CONTR/CHKD	PRECED. PREVIOUS	FOGLIO SHEET	SUCCESS. NEXT
SIDAM S.r.l.	/	/	MVO	SBO	241	242	243
		REV. 0		DATA/DATE 25/09/2002			

DATI PER ARCHIVIAZIONE/FILING DATA
A433--05



SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION Pump 1 motor		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS 242	FOGLIO SHEET 243	
Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002		SUCCESS. NEXT 244	
					DATI PER ARCHIVIAZIONE/FILING DATA A433--05		



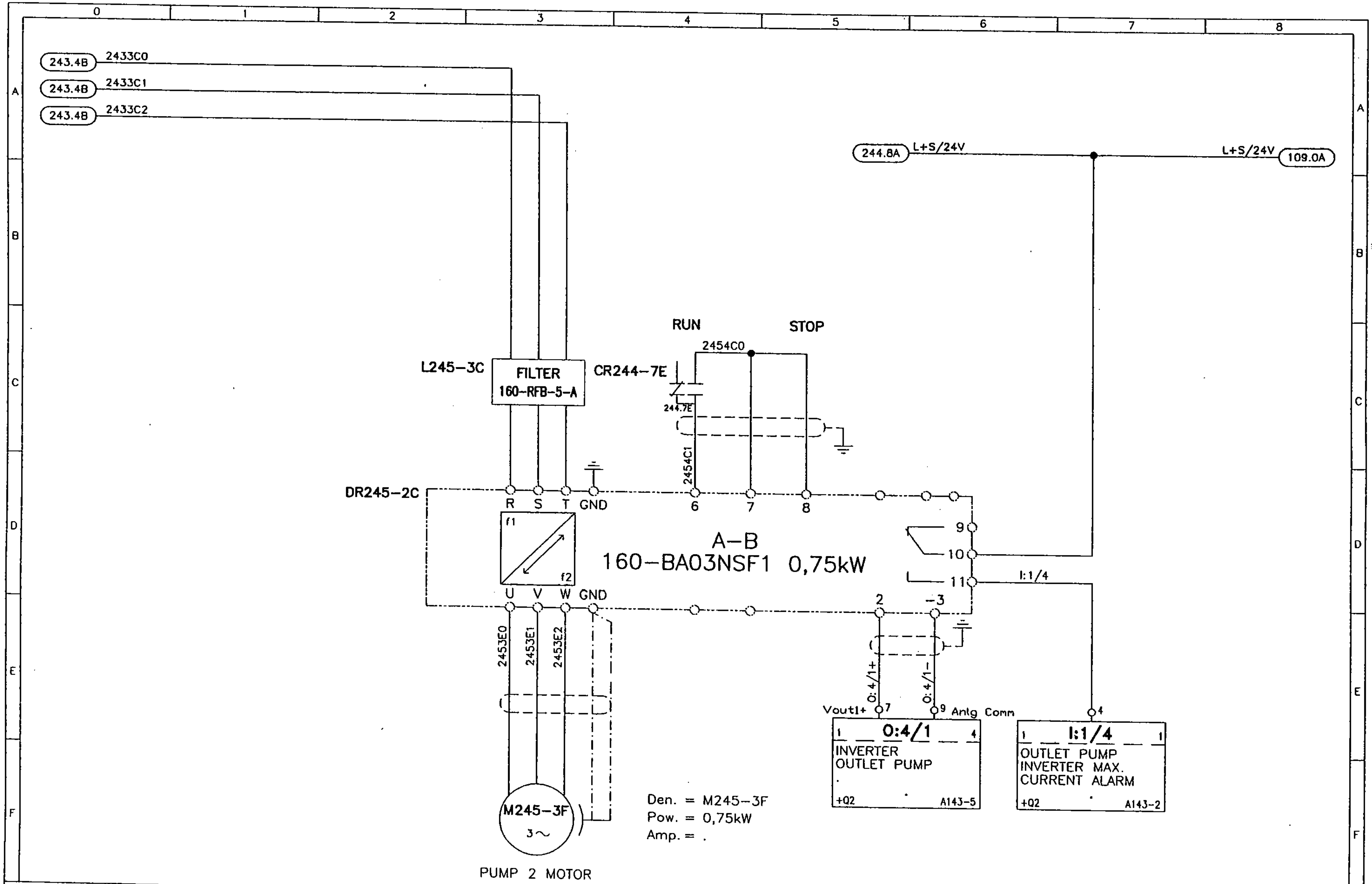
SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Auxiliary motor

Sidam

CLIENTE/CUSTOMER	DISEGNO/DRAWING	REV.	SCALA/SCALE	DISEG/DFTM	CONTR/CHKD	DATA/DATE	PRECED. PREVIOUS	FOGLIO SHEET	SUCCESS. NEXT
SIDAM S.r.l.	/	0	/	MVO	SBO	25/09/2002	243	244	245

DATI PER ARCHIVIAZIONE/FILING DATA
A433--05



SOCIETA' AUTOMAZIONE INDUSTRIALE	DESCRIZIONE/DESCRIPTION Pump 2 motor		SCALA/SCALE /	DISEG/DFTM MVO	CONTR/CHKD SBO	PRECED. PREVIOUS	244	FOGLIO SHEET 245
	Sidam	CLIENTE/CUSTOMER SIDAM S.r.l.	DISEGNO/DRAWING /	REV. 0	DATA/DATE 25/09/2002			SUCCESS. NEXT 701
						DATI PER ARCHIVIAZIONE/FILING DATA A433--05		

BOARD +Q2 — TERMINAL STRIP X1

201.1C	1	I:1/5	+Q2	X1	2.5
201.1A	2	L+S/24V	+Q2	X1	2.5
201.3A	3	L+S/24V	+Q2	X1	2.5
201.3C	4	I:1/6	+Q2	X1	2.5
212.1D	5	O:2/7	+Q2	X1	2.5
212.1E	6	L-S/24V	+Q2	X1	2.5
214.3D	7	2143C0	+Q2	X1	2.5
214.3E	8	L-S/24V	+Q2	X1	2.5
214.5D	9	2145C0	+Q2	X1	2.5
214.5E	10	L-S/24V	+Q2	X1	2.5
221.2C	11	L-S/24V	+Q2	X1	2.5
221.3C	12	L+S/24V	+Q2	X1	2.5
221.3E	13	I:3/1+	+Q2	X1	2.5
221.3C	14	2213C0	+Q2	X1	2.5
221.4E	15	GND	+Q2	X1	2.5
221.4C	16	O:3/0+	+Q2	X1	2.5
221.4C	17	GND	+Q2	X1	2.5
222.3C	18	L+S/24V	+Q2	X1	2.5
222.3E	19	I:3/2	+Q2	X1	2.5
242.3D	20	N.2	+Q2	X1	2.5
242.3D	21	1103E1/230V	+Q2	X1	2.5
242.3D	22	927C1	+Q2	X1	2.5
242.3D	23	2423D0	+Q2	X1	2.5
	24	L-S/24V	+Q2	X1	2.5

SOCIETA' AUTOMAZIONE INDUSTRIALE

DESCRIZIONE/DESCRIPTION
Terminal strip X1

Sidam

CLIENTE/CUSTOMER
SIDAM S.r.l.

DISEGNO/DRAWING /

SCALA/SCALE / | DISEG/DFTM MVO | CONTR/CHKD SBO | PRECED. PREVIOUS 245 | FOGLIO SHEET 701
REV. 0 | DATA/DATE 25/09/2002 | SUCCESS. NEXT /

DATI PER ARCHIVIAZIONE/FILING DATA
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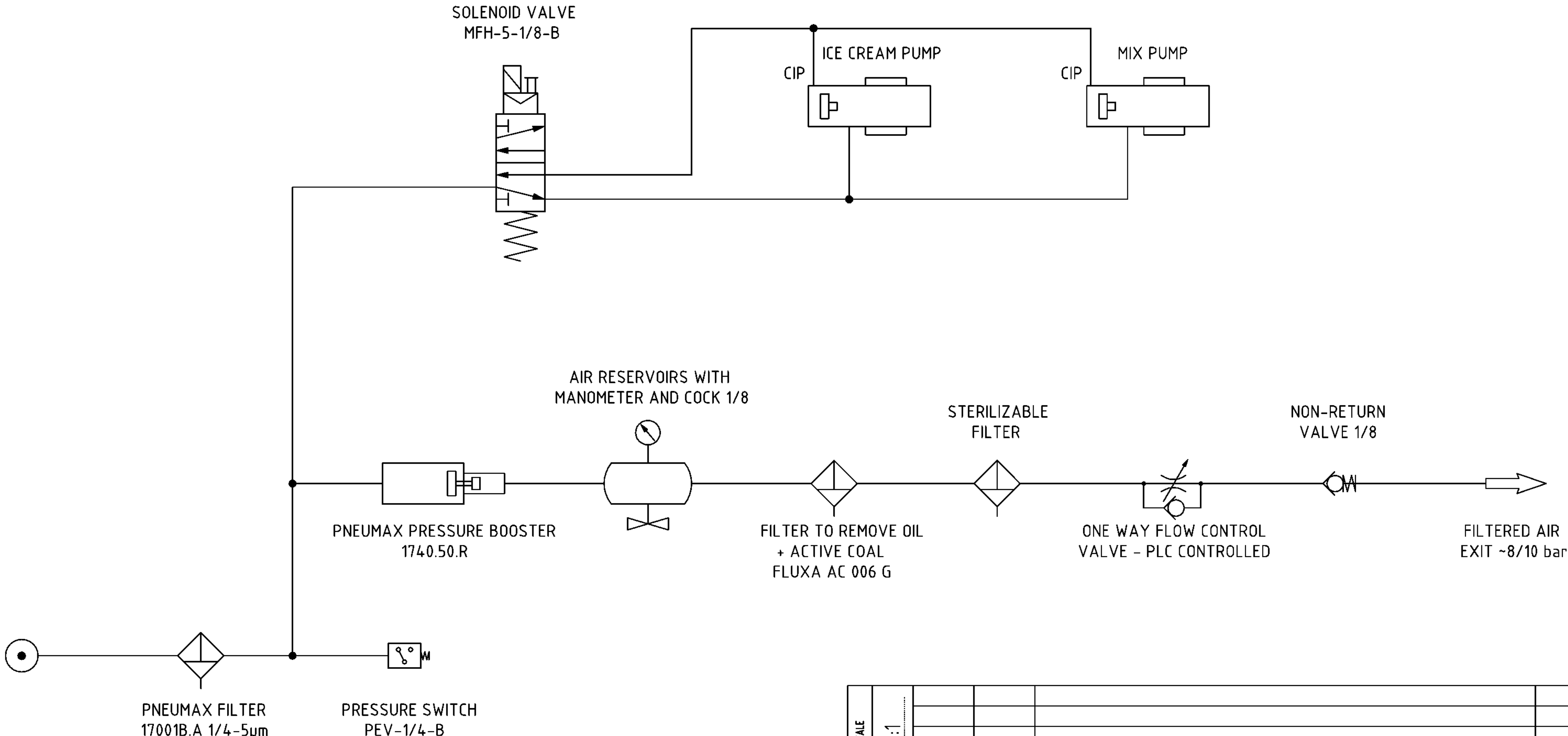
PNEUMATIC DIAGRAM

ENCLOSE 2



SCALE	DATE	APP'D	DRAWN
1:1	21-05-02		Bertoletti R.

NUMBER	DATE	REVISIONS	BY

Sidam
CORMANO - MILAN ITALY
The ice cream machines

DENOMINATION PNEUMATIC SCHEME GIF 600

TOLLERANZE GENERALI H/h 13
TOLLERANZE SU INTERASSI J 13
SMUSSI GENERALI 1x45° TRANNE DOVE SPECIFICATO

MATERIALE	PESO GREZZO	PESO FINITO
/		

TRATTAMENTO /

DRAWING No.	REV.	Sheet N.	
9060526	0	1 of 1	A3

ELECTRICAL BOARD OPERATING AND MAINTENANCE MANUAL

ENCLOSE 3

Società Automazione Industriale

Electrical Board Operating and Maintenance Manual

Via G. Carducci, 221 - 20099 Sesto San Giovanni (MI) - Tel. ++39 02 24 00 785 Fax ++39 02 24 21 354 - e-mail: info@saiautomazione.it
Cap Soc. € 52.000,00 COD.FISC. 10980690159 - P.IVA 02730120967 - C.C.I.A.A. N.1426206 - TRIB.MILANO 337861

Società Automazione Industriale

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Società Automazione Industriale

Technical Specifications

Installation, Setting at work, Maintenance

Società Automazione Industriale

First Aid

Electrical board operating and maintenance manual

03	1998 January 29th	Revision	Udi	Lba	Cvo
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00	1996 May 17th	First edition	Udi	Lba	Cvo
Rev.	**Date**	**Description**	**Prepared**	**Checked**	**Approved**

UL LISTED

c UL LISTED

COMITATO ELETTROTECNICO ITALIANO

TÜV CERT DIN EN ISO 9001

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Behaviour in Case of Accident

This page should be copied and placed at all locations where the risks of such accidents can occur, e.g. in the Electro-room.

DANGER!

Do not forget to protect yourself when saving others!
Injured or dead persons who are in contact with an electrical connection may be touched only if the voltage (main plant switch) has been previously switched off or if special equipment such as special rubber gloves, are available.

In case of fire, only extinguishers which are suitable for fires involving electricity and which are correspondingly marked, may be used.

Contact a doctor as quickly as possible!

Notice for the doctor:

If possible, begin with infusion treatment with isotonic electrolyte solution on site of accident!

Emergency	**Tel.:**__________
Nearest Hospital	**Tel.:**__________
Police	**Tel.:**__________
______________	**Tel.:**__________

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After the rescue in the case of :

Unconsciousness

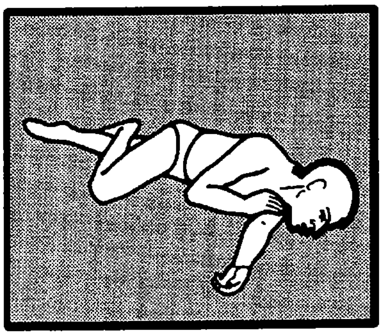
- Patient is breathing and has a pulse

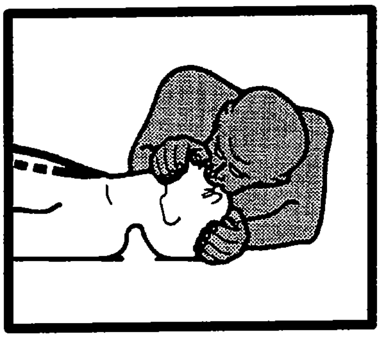
No Breathing

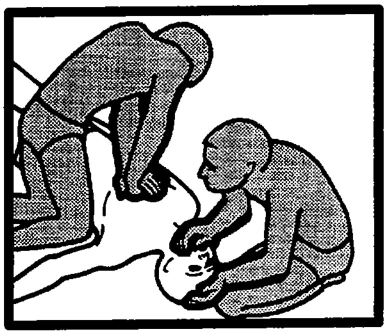
- Unconsciousness
- Blue colouring of skin

No Circulatory Functions

- Unconsciousness
- No breathing
- No pulse on the neck artery
- Wide pupils with no reaction to light
- Pale or bluish skin







Positioning in case of Unconsciousness

- Protect against weather influences
- Keep watch

Mouth-to mouth resuscitation

- Tilt head backwards
- Press lower jaw open
- Blow air into nose (approx. 15 breaths per minute)

Mouth-to mouth resuscitation and external heart massage

- Immediately one hefty punch to the middle of the breast bone

If not effective:

- Immediately 5 deep breaths into patient's mouth
- Then immediately:

If alone:

- alternately approx. 3 cycles per minute
- 15 heart massages in a rhythm of approx. 80 pushes per minute
- 2 breaths

If 2 Persons:

- alternating after
- 5 heart massages in a rhythm of approx. 80 pushes per minute
- 1 breath into patient's mouth

⚠ **DANGER!**
Do not attempt to give drinks to unconscious persons!

Bleeding

- Raise injured part of body
- Apply compression bandage
- If necessary, apply finger
- pressure in wound

Burns

- Cool burn wounds sufficiently as quickly as possible with cold water
- Do **not** remove clothes
- Cover the wounds with clean material (only after cooling)
- Protect against cold
- In the case of extensive burns; if delivery into hospital cannot take
- place within one hour, give patient sufficient liquids (non-alcoholic)

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Safety

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INDEX

1 - GENERAL INFORMATION

1.1 Purpose and Convention

This document comprises the chapter on safety of the control system plant. It informs the user about the residual risks and dangers if the system is incorrectly used. Furthermore, it contains details regarding due care and attention, so that risks can be prevented.

Note:
This document must be read by every user, so that he or she does not endanger himself or herself, others or the plant.

The following danger signs are featured in the relevant positions in this operation manual in order to protect people and machines.

⚠ **The warning sign Safety at Work 183 is found with certain safety and danger signs where attention is drawn to a mortal danger.**

The following 4 rules apply:

❶ ⚠

DANGER! **For dangers which immediately lead to serious physical injury or death.**

❷ ⚠

WARNING! **For dangers which could lead to serious physical injury or death.**

❸ ⚠

CAUTION! **For dangers or unsafe handling which could lead to minor physical injuries or damages.**

❹ ***Note:***
For information and special instructions which must be unconditionally observed. Special details regarding the efficient use of the plant / machine.

2 - SAFETY: GENERAL PRINCIPLES

- The plant control system corresponds to state-of-the art technology and conforms to the recognised safety regulations. Dangers may still exist however.
- The plant control system may only be used when in perfect working order, observing the operation manual!
- Any form of work which adversely affects the safety of the personnel, the plant and the plant control system is forbidden.
- Only authorized people may work on the plant control system.
- Working in or on current-carrying electrical devices should be refrained from, whenever possible. This applies especially to maintenance and repair work, working inside panels, opening monitors and electronic devices, and exchanging cables, motors, valves, terminal switches, etc.
- It is forbidden to undertake any rebuilding or alterations to the plant control system which reduce safety.
- Safety and supervisory equipment may not be by-passed, disassembled or circumvented, e.g. motor contactor switches, terminal switches, safety switches, overflow fuses, safety terminal switches, personnel protection switches, explosion flaps, etc.
- When installing panels, the legal regulations regarding emergency escapes must be observed.
- Emergency escapes must not be blocked.
- In hazardous areas (explosion protection, etc.) maintenance and repair work may only be carried out if the ambient conditions allow it.
- When carrying out electric welding, it must be made sure that the earthing is attached in the immediate vicinity of the welding place, as otherwise electronic devices could be damaged.
- The safety of devices, controls, components, etc., is also in the responsibility of the customer.

2.1 Insulation Faults
People and plant are protected against insulation faults by the earthing system.

2.2 Start Warning
A start warning is made before a process line is started. For this purpose, a terminal is provided in the control cabinet for the connection of a horn or a warning lamp.

2.3 Position of the local Control Boxes
The local control boxes should be located wherever possible in a position where they can be seen during the operation of the process to be controlled.

2.4 Explosion Protection
If welding equipment or other tools which can create sparks have to be used during maintenance or service work, the safety regulations regarding the prevention of dust explosions and fires have to be observed at all times.

2.5 Measures against Electrostatic Charging
In order to ensure earthing and the protection against explosions caused by spark discharge, coats of paint must be removed from the area of electrical connection.

3 - SAFETY IN CONNECTION WITH ACTIVITIES

3.1 Transport

- Local or general regulations and guidelines concerning the transport of electrical panels or similar products must be observed wherever they exist.
- When lifting the panels, only the suspension points provided should be used
- Do not walk under any suspended load
- Check the lifting gear for its approved load
- Protect the panels against toppling over, as their centre of gravity is relatively high
- Ensure that no unauthorized person is in near loading and unloading areas.
- Packing must be removed by suitable tools, e.g. screwdriver, pliers, crowbar, as otherwise a danger may occur.
- The packing materials must be stored in a clean condition or be disposed of, i.e. wooden parts should be stored in such a way that no danger arises as a result of protruding nails, screws, etc., and plastic foils, etc. should be disposed of in such a way, that nobody, especially children, can become caught up in it.
- The personnel responsible for transport should be familiar with handling electrical panels.

WARNING!
Falling electrical panels can lead to serious physical injury or death

3.2 Mechanical Installation of Panels

- Local or general regulations and guidelines concerning the installation of electrical panels or similar products must be observed wherever they exist.
- After the panels has been positioned, they should be secured immediately so that they cannot topple over.
- The local regulations regarding escape routes must be observed.
- After cables have been connected to the panels, they should not be moved again, as the cables could be damaged, which may lead to short circuits.
- During the installation, it should be made sure that no unauthorised people are in the danger area. This can be realised by setting up barriers and entry blocks.
- If other work is being carried out in the plant at the same time as the installation of the plant control system, it must be made sure that the plant control system is not damaged by dirt, dust or splinters. If necessary, the plant control system should be covered.
- The personnel responsible for the installation should be familiar with handling electrical panels.
- It must be made sure that the panels are not installed directly under water or gas pipes or pipes conveying other liquids. Neither should such pipes be led through electrical panels.

WARNING!

Dirt and dampness in the panels can lead to short circuits and leak current, which can cause fire sand endanger people.
Combustible gases in the panels can lead to explosions.

3.3 Electrical Installation in the Plant

- Local or general regulations and guidelines concerning the electrical installation must be observed wherever they exist.
- The regulations of the local accident prevention authorities must be observed.
- Electric motors and other electrical appliances are to be installed according to local regulations.
- Depending on the local regulations, the following additional safety measures should be applied:
- Installation of all-pole separating safety switches for the motors (safety switches are not included in the scope of delivery of the control).
- Installation of service switches in the control circuit of the motors (service switches are not included in the scope of delivery of the control).
- When installing connections to external control units, care must be taken to ensure that these have previously been disconnected from the power supply.

WARNING!
Incorrect electrical installation can lead to serious physical injury or death. The plant may be damaged and fires may be started.

3.4 Before Commissioning

- The plant control system should only be commissioned when all the safety equipment, especially the emergency off switches and the personnel protection appliances, have been installed and connected.
- The panels should be cleaned before the commissioning, as otherwise short-circuiting may occur.

WARNING!
Before the commissioning, all dirt/dust should be removed from the electrical units, as otherwise fires or explosions may occur.

3.5 During Commissioning

- Local or general regulations and guidelines concerning the commissioning of electrical panels or similar products must be observed wherever they exist.
- Safety appliances must not be by-passed.
- Before any other functions are tested, the functions of the safety appliances must be tested. At this stage, it should be assumed that these functions are not guaranteed.
- During the commissioning, it must be made sure that no unauthorised people are in the danger area. This can be ensured by installing barriers and entrance blocks. Particularly in the case of plant control systems, it should be noted that no assurance is given that part of the plant which is being commissioned can always be seen.
- When carrying out initial tests of plant parts, motors which are not required to be operative should be previously switched off by means of the safety switch, in order to prevent them from starting in the event of any faulty installation.

WARNING!
Safety installations must not be by-passed even during the commissioning. These must be tested first. When testing, it should be considered that the installations do not function correctly.

3.6 In Operation

- Covers, warning signs, as well as appliances which serve to promote safety must not be removed.
- Safety appliances must not be by-passed
- The installations and the plant control system should be checked regularly
- Faulty installations and devices should be repaired or replaced immediately
- Loose cables on the floor should be avoided
- The electrical power supply should be disconnected in the event of a lengthy interruption of operation
- The complete mains supply network should be re-measured for insulation faults at least once a year by a qualified and authorised electrical technician, according to the guidelines of the local regulations.
- The emergency off circuits, the warning horns and start warnings (if available) should be checked at least once a year.

WARNING!
If any faults are found in the electrical installation or equipment, these should be eliminated immediately by the maintenance personnel, or the plant must be switched off and the power supply disconnected by means of the plant main switch.

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3.7 Troubleshooting

- Safety installations must not be by-passed
- Before exchanging a motor, its power supply must be disconnected by means of the safety switch which is to be locked with a padlock.
- If any electrical units inside or outside of the plant control system have to be replaced, the plant control system has to be switched off by means of the all-pole separating plant main switch, which has to be locked by padlock.. Exceptions to this are motors which are equipped with safety switches or section safety switches.
- If panels have to be opened, no covers may be removed as long as the plant main switch is not switched off and secured. Correspondingly, this is also valid the external voltages of external control units. It must be taken into account that in this case the panels are under voltage.
- Electrical units may only be replaced by maintenance personnel or people of similar qualifications.
- The panels should be cleaned after any repair work is done on them, as otherwise short circuits could occur.

3.8 Maintenance and Service Work

- While carrying out all types of maintenance and service work on the plant control system, the all-pole separating plant main switch must be switched off, which is to be locked by padlock!
- Caution! Even if the plant main switch is switched off, the following devices and apparatus, if existent, can be under voltage:
- Lighting in general, etc
  The power supplies of these devices are taken up in front of the plant main switch
- Interface signals to external control units
- These live devices are installed within the panels, are covered, separated and specially marked. Before carrying out any maintenance or service work on such devices, the relevant isolating link must be switched off
- When carrying out all types of maintenance and service work on the motors, the all-pole separating safety switches, if available, should be switched off and be locked with a padlock.
- Service switches may only be used to test functionality, they may not however be used as safety switches.
- Electrical units may only be replaced by maintenance personnel or people of similar qualifications.
- If panels have to be opened, no covers may be removed as long as the plant main switch is not switched off and secured. Correspondingly, this is also valid the external voltages of external control units. It must be taken into account that in this case the panels are under tension.
- The panels should be cleaned after any service or maintenance work is done on them, as otherwise short circuits could occur.

3.9 Shut Down of Plan Control System

The plant control system is regarded as having been shut down when it is no longer used and authorization to disassemble has been granted. Before it is disassembled, the following points must be observed:

- All power supplies have to be switched to a tension-free state and disassembled. It is not sufficient that only the supply unit has been switched off or the fuse has been removed, the risk that people can be endangered as a result of an unintentional switching on is too high.

- Connections to external control units have to be switched to a tension-free state and disassembled.

- Monitors should be disassembled individually or protected so that no danger can occur due to imploding screens.

- The details on safety for installation and transport also retain their validity here.

- When disposing of the plant control system, care must be taken to ensure that the local regulations regarding the individual components such as metal, glass, plastics, batteries, and also electronic parts, etc. are adhered to.

4 - REQUIREMENTS ON THE ORGANIZATION AND PERSONNEL

4.1 Organizations

- The operating manual must be read and understood by all users. The management is responsible for ensuring that this is the case. In the event of any queries, the employee's superior is to be consulted. If any points are still open, SAI S.r.l. will be glad to assist with further information.
- The recognised regulations of the particular country regarding safety at work, including the prevention of accidents, must be observed.
- The management of the plant is responsible for ensuring that faults and damages to the safety installations are eliminated immediately, or that the plant is stopped immediately, and by means of the plant main switch that the power supply is disconnected and secured.
- The plant may only be operated and serviced by people in full possession of their mental abilities. In particular, these people must not be fatigued or under stress, or be under the influence of drugs or alcohol, as otherwise danger exists for people, the plant and the production.
- When carrying out troubleshooting and maintenance work, care should be taken to ensure that no disturbances or distractions are caused by any third parties.

4.2 Personnel Instruction

- The plant control system may only be installed and serviced by trained and qualified personnel.
- Any work whatsoever on the plant control system requires a comprehensive study of the plant regulations and the circuit diagrams.
- Only authorized people are allowed to be in the vicinity of the panels. These must be protected against access by unauthorized people.

4.3 Additional Dangers

- Only suitable tools may be used for working on panels. Especially the handles of such tools should be insulated.
- Care should be taken to ensure that the measuring and testing instruments used are actually intended for the sizes to be measured. Otherwise these instruments may be destroyed, which may lead to endangering personnel.
- Batteries etc. must be replaced in good time, as otherwise they may start to leak. Leaking battery fluid can be caustic to the skin. If battery fluid gets into the eyes, they should be rinsed out immediately with clean water and a doctor consulted without delay.
- If condensation occurs in the panels as a result of a sudden change in temperature, the danger of a short circuit occurring increases as a result of leak current, which can lead to fires and the destruction of plant components.
- The plant has to be protected against animals such as mice, etc. They can eat through the cable insulation which can result in short circuits and fires. Possible measures are the insulation of cable conduits. Panel doors should be kept closed.
- The use of fire protection appliances, such as sprinklers, etc. can destroy electrical installations, panels, and electric/electronic components. In addition there is a danger for people when electrical units are not tested and re-used after fire protection appliances have been used on them.

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Installation, Setting at work, Maintenance

Electrical board operating and maintenance manual

04	1999 April 28 th	Revision	Bsp	Lba	Cvo
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INDEX

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1 - AVAILABLE DOCUMENTATION

INSTALLATION

In installation section are contained the instructions to unpack board for the mechanical assembly and wiring connections.

OPERATION INSTRUCTIONS

In operation instructions section are contained board layout, wiring diagram and used simbology.

MAINTENANCE

In maintenance section are contained instructions for repairs and precautions that must be used.

COMPONENTS LIST/SPARE PARTS

In components list/spare parts section are contained the used components and spare parts advised.

TEST AND CONFORMITY CERTIFICATES

In test and conformity certificates section are contained all certificate and test documentation.

TECHNICAL CARDS OF USED MATERIALS

In technical cards of used materials are contained all data-sheets of used components

2 - INSTALLATION

2.1 Mechanical

- The lifting of equipments must be made only with the preset eyebolts.
- In case of big equipments, the base of board forecast holes for its lifting.

2.2 Electrical

- Ground cable must have 25mmq minimum section.
- Line must be connected directly to the general switch.
- Line voltage must be verified from wiring diagram.
- All cables come from field must be fixed to relative supports.
- Cables must used with a section adeguate to preset terminals

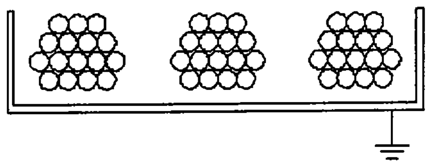
2.3 Emc

If these guidelines are not observed, adequate noise immunity will not be ensured.
In addition, the relevant local regulations for electrical installations must be observed.

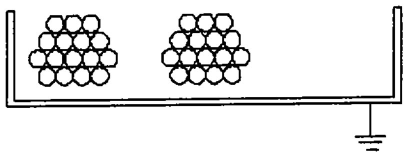
1. Separation of signal lines from power-voltage lines < 500VAC

Cables with digital signal lines for direct current and cables with shielded analog signal lines should preferably be installed in separate cable trays from those for power-voltage cables up to 500Vac

Example 1
< 500 Vac or switched direct currents



Digital signal lines for direct current
Analog signal lines
Serial data trasmission lines

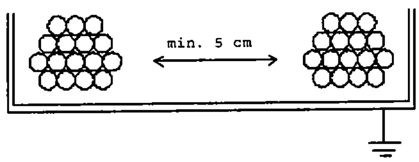


If the cables have to be installed in the same cable tray, the following possibilities exist:

Example 2

- Observe a minimum distance of 5cm (Preferably use metal cable trays).

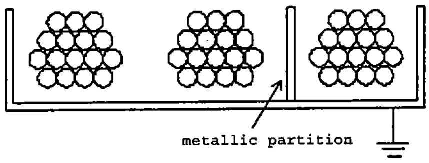
< 500Vac	Digital Signal lines for
or switched	direct current
direct current	Analog signal lines
	Serial data transmission lines



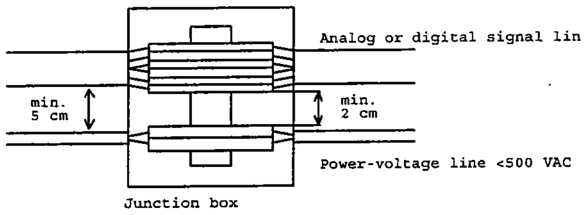
Example 3

- Separate the cable groups with a metallic partition
  The cable trays and the partition must be electrically connected. (for reasons of electromagnetic interference and lightning strike protection)

< 500Vac	Digital Signal lines for
or switched	Direct current
direct current	Analog signal lines
	Serial data trasmission lines



Signal lines should, if way possible, be separated from power-voltage cables < 500 V by different terminal boxes. At the very least, the feed-through bushings should be at separate locations, and the terminals on the terminal strip should be separated from each other but at least 2cm.

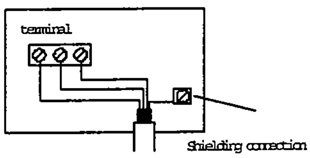


2. Separation of signal lines from power-voltage lines > 500Vac

Digital signal lines, analog signal lines and data transmission cables must be separated from power-voltage cables > 500 VAG to 1000Vac by a minimum distance of 10cm. and from power voltage cables > 1kVac by a distance greater than 30 cm, preferably in separate cable trays.

3. Analog signal lines

Analog signal lines must be installed with shielded cable.
Connect the shielding according to the sketch, at one end or bath, depending on what is specified in the schematic.
It is preferable use cable types with copper braid shielding.
The inner conductors must be in twisted pairs for the lead and return signal conductors



Important !

Shield connection short (< 3 cm)
and signal line separate from lines which can generate interference.

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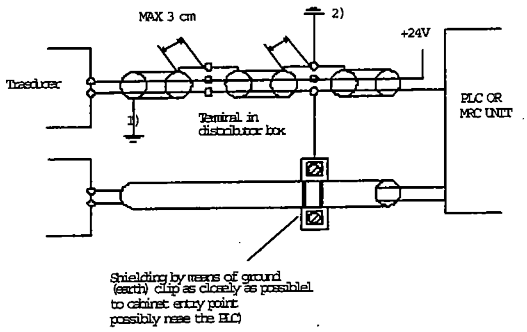


1) Only if specified in the schematic (shielding connected at both ends). If the shielding is connected at both ends, a voltage equalization conductor may be provided, specially in case of greater distances or different power supplies.

2) If a capacitive shielding connection is used at the MCR unit, the shielding must not be grounded (shielding connected to appropriate unit terminal or plugin connector).In this case, no separate voltage equlization conductor is required.

4. Motor cables

Motor cables with a high interference level, e.g. from

- frequency converters
- rectifiers
- soft starters
- timed DC motor controllers

must be installed shielded. The shielding must be connected as closely as possible to ground (earth) at the control cabinet end.
Also on the motor side, the shield must be connected as short as possible to the shassis (earth grounding connection). If the shield is only connected on the cabinet side to earth, high emissions can be caused. If the motor lines are switched e.g. by a safety switch, the shield must be wired over these elements as short as possible, expetionally the shield can be connected on both sides to the chassis, because only the radiation damages have to be blocked.

3 - MAINTENANCE

3.1 General

- The repairs of automation apparatures must be made only by maintenance personnel.
- In case of replacement of parts or components, they must be used only the ones that are showed in spare parts list of this documentation.

This warning sign is used with particular warnings or explanations about dangerous situations that could cause death. In particular cases it is used as under specificated:

❶

DANGER!
The opening of equipment by unauthorised personnel and repairs carried out incorrectly, may cause death or serious injury.

3.2 Circuit Breakers

- If an undervoltage relase has been installed, this must be energized, other wise the circuit breaker cannot be reclosed!
- After a tripping operation following to thermal overload, the circuit breaker can only be reclosed after a cooling period of several minutes.

3.3 Contactors

- The following components can be replaced: main, contacts, arc chute, magnet coil, auxiliary contact blocks;
- Remove dust with suction.
- Dark or rough contacts can still function. Do not refinish or grease them. If the contact facings are so badly eroded that the carrier material is visible, all contacts must replaced.
- Ensure that the pole faces of the magnet coil are clean. Do not use grease solvents or sharp objects for cleaning.

3.4 Fan and Filter units

- Note: filter replacement must be carried out in good time. A soiled filter may will cause the temperature to rise inside the enclosure!
- The filter may be regenerated by washing or blowing out.

3.5 Maintenance Operating Time

The ordinary maintenance activity must be carry out on the following plant parts:

1. General Controls
2. Instruments
3. Power Distribution Bus Bar System
4. Boards Metallic Carpentry
5. Various Circuit Breakers
6. Contactors
7. Fan and Filter

The maintenance operations must be carry out with the following periodicity:

1	- General Controls	Weekly	Monthly	Bimonthly	Six-Monthly	Annual
1.1	Control and possible signalling lamps replacement	**X**				
1.2	Alarms operation control	**X**				
1.3	Measure instruments verification	**X**				
1.4	Cleaning units and commands boards with compressed air and possible repairs.		**X**			
2	- Instruments					
2.1	Indicator instruments operation control		**X**			
2.2	Control and reading of totalizator instruments			**X**		
2.3	Isolation measures instrumentation of auxiliary circuits					**X**
2.4	Totalizator instruments calibration					**X**
3	- Power Distribution Bus Bar System					
3.1	Bars Isolation Measures					**X**
4	- Boards Metallic Carpentry					
4.1	Control and possible bolts and nuts tightening					**X**
4.2	Grasing verification of hinges and latches					**X**
4.3	Painting control and possible repairs					**X**
4.4	Users indicator label control and possible correction;					**X**
4.5	Internal and external cleaning with compressed air;					**X**

Società Automazione Industriale

5	- Various Circuits Breakers	Weekly	Monthly	Bimonthly	Six-Monthly	Annual
5.1	Catch verification;		X			
5.2	Continuity ohmic verification ;		X			
5.3	Control and possible replacement of limiting fuses		X			
5.4	Control and possible replacement;		X			
6	- Contactors					
6.1	Control, cleaning and possible replacement of principal contacts;		X			
6.2	Control, cleaning and possible replacement of auxiliary contacts		X			
6.3	Arcing contact control;		X			
6.4	Isolation Measure of command coil;				X	
6.5	Isolation Measure of command lines;				X	
7	- Fan and Filter					
7.1	Control, cleaning and possible filter replacement;	X				

MATERIAL LIST

ENCLOSE 4

	SAI Società Automazione Industriale	Commessa/Job	0433
	Descrizione *Description* SIDAM QUADRO PLC/FM USA +Q2 FREEZER GIF 600	Identificazione *Identification*	0433em02.mdb
		Revisione *Revision*	0
		Data *Date*	12/09/2002
		Editato *Filling*	Malegnifarece
LISTA MATERIALI / MATERIAL LIST		Verificato *Cecked*	SBO
		Approvato *Approved*	SBO

POS. *POS.*	Q.TA *Q.TY*	SIGLA *TAG*	DESCRIZIONE *DESCRIPTION*	ARTICOLO *ITEM*	MARCA *MAKE*
			BOARD +Q2		
1	1	+Q2	PLATE 710X410X12	SIDAM	SIDAM
2	1	CR92-6B	PHASES CONTROL RELAY	RM4-TU02	Telemecanique
3	3	DISC92-4C	FUSE UL CSA WPS 27X60 600V 60A	1807060	ITALWEBER
4	1	DISC92-4C	ISOLATING SWITCH 60A	194R-NJ060P3	ROCKWELL AUTOMATI
5	1	DISC92-4C	OPERATING SHAFT	194R-R2	ROCKWELL AUTOMATI
6	1	DISC92-4C	RED/YELLOW TRANSITION (IP66) CO	194R-HS4E	ROCKWELL AUTOMATI
7	1	CR109-1C	SAFETY RELAY PNOZ5 24VDC	474590	PILZ
8	1	PB109-1B	MUSH-ROOM EMERGENCY DIAM. 40MM	800EP-MT4	ROCKWELL AUTOMATI
9	1	PB109-1B	N.C. CONTACT BLOCK	800E-3X01	ROCKWELL AUTOMATI
10	1	PB109-1B	N.C. CONTACT BLOCK WITH CONTACT CARRIER	800E-3LX01	ROCKWELL AUTOMATI
11	1	PB109-2B	BLUE PUSH-BUTTON	800EP-F6	ROCKWELL AUTOMATI
12	1	PB109-2B	N.O. CONTACT BLOCK WITH CONTACT CARRIER	800E-3LX10	ROCKWELL AUTOMATI
13	1	CB110-1B	CIRCUIT BREAKER 2P D 0,5A 6KA IP2X	5SY62058	SIEMENS
14	1	CB110-1D	CIRCUIT BREAKER 1P C 1,6A 6KA IP2X	5SY61157	SIEMENS
15	1	CB110-2D	CIRCUIT BREAKER 1P. C 1A 6KA IP2X	5SX21017	SIEMENS
16	1	CB110-5B	CIRCUIT BREAKER 1P D 6A 6KA IP2X	5SY61068	SIEMENS
17	1	CB110-5E	CIRCUIT BREAKER 1P C 4A 6KA IP2X	5SY61047	SIEMENS
18	1	FAN110-2E	FAN 115VAC 20 M3/H	3321.115	RITTAL
19	1	FAN110-2E	FILTER	3321.200	RITTAL
20	1	PWS110-5C	FEEDER PS 307 FOR S7-300 5A	6ES73071EA000AA0	SIEMENS
21	1	T110-1C	TRANSFORMER 310VA P480 S.2X115	4AM34428DD400FA0	SIEMENS
22	1	A143-1	COMPACT LOGIX MODULE 5330 256KBYTE 2 SERIAL CHANNELS RS-232	1769-L30	ROCKWELL AUTOMATI
23	1	A143-2	COMPACT I/O MODULE 16 INPUT (SINK/SOURCE)	1769-IQ16	ROCKWELL AUTOMATI
24	1	A143-3	COMPACT I/O MODULE 16 OUTPUT	1769-OB16	ROCKWELL AUTOMATI
25	1	A143-4	COMPACAT I/O MODULE ANALOG 4 INPUT/2 OUTPUT	1769-IF4XOF2	ROCKWELL AUTOMATI
26	1	A143-5	COMPACT I/O MODULE 2 OUTPUT ANALOG	1769-OF2	ROCKWELL AUTOMATI
27	1	PWS143-3B	COMPACT I/O 120/240VAC 2A	1769-PA2	ROCKWELL AUTOMATI
28	1	PB202-1B	LAMP Ba9s 30V 2W 10x28	4101126	WIMEX

POS. POS.	Q.TA Q.TY	SIGLA TAG	DESCRIZIONE DESCRIPTION	ARTICOLO ITEM	MARCA MAKE
29	1	PB202-1B	N.O. CONTACT BLOCK + BA9S	800E-3DL0X10	ROCKWELL AUTOMATI
30	1	PB202-1B	WHITE ILLUMINATED PUSH BUTTON	800EP-LF7	ROCKWELL AUTOMATI
31	1	PB202-3B	LAMP Ba9s 30V 2W 10x28	4101126	WIMEX
32	1	PB202-3B	N.O. CONTACT BLOCK + BA9S	800E-3DL0X10	ROCKWELL AUTOMATI
33	1	PB202-3B	WHITE ILLUMINATED PUSH BUTTON	800EP-LF7	ROCKWELL AUTOMATI
34	1	PB202-5B	LAMP Ba9s 30V 2W 10x28	4101126	WIMEX
35	1	PB202-5B	N.O. CONTACT BLOCK + BA9S	800E-3DL0X10	ROCKWELL AUTOMATI
36	1	PB202-5B	WHITE ILLUMINATED PUSH BUTTON	800EP-LF7	ROCKWELL AUTOMATI
37	1	PB202-7B	LAMP Ba9s 30V 2W 10x28	4101126	WIMEX
38	1	PB202-7B	N.O. CONTACT BLOCK + BA9S	800E-3DL0X10	ROCKWELL AUTOMATI
39	1	PB202-7B	WHITE ILLUMINATED PUSH BUTTON	800EP-LF7	ROCKWELL AUTOMATI
40	1	PB203-1B	LAMP Ba9s 30V 2W 10x28	4101126	WIMEX
41	1	PB203-1B	N.O. CONTACT BLOCK + BA9S	800E-3DL0X10	ROCKWELL AUTOMATI
42	1	PB203-1B	WHITE ILLUMINATED PUSH BUTTON	800EP-LF7	ROCKWELL AUTOMATI
43	1	CR211-3E	MODULE RSMO1 OPTO 3-24/4-60/3A	NS043387	WEIDMULLER
44	1	CR211-5E	BASE FOR MY	PYF14AN	OMRON
45	1	CR211-5E	RELAY 24VDC	MY4ND2	OMRON
46	1	CB241-1B	AUXILIARY CONTACT 1NO+1NC	140M-C-AFA11	ROCKWELL AUTOMATI
47	1	CB241-1B	CIRCUIT BREAKER 10..16A	140M-C2E-C16	ROCKWELL AUTOMATI
48	1	CON241-4E	100-C16DJ10 CONTACTOR 16A-7.5KW	100-C16DJ10	ROCKWELL AUTOMATI
49	1	CT241-2B	CURRENT CONTROL WAS2 CMA	85458300000	WEIDMULLER
50	1	CB242-1B	AUXILIARY CONTACT 1NO+1NC	140M-C-AFA11	ROCKWELL AUTOMATI
51	1	CB242-1B	CIRCUIT BREAKER 23..32A	140M-F8E-C32	ROCKWELL AUTOMATI
52	1	CON242-5E	100-C23DJ10 CONTACTOR 23A-11KW	100-C23DJ10	ROCKWELL AUTOMATI
53	1	CB243-3A	AUXILIARY CONTACT 1NO+1NC	140M-C-AFA11	ROCKWELL AUTOMATI
54	1	CB243-3A	CIRCUIT BREAKER 4..6,3A	140M-C2E-B63	ROCKWELL AUTOMATI
55	1	DR243-2C	INVERTER 160 SSC, 380-460V, 3-2.3A, 0.75KW,IP20	160-BA03NSF1	ROCKWELL AUTOMATI
56	1	DR243-2C	KEYPAD MODULE 160, PROGRAM KEYPAD MODULE	160-P1	ROCKWELL AUTOMATI
57	1	L243-3C	FILTER RFI FOR COMPATIBILITY CE,200-460V	160-RFB-5-A	ROCKWELL AUTOMATI
58	1	CON244-1E	100-C09DJ10 CONTACTOR 24CC CON	100-C09DJ10	ROCKWELL AUTOMATI
59	1	CON244-1E	100-FA11 AUXILIARY CONTACT	100-FA11	ROCKWELL AUTOMATI
60	1	CR244-7E	BASE FOR MY	PYF14AN	OMRON
61	1	CR244-7E	RELAY 24VDC	MY4ND2	OMRON
62	1	DR245-2C	INVERTER 160 SSC, 380-460V, 3-2.3A, 0.75KW,IP20	160-BA03NSF1	ROCKWELL AUTOMATI
63	1	DR245-2C	KEYPAD MODULE 160, PROGRAM KEYPAD MODULE	160-P1	ROCKWELL AUTOMATI

POS. POS.	Q.TA Q.TY	SIGLA TAG	DESCRIZIONE DESCRIPTION	ARTICOLO ITEM	MARCA MAKE
64	1	L245-3C	FILTER RFI FOR COMPATIBILITY CE,200-460V	160-RFB-5-A	ROCKWELL AUTOMATI
65	12	X1	TERMINAL BLOCK UKK 5	2774017	PHOENIX

CERTIFICATE
TEST
MEASURE
CERTIFICATE

ENCLOSE 5

Certificato di Collaudo

Test Certificate

DIN EN ISO 9001
Zertifikat: 09 100 80289

Cliente/customer: SIDAM S.r.L.	Descrizione/description: FREEZER GIF 600 - UL - USA +Q2	Comm. job	0433
Disegno/drawing:	Specifiche Tecniche/technical specifications 0433 SP01 .doc	Data: date	29-07-02

TIPO DI TEST type of test	TEST RICHIESTO required test	TEST ESEGUITO performed test	NOTE notes
DIMENSIONI DI INGOMBRO DELLE APPARECCHIATURE overall dimensions of equipments 8.2.4.2.1	☐ SI/yes ☒ NO/no	☐ SI/yes	
ELEMENTI DETERIORABILI NEL TEMPO deteriorating components along the time 8.2.4.2.2	☐ SI/yes ☒ NO/no	☐ SI/yes	
FINITURE finishing 8.2.4.2.3	☐ SI/yes ☒ NO/no	☐ SI/yes	
VERNICIATURA painting 8.2.4.2.4	☐ SI/yes ☒ NO/no	☐ SI/yes	
TARGHETTE nameplates 8.2.4.2.5	☐ SI/yes ☒ NO/no	☐ SI/yes	
CAVI D'INTERFACCIAMENTO cables interface 8.2.4.2.6	☐ SI/yes ☒ NO/no	☐ SI/yes	
MORSETTIERE E/O CONNETTORI terminal strips and connectors 8.2.4.2.7	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit
CONTROLLO A VISTA E DIMENSIONALE dimensional and visual check 8.2.4.2.8	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit
CABLAGGI wirings 8.2.4.2.10	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit (AWL)
CONTROLLO TENUTA RETE ARIA air seal insulation check 8.2.4.2.11	☐ SI/yes ☒ NO/no	☐ SI/yes	
STRUMENTAZIONE ELETTRICA electrical instrumentation 8.2.4.2.12	☐ SI/yes ☒ NO/no	☐ SI/yes	
STRUMENTAZIONE PNEUMATICA pneumatic instrumentation 8.2.4.2.13	☐ SI/yes ☒ NO/no	☐ SI/yes	
ASSERVIMENTI E BLOCCHI ELETTRICI interlockings and electric block systems 8.2.4.2.14	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit
RILEVAMENTO ASSORBIMENTI E CADUTE DI TENSIONE electrical absorption and voltage drops measurements 8.2.4.2.15	☐ SI/yes ☒ NO/no	☐ SI/yes	
SEZIONAMENTI E PROTEZIONI sectionings and protections 8.2.4.2.16	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit

REV	DESCRIZIONE-Description	DATA-Date	COMP.-Fill in	CONTR-Chk	APPR.-App'd
0	EMESSO COME PROCEDURA / emitted as procedure	15/10/2001	BSP	MVO	CVO

Certificato di Collaudo

Test Certificate

TÜV CERT DIN EN ISO 9001 Zertifikat: 09 100 80289

Cliente/customer: SIDAM S.r.L.	Descrizione/description: FREEZER GIF600 -UL- USA +Q2	Comm./job 0433
Disegno/drawing: —	Specifiche Tecniche/technical specifications 0433 sp 01 . doc	Data:/date 29-07-02

TIPO DI TEST type of test	TEST RICHIESTO required test	TEST ESEGUITO performed test	NOTE notes
INFLUENZA DELL'ALIMENTAZIONE ELETTRICA power supply influence 8.2.4.2.17	☐ SI/yes ☒ NO/no	☐ SI/yes	
INFLUENZA MECCANICA E SENSIBILITA' ALLE VIBRAZIONI mechanical influence and vibrations sensivity 8.2.4.2.18	☐ SI/yes ☒ NO/no	☐ SI/yes	
GRADO DI PROTEZIONE protection degree 8.2.4.2.19	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit (NEMA 1)
PRESSURIZZAZIONE pressurization 8.2.4.2.20	☐ SI/yes ☒ NO/no	☐ SI/yes	
RILEVAMENTO TEMPERATURA ALL'INTERNO DEGLI ARMADI temperature measurement in board 8.2.4.2.21	☐ SI/yes ☒ NO/no	☐ SI/yes	
CONTROLLO SISTEMA DI SICUREZZA PORTE security doors system check 8.2.4.2.22	☐ SI/yes ☒ NO/no	☐ SI/yes	
	☐ SI/yes ☐ NO/no	☐ SI/yes	

Prove/testing CEI EN 60204-1

CONTINUITA' DEL CIRCUITO DI PROTEZIONE continuity of the protective bonding circuit 8.2.4.2.24	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit (To see enclosure)
PROVE DI RESISTENZA DELL'ISOLAMENTO insulation resistance tests 8.2.4.2.25	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit (To see enclosure)
PROVE DI TENSIONE voltage tests 8.2.4.2.26	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit (To see enclosure)
PROTEZIONE CONTRO LE TENSIONI RESIDUE protection against residual voltages 8.2.4.2.27	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit (wait 3 minutes)
PROVE FUNZIONALI functional test 8.2.4.2.28	☒ SI/yes ☐ NO/no	☒ SI/yes	Fit
	☐ SI/yes ☐ NO/no	☐ SI/yes	

SAI s.r.l. [signature]

REV	DESCRIZIONE-Description	DATA-Date	COMP.-Fill in	CONTR-Chk	APPR.-App'd
0	EMESSO COME PROCEDURA / emitted as procedure	15/10/2001	BSP	MVO	CVO

Certificato di misura
measure certificate

DIN EN ISO 9001
Zertifikat 09 100 80289

Cliente/customer: SIDAM S.r.l	Descrizione/description: FREEZER GIF 600 - UL - USA +Q2	Comm. job 0433
Disegno/drawing: —	Specifiche Tecniche/technical specifications 0433sp01.doc	Data: date 29-01-02

20.2 Continuità del circuito di protezione
continuity of the protective bonding circuit

Sezione minima effettiva del conduttore di protezione equipotenziale della parte in prova (mm²) minimum effective protect conductor cross-sectional area of the branch under test (mm²)	Caduta di tensione massima misurata (V) Maximum measured voltage drop (V)	STRUMENTO/instrument: FULLTEST HT ITALIA N° 9605 1226
1,0	3,3	TEST ESEGUITO performed test
1,5	2,6	
2,5	1,9	☒ SI/yes
4,0	1,4	
>6,0	1	

20.3 Prove di resistenza dell'isolamento
insulation resistance tests

La resistenza di isolamento misurata a 500V in c.c. tra i conduttori del circuito di potenza e il circuito di protezione equipotenziale non deve essere minore di 1Mohm.	STRUMENTO/instrument: FULLTEST HT ITALIA N° 9605 1226
the insulation resistance measured at 500V d.c. between the power circuit conductors and the protective bonding circuit shall be not less than 1 Mohm.	TEST ESEGUITO performed test
	☒ SI/yes

20.4 Prove di tensione
voltage tests

La tensione di prova deve: avere un valore doppio della tensione d'alimentazione nominale dell'equipaggiamento, o di 1000 V, scegliendo il valore più elevato.	STRUMENTO/instrument: FULLTEST HT ITALIA N° 9605 1226
the test voltage shall: have a value of twice the rated supply voltage of the equipment or 1000 V, choosing the greatest value.	TEST ESEGUITO performed test
	☒ SI/yes

20.5 Tensioni su trasformatori e alimentatori
power supply voltages on transformers and feeders

SIGLA tag	TENSIONE PRIMARIA primary voltage	TENSIONE SECONDARIA secondary voltage	TEST ESEGUITO performed test
T110-1C	397VAC	123 VAC 246 VAC	☒ SI/yes
PWS110-5C	246VAC	23,91VDC	☒ SI/yes
			☐ SI/yes
			☐ SI/yes
			☐ SI/yes
			☐ SI/yes

REV	DESCRIZIONE-Description	DATA-Date	COMP.-Fill in	CONTR-Chk	APPR.-App'd
0	EMESSO COME PROCEDURA / emitted as procedure	15/10/2001	BSP	MVO	CVO

Società Automazione Industriale

DECLARATION "UL®" OF CONFORMITY

UL Underwriters Laboratories Inc. ®

SUPPLIER

SAI
Società Automazione Industriale S.r.l.
Industrial Control Panel
File: E178310 - NITW
VIA GIOSUE' CARDUCCI, 221
20099 SESTO SAN GIOVANNI - MI -
☎TEL. ++39 02 26 26 00 88 - FAX ++39 02 24 21 354 - e-mail: info@saiautomazione.it

DESCRIPTION

SIDAM S.r.l.
FREEZER GIF 600

(USA)

ELECTRICAL BOARD "QE-0433/+Q2"
DRAWING. "/"
FILING DATA "A433--"
LAST REVISION "0" 2002 September 25th

SPECIFICATION

UL 508A
Industrial Control Panel

Sesto San Giovanni
2002 September 26th

SAI
Società Automazione Industriale S.r.l.
Sig. Cosimo Vorace

N.B. LA PRESENTE DICHIARAZIONE VIENE RILASCIATA PER IL QUADRO CORRISPONDENTE AGLI SCHEMI ELETTRICI COMPLETI DI ULTIMA REVISIONE DI CUI UNA COPIA E' CONSERVATA PRESSO IL NOSTRO ARCHIVIO.
PERTANTO MODIFICHE DI QUALSIASI NATURA APPORTATE AL QUADRO, COMPORTERANNO L'ANNULLAMENTO DELLA NOSTRA RESPONSABILITA' E DELLA GARANZIA

N.B THIS STATEMENT IS ISSUED FOR THE BOARD RELATIVE TO COMPLETE WIRING DIAGRAM WITH LAST REVISION, ONE COPY OF THIS WIRING DIAGRAM IS IN OUR ARCHIVES.
THEREFORE MODIFICATIONS OF EVERY NATURE MADE ON BOARD, WILL CANCEL OUR RESPONSABILITY AND WARRANTY.

CORIOLIS MASS FLOW MESURING SYSTEM

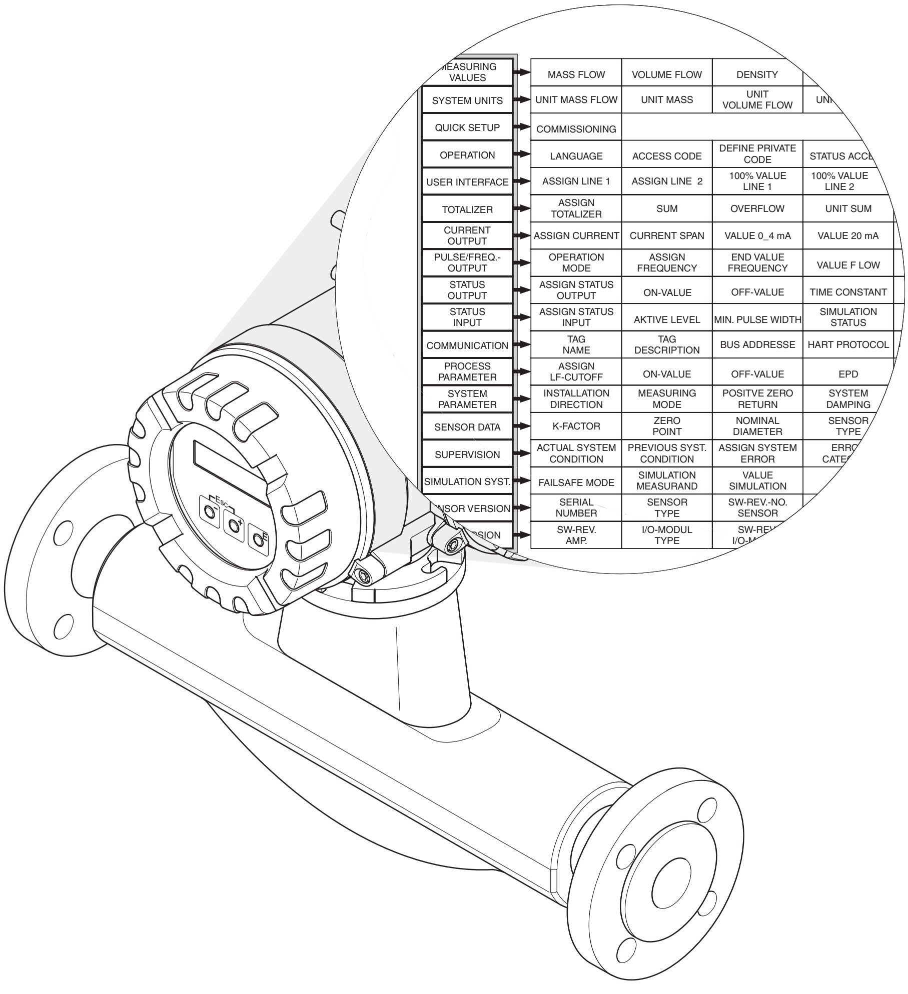
ENCLOSE 6

BA 058D/06/en/11.01
50098512

Valid as of software version:
V 1.02.XX (amplifier)
V 1.02.XX (communication)

PROline promass 80
Coriolis Mass Flow Mesuring System

Description of Device Functions



Endress + Hauser
The Power of Know How

Table of Contents

Registered trademarks
HART®
Registered trademark of HART Communication Foundation, Austin, USA

S-DAT™
Registered trademark of Endress+Hauser Flowtec AG, Reinach, CH

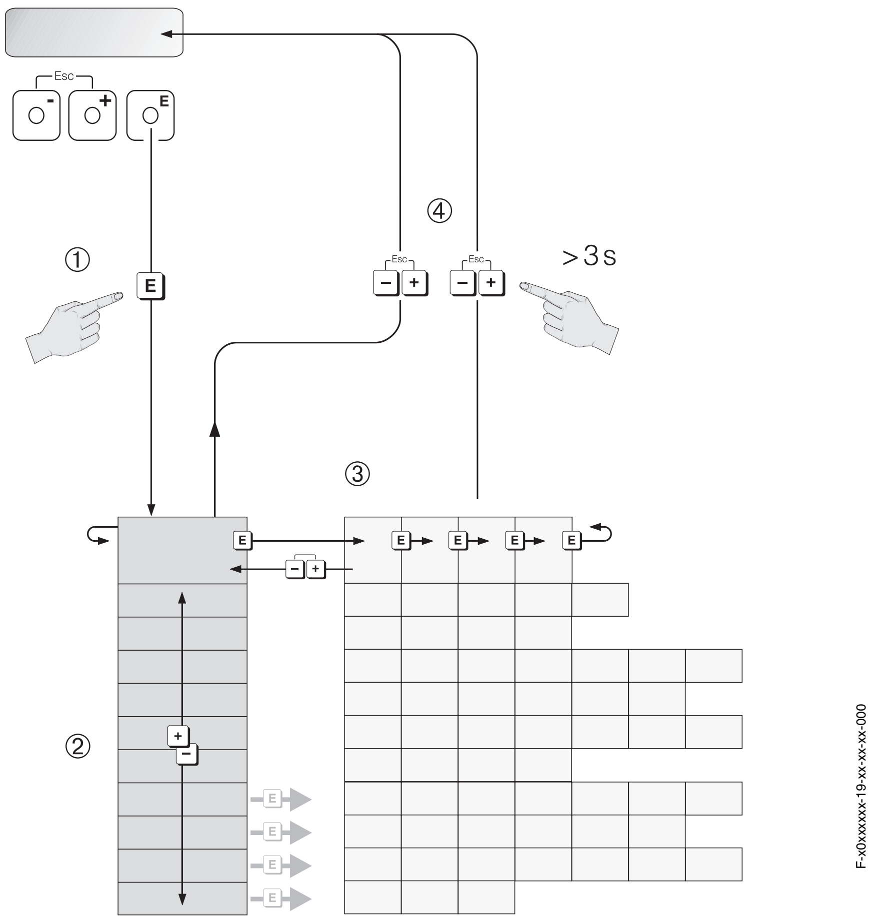
1 Function matrix PROline Promass 80

1.1 The function matrix: layout and use

The function matrix is a two-level construct: the groups form one level, functions the other.
The groups are the highest-level grouping of the control options for the measuring device.
Each group comprises a number of functions.
You select a group in order to access the individual functions for controlling or parameterizing the measuring device.

You will find an overview of the groups in the table of contents on Page 3 and in the graphical representation of the function matrix on Page 7.
You will also find an overview of the functions on Page 7, complete with the page references of the detailed function descriptions.
The descriptions of the individual functions start on Page 8.

Example of how to parameterize a function (in this case changing the language for the user interface):
① Entry into the function matrix (E-key).
② Select the OPERATION group.
③ Select the LANGUAGE function, change the setting from ENGLISH to DEUTSCH +/- and save E (all texts displayed on the user interface appear in German).
④ Exit the function matrix (ESC > 3 seconds).



1.2 Graphical illustration of the function matrix

MEASURING VALUES (p. 8)	MASS FLOW (p. 8)	VOLUME FLOW (p. 8)	DENSITY (p. 8)	TEMPERATURE (p. 8)						
SYSTEM UNITS (p. 9)	UNIT MASS FLOW (p. 9)	UNIT MASS (p. 9)	UNIT VOLUME FLOW (p. 10)	UNIT VOLUME (p. 10)	UNIT DENSITY (p. 11)	UNIT TEMPERATURE (p. 11)	UNIT LENGTH (p. 11)	UNIT PRESSURE (p. 11)		
QUICK SETUP (p. 12)	SETUP COMMISSION (p. 12)									
OPERATION (p. 14)	LANGUAGE (p. 14)	ACCESS CODE (p. 14)	DEF. PRIVATE CODE (p. 14)	STATUS ACCESS (p. 14)						
USER INTERFACE (p. 15)	ASSIGN LINE 1 (p. 15)	ASSIGN LINE 2 (p. 15)	100% VALUE (p. 15)	100% VALUE (p. 16)	FORMAT (p. 16)	DISPLAY DAMPING (p. 16)	CONTRAST LCD (p. 16)	TEST DISPLAY (p. 17)		
TOTALIZER (p. 18)	ASSIGN TOTALIZER (p. 18)	SUM (p. 18)	OVERFLOW (p. 18)	UNIT TOTALIZER (p. 18)	RESET TOTAL. (p. 19)	FAILSAFE MODE (p. 19)				
CURRENT OUTPUT (p. 20)	ASSIGN CURRENT (p. 20)	CURRENT SPAN (p. 20)	VALUE 0_4 mA (p. 21)	VALUE 20 mA (p. 21)	TIME CONSTANT (p. 23)	FAILSAFE MODE (p. 23)	ACTUAL CURRENT (p. 23)	SIMULATION CURR. (p. 24)	VALUE SIM. CURR. (p. 24)	
PULSE/FREQ. OUT. (p. 25)	OPERATION MODE (p. 25)	ASSIGN FREQUENCY (p. 25)	END VALUE FREQ. (p. 25)	VALUE F LOW (p. 26)	VALUE F HIGH (p. 26)	OUTPUT SIGNAL (p. 28)	TIME CONSTANT (p. 28)	FAILSAFE MODE (p. 29)	FAILSAFE VALUE (p. 29)	ACTUAL FREQ. (p. 29)
	SIMULATION FREQ. (p. 30)	VALUE SIM. FREQ. (p. 30)	ASSIGN PULSE (p. 30)	PULSE VALUE (p. 31)	PULSE WIDTH (p. 31)	OUTPUT SIGNAL (p. 32)	FAILSAFE MODE (p. 32)			
STATUS OUTPUT (p. 33)	ASSIGN STATUS (p. 33)	ON-VALUE (p. 33)	OFF-VALUE (p. 33)	TIME CONSTANT (p. 34)	ACTUAL STATUS (p. 34)	SIM. SWITCH POINT (p. 34)	VAL. SIM. SWIT. PNT (p. 34)			
STATUS INPUT (p. 37)	ASSIGN STATUS IN (p. 37)	ACTIVE LEVEL (p. 37)	MIN. PULSE WIDTH (p. 37)	SIM. STATUS IN (p. 37)	VAL. SIM. STAT. IN (p. 38)					
COMMUNICATION (p. 39)	TAG NAME (p. 39)	TAG DESCRIPTION (p. 39)	BUS ADDRESS (p. 39)	HART PROTOCOL (p. 39)	WRITE PROTECTION (p. 39)	MANUFACTURER ID (p. 39)	DEVICE ID (p. 39)			
PROCESS PARAM. (p. 40)	ASSIGN LF-CUT OFF (p. 40)	ON-VAL. LF-CUT OFF (p. 40)	OFF-VAL. LF-CUT OFF (p. 40)	EMPTY PIPE DET. (p. 41)	EPD VALUE LOW (p. 41)	EPD VALUE HIGH (p. 41)	EPD RESPONSETIME (p. 41)	ZERO POINT ADJUST (p. 42)	DENSITY SET VALUE (p. 42)	MEASURE FLUID (p. 42)
	DENSITY ADJUST (p. 43)	RESTORE ORIGINAL (p. 43)	PRESSURE MODE (p. 43)	PRESSURE (p. 43)						
SYSTEM PARAMETER (p. 44)	INSTL. DIR. SENSOR (p. 44)	MEASURING MODE (p. 44)	POS. ZERO RETURN (p. 46)	DENSITY DAMPING (p. 46)	FLOW DAMPING (p. 46)					
SENSOR DATA (p. 47)	K-FACTOR (p. 47)	ZERO POINT (p. 47)	NOMINAL DIAMETER (p. 47)	TEMP. COEF. KM (p. 47)	TEMP. COEF. KM 2 (p. 47)	TEMP. COEF. KT (p. 47)	CAL. COEF. KD 1 (p. 47)	CAL. COEF. KD 2 (p. 47)	DENSITY COEF. C 0 (p. 48)	DENSITY COEF. C 1 (p. 48)
	DENSITY COEF. C 2 (p. 48)	DENSITY COEF. C 3 (p. 48)	DENSITY COEF. C 4 (p. 48)	DENSITY COEF. C 5 (p. 48)	MIN. TEMP. MEAS. (p. 48)	MAX. TEMP. MEAS. (p. 48)	MIN. TEMP. CARR. (p. 48)	MAX. TEMP. CARR. (p. 48)		
SUPERVISION (p. 49)	ACTUAL SYS. COND. (p. 49)	PREV. SYS. COND (p. 49)	ASSIGN SYS. ERROR (p. 49)	ERROR CATEGORY (p. 49)	ASSIGN PROC. ERR. (p. 49)	ERROR CATEGORY (p. 50)	ALARM DELAY (p. 50)	SYSTEM RESET (p. 50)	TROUBLESHOOTING (p. 50)	
SIMULAT. SYSTEM (p. 51)	SIM. FAILSAFE MODE (p. 51)	SIM. MEASURAND (p. 51)	VALUE SIM. MEAS. (p. 51)							
SENSOR VERSION (p. 52)	SERIAL NUMBER (p. 52)	SENSOR TYPE (p. 52)	SW-REV. S-DAT (p. 52)							
AMP. HW VERSION (p. 52)	SW-REV. AMP. (p. 52)	I/O MODUL TYPE (p. 52)	SW-REV. I/O (p. 52)							

2 Group MEASURING VALUES

Function description MEASURING VALUES	
Note! • The engineering unit of the measured variable shown here can be set in the “SYSTEM UNITS” group (see Page 9). • If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
MASS FLOW	In this function, the currently measured mass flow appears on the display. **Display shows:** 5-digit floating-point number, including unit and sign (e.g. 462.87 kg/h; –731.63 lb/min; etc.)
VOLUME FLOW	In this function, the currently measured volumetric flow appears on the display. The volumetric flow is derived from the measured mass flowrate and the density of the fluid measured. **Display shows:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)
DENSITY	In this function, the currently measured density or the specific gravity appears on the display. **Display shows:** 5-digit fixed-point number, including unit (e.g. 1.2345 kg/dm^3; 993.5 kg/dm^3; 1.0015 SG_20 °C; etc.)
TEMPERATURE	In this function, the currently measured temperature appears on the display. **Display shows:** 5-digit floating-point number, including unit and sign (e.g. –23.4 °C; 160.0 °F; 295.4 K; etc.)

3 Group SYSTEM UNITS

Function description SYSTEM UNITS	
You can select the unit for the measured variable in this function group.	
UNIT MASS FLOW	Use this function to select the unit for displaying the mass flow (mass/time). The unit you select here is also valid for: • Current output • Frequency output • Switching points (limit value for mass flow, flow direction) • Low flow cut off **Options:** Metric: gram → g/s; g/min; g/h; g/day kilogram → kg/s; kg/min; kg/h; kg/day Metric ton → t/s; t/min; t/h; t/day US: ounce → oz/s; oz/min; oz/h; oz/day pound → lb/s; lb/min; lb/h; lb/day ton → ton/s; ton/min; ton/h; ton/day **Factory setting:** Country dependent (kg/h or US lb/day)
UNIT MASS	Use this function to select the unit for displaying the mass. The unit you select here is also valid for: • Pulse value (e.g. kg/p) **Options:** Metric → g; kg; t US → oz; lb; ton **Factory setting:** Country dependent (kg or US lb) ✎ Note! The unit for the totalizer is independent of your choice here, it is selected separately in the TOTALIZER group (see Page 18).

Function description SYSTEM UNITS	
UNIT VOLUME FLOW	Use this function to select the unit for the volume flow. The unit you select here is also valid for: • Current output • Frequency output • Switching points (limit value for volume flow, flow direction) • Low flow cut off **Options:** Metric: Cubic centimeter → cm^3/s; cm^3/min; cm^3/h; cm^3/day Cubic decimeter → dm^3/s; dm^3/min; dm^3/h; dm^3/day Cubic meter → m^3/s; m^3/min; m^3/h; m^3/day Milliliter → ml/s; ml/min; ml/h; ml/day Liter → l/s; l/min; l/h; l/day Hectoliter → hl/s; hl/min; hl/h; hl/day Megaliter → Ml/s; Ml/min; Ml/h; Ml/day US: Cubic centimeter → cc/s; cc/min; cc/h; cc/day Acre foot → af/s; af/min; af/h; af/day Cubic foot → ft^3/s; ft^3/min; ft^3/h; ft^3/day Fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day Gallon → gal/s; gal/min; gal/h; gal/day Million gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (beer: 31.0 gal/bbl) ⇨ bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (filling tanks: 55.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Imperial: Gallon → gal/s; gal/min; gal/h; gal/day Mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day **Factory setting:** Country dependent (m^3/h or US Mgal/day)
UNIT VOLUME	Use this function to select the unit for the volume. The unit you select here is also valid for: • Pulse value (e.g. m^3/p) **Options:** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml US → cc; af; ft^3; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** Country dependent (m^3 or US Mgal) ✎ Note! The unit for the totalizer is independent of your choice here, it is selected separately in the TOTALIZER group (see Page 18).

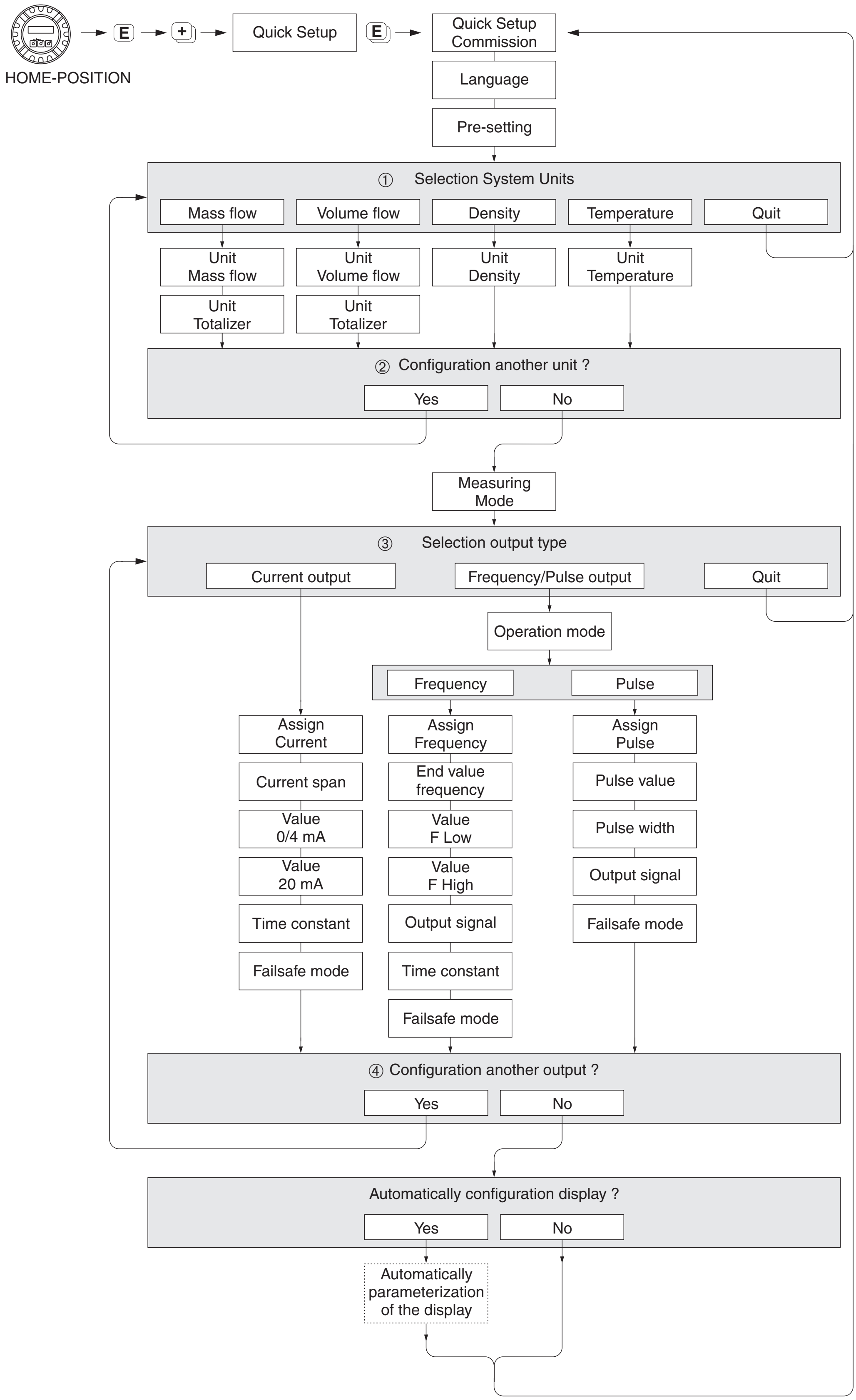
Function description SYSTEM UNITS	
UNIT DENSITY	Use this function to select the unit for displaying the fluid density. The unit you select here is also valid for: • Current output • Frequency output • Switching points • Density adjustment value • Density responce value for EPD **Options:** Metric → g/cm^3; g/cc; kg/dm^3; kg/l; kg/m^3; SD 4 °C, SD 15 °C, SD 20 °C; SG 4 °C, SG 15 °C, SG 20 °C US → lb/ft^3; lb/gal; lb/bbl (normal fluids); lb/bbl (beer); lb/bbl (petrochemicals); lb/bbl (filling tanks) Imperial → lb/gal; lb/bbl (beer); lb/bbl (petrochemicals) **Factory setting:** kg/l SD = Specific Density, SG = Specific Gravity The specific density is the ratio of fluid density to water (at water temperature = 4, 15, 20 °C)
UNIT TEMPERATURE	Use this function to select the unit for displaying the temperature. The unit you select here is also valid for: • Current output • Frequency output • Switching points **Options:** °C (CELSIUS) K (KELVIN) °F (FAHRENHEIT) R (RANKINE) **Factory setting:** °C (CELSIUS)
UNIT LENGTH	Use this function to select the unit for the unit of length for nominal diameter. The unit you select here is also valid for: • nominal diameter of the sensor (see the NOMINAL DIAMETER function on Page 47). **Options:** MILLIMETER INCH **Factory setting:** Country dependent (MILLIMETER or INCH)
UNIT PRESSURE	Use this function to select the unit for pressure. The unit you select here is also valid for: • Specified pressure (see function DRUCK auf Page 43) **Option:** BAR G PSI G BAR A PSI A **Factory setting:** BAR G

4 Group QUICK SETUP

Function description QUICK SETUP	
QUICK SETUP COMMISSION	Use this function to start the Setup menu for commissioning. **Options:** NO YES **Factory setting:** NO

✎ Note:

- The display returns to the QUICK SETUP COMMISSION cell if you press the ESC key combination during programming of a parameter.
- ① Only units not yet configured in the current Quick Setup are offered for selection in each cycle. The unit for mass and volume is derived from the corresponding flow unit.
- ② The “YES” option remains visible until all the units have been parameterised. “NO” is the only option displayed when no further units are available.
- ③ Only the outputs not yet configured in the current Quick Setup are offered for selection in each cycle.
- ④ The “YES” option remains visible until all the outputs have been parameterised. “NO” is the only option displayed when no further outputs are available.



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5 Group OPERATION

Function description OPERATION	
LANGUAGE	Use this function to select the language for all texts, parameters and messages shown on the local display. **Options:** ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO JAPANESE (syllabary) ✎ Note! If you press the +/- keys simultaneously during startup, the language defaults to "ENGLISH".
ACCESS CODE	All data of the measuring system are protected against inadvertent change. Programming is disabled and the settings cannot be changed until a code is entered in this function. If you press the +/- key in any function the measuring system automatically goes to this function and the prompt to enter the code appears on the display (programming disabled). You can enable programming by entering the personal code (**Factory setting = 80**, see the DEFINE PRIVATE CODE function) **User input:** max. 4-digit number: 0...9999 ✎ Note! • The programming levels are disabled if you do not press a key within 60 seconds following return to the HOME position. • You can also disable programming in this function by entering any number (other than the defined private code). • The Endress+Hauser service organization can be of assistance if you lose your personal code.
DEFINE PRIVATE CODE	Use this function to define a personal code number for enabling programming. **User input:** max. 4-digit number: 0...9999 **Factory setting:** 80 ✎ Note! • If you define the personal code number = 0, the programming is always enabled. • Programming has to be enabled before this code can be changed. When programming is disabled the function can't be changed, this precaution prevents others from changing your personal code without your knowledge and consent.
STATUS ACCESS	Use this function to check the access status for the function matrix. **Display shows:** ACCESS CUSTOMER (Parameterization enabled) LOCKED (Parameterization disabled)

6 Group USER INTERFACE

Function description USER INTERFACE	
ASSIGN LINE 1	Use this function to define the display value assigned to the main line (the upper line of the local display) for display during normal measuring operation. **Options:** OFF MASS FLOW MASS FLOW IN % VOLUME FLOW VOLUME FLOW IN % DENSITY TEMPERATURE **Factory setting:** MASS FLOW
ASSIGN LINE 2	Use this function to define the display value assigned to the additional line (the bottom line of the local display) for display during normal measuring operation. **Options:** OFF MASS FLOW MASS FLOW IN % VOLUME FLOW VOLUME FLOW IN % DENSITY TEMPERATURE TOTALIZER TAG NAME OPERATION/SYSTEM CONDITION DISPLAY FLOW DIRECTION MASS FLOW BARGRAPH IN % VOLUME FLOW BARGRAPH IN % **Factory setting:** TOTALIZER
100% VALUE (Line 1)	✎ Note! This function is not available unless MASS FLOW IN % or VOLUME FLOW IN % was selected in the ASSIGN LINE 1 function. Use this function to define the flow value to be shown on the display as the 100% value of the variable assigned to line 1. **User input:** 5-digit floating-point number **Factory setting:** • 10 kg/s (if MASS FLOW IN % or MASS FLOW BARGRAPH IN % is selected) • 10 l/s (if VOLUME FLOW IN % or VOLUME FLOW BARGRAPH IN % is selected)

Function description USER INTERFACE	
100% VALUE (Line 2)	✎ Note! This function is not available unless MASS FLOW IN %, MASS FLOW BARGRAPH IN %, VOLUME FLOW IN % or VOLUME FLOW BARGRAPH IN % was selected in the ASSIGN LINE 2 function. Use this function to define the flow value to be shown on the display as the 100% value of the variable assigned to line 2. **User input:** 5-digit floating-point number **Factory setting:** • 10 kg/s (if MASS FLOW IN % or MASS FLOW BARGRAPH IN % is selected) • 10 l/s (if VOLUME FLOW IN % or VOLUME FLOW BARGRAPH IN % is selected)
FORMAT	Use this function to define the maximum number of places after the decimal point displayed for the reading in the main line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY DAMPING	Use this function to enter a time constant defining how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** 0...100 s **Factory setting:** 1 s ✎ Note! Setting the time constant to zero seconds switches off damping.
CONTRAST LCD	Use this function to optimize display contrast to suit local operating conditions. **User input:** 10...100% **Factory setting:** 50%

Function description USER INTERFACE	
TEST DISPLAY	Use this function to test the operability of the local display and its pixels. **Options:** OFF ON **Factory setting:** OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line and additional line are darkened for minimum 0.75 second. 3. Main line and additional line show an “8” in each field for minimum 0.75 second. 4. Main line and additional line show a “0” in each field for minimum 0.75 second. 5. Main line and additional line show nothing (blank display) for minimum 0.75 second. 6. When the test completes the local display returns to its initial state and the setting changes to OFF.

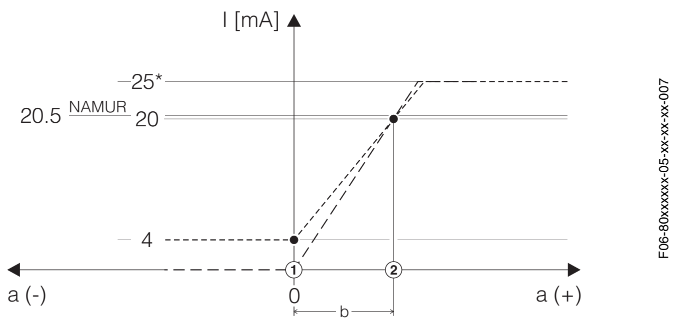
7 Group TOTALIZER

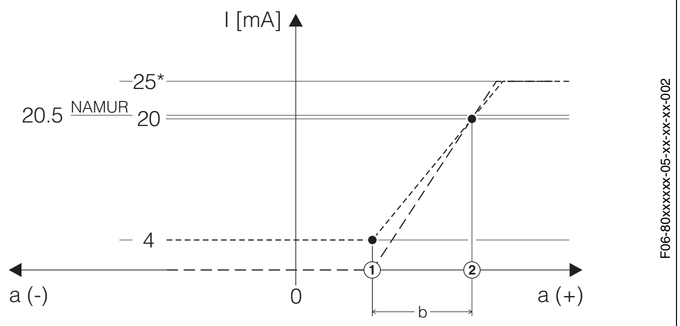
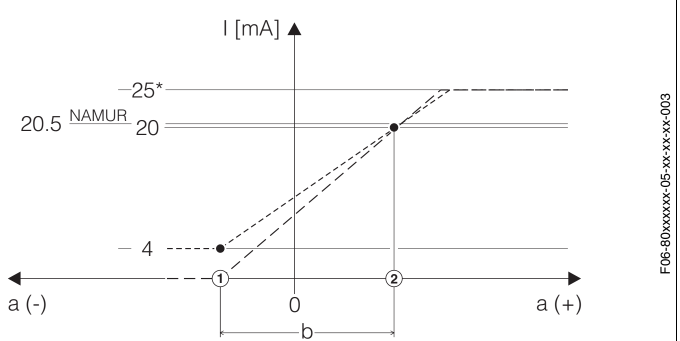
Function description TOTALIZER	
ASSIGN TOTALIZER	Use this function to assign a measured variable to the totalizer. **Options:** MASS FLOW VOLUME FLOW **Factory setting:** MASS FLOW ✎ Note! The totalizer is reset to “0” as soon as the selection is changed.
SUM	Use this function to view the total for the totalizer measured variable aggregated since measuring commenced. The value can be positive or negative. **Display shows:** max. 7-digit floating-point number, including sign and unit (e.g. 15467.04 kg) ✎ Note! The totalizer response to faults is defined in the FAILSAFE MODE function (see Page 19).
OVERFLOW	Use this function to view the overflow for the totalizer aggregated since measuring commenced. Total flow quantity is represented by a floating decimal point number consisting of max. 7 digits. You can use this function to view higher numerical values (>9,999,999) as overflows. The effective quantity is thus the total of OVERFLOW plus the value returned by the SUM function. Example: Reading for 2 overflows: 2 E7 kg (= 20,000,000 kg) The value returned by the SUM function = 196,845.7 kg Effective total quantity = 20,196,845.7 kg **Display shows:** Integer with exponent, including sign and unit, e.g. 2 E7 kg
UNIT TOTALIZER	Use this function to define the unit for the totalizer measured variable, as selected beforehand. **Options (for the MASS FLOW assignment):** Metric → g; kg; t US → oz; lb; ton **Factory setting:** Depends on nominal diameter and country, [value] / [g ...kg or US oz...US ton] corresponding to the totalizer unit factory setting (see Page 53 ff.) **Options (for the VOLUME FLOW assignment):** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml US → cc; af; ft^3; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3 ...m^3 or US gal...US Mgal] corresponding to the totalizer unit factory setting (see Page 53 ff.)

Function description TOTALIZER	
RESET TOTALIZER	Use this function to reset the sum and the overflow of the totalizer to zero (= RESET). **Options:** NO YES **Factory setting:** NO ✎ Note! If the device has a status input and is appropriately configured, a reset for the totalizer can also be triggered by a pulse.
FAILSAFE MODE	Use this function to define the totalizer response to fault. **Options:** STOP The totalizer is paused until the fault is rectified. The totalizer stops at the last value prior to the occurrence of the error. ACTUAL VALUE The totalizer continues to count is based on the current flow measured value. The fault is ignored. HOLD VALUE The totalizer continues to count the flow is based on the last valid flow value (before the fault occurred). **Factory setting:** STOP

8 Group CURRENT OUTPUT

Function description CURRENT OUTPUT	
ASSIGN CURRENT	Use this function to assign a measured variable to the current output. **Options:** OFF MASS FLOW VOLUME FLOW DENSITY TEMPERATURE **Factory setting:** MASS FLOW ✎ Note! If you select OFF, the only function shown in this group is these (ASSIGN CURRENT) function.
CURRENT SPAN	Use this function to define the current range. You can configure the current output either in accordance with the NAMUR recommendation (max. 20.5 mA) or for a maximum drive of 25 mA. **Options:** NAMUR-compliant: 0-20 mA 4-20 mA 4-20 mA HART not NAMUR-compliant: 0-20 mA (25 mA) 4-20 mA (25 mA) 4-20 mA (25 mA) HART **Factory setting:** 4-20 mA HART ✎ Note! Select a 4-20 mA current range for switchover from an active to a passive output signal (see BA 057D/06/en “Promass 80 Operating Instruction”).

Function description CURRENT OUTPUT	
VALUE 0_4 mA	✎ Note! This function is not available unless the DENSITY or TEMPERATURE option was selected in the ASSIGN CURRENT function. Use this function to assign a value to the 0/4 mA current, (see "Setting the span by means of the 0_4 mA and 20 mA value" on Page 21). **Option:** 5-digit floating-point number (with sign for the TEMPERATURE measured variable) **Factory setting:** 0.5 [kg/l] or –50 [°C]
VALUE 20 mA	Use this function to assign a value to the 20 mA current, (see "Setting the span by means of the 0_4 mA and 20 mA value" on Page 21). **Option:** 5-digit floating-point number (with sign for the MASS FLOW, VOLUME FLOW and TEMPERATURE measured variables) **Factory setting:** Depends on nominal diameter [kg/h] or 2 [kg/l] or 200 [°C]
Setting the span by means of the 0_4 mA and 20 mA value	The span for the measured variable selected in the ASSIGN CURRENT function is specified via the VALUE 0_4 mA and VALUE 20 mA functions. The span is defined differently, depending on the measured variable selected: **MASS FLOW and VOLUME FLOW** • The VALUE 0_4 mA function is not available; the value for the zero flow (0 kg/h or 0m^3/h) is assigned to the 0/4 mA current. • The flow value for the 20 mA current is defined in the VALUE 20 mA function, (input range –99999 to +99999). The appropriate unit is taken from the UNIT MASS FLOW or UNIT VOLUME FLOW function. Example (for standard measuring mode):  25* = max. current ① = Flow value at which a current of 0 or 4 mA should be output (preset, cannot be edited). ② = Flow value at which a current of 20 mA should be output (entry in VALUE 20 mA function). a = Flow b = Span (Continued on next page)

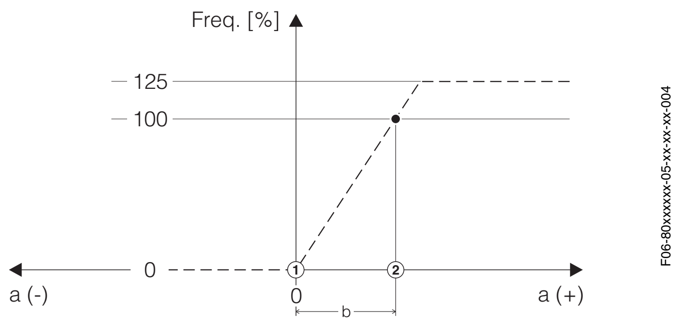
Function description CURRENT OUTPUT	
Setting the span by means of the 0_4 mA and 20 mA value (contd)	**DENSITY** • The density value for the 0/4 mA current is defined in the VALUE 0_4 mA function, (input range 0.0000 to +99999). The appropriate unit is taken from the UNIT DENSITY function. • The density value for the 20 mA current is defined in the VALUE 20 mA function, (input range 0.0000 to +99999). The appropriate unit is taken from the UNIT DENSITY function. Example (for standard measuring mode):  25* = max. current ① = Density value at which a current of 0 or 4 mA should be output (entry in VALUE 0_4 mA function). ② = Density value at which a current of 20 mA should be output (entry in VALUE 20 mA function). a = Density b = Span **TEMPERATURE** • The temperature value for the 0/4 mA current is defined in the VALUE 0_4 mA function, (input range –99999 to +99999). The appropriate unit is taken from the UNIT TEMPERATURE function. • The temperature value for the 20 mA current is defined in the VALUE 20 mA function, (input range –99999 to +99999). The appropriate unit is taken from the UNIT TEMPERATURE function. ✎ Note! Values with different signs **cannot** be entered for the 0_4 mA and 20 mA values if SYMMETRY is the option selected in the MEASURING MODE function, (see Page 44), The message "INPUT RANGE EXCEEDED" appears on the display. Example (for standard measuring mode):  25* = max. current ① = Temperature value at which a current of 0 or 4 mA should be output (entry in VALUE 0_4 mA function). ② = Temperature value at which a current of 20 mA should be output (entry in VALUE 20 mA function). a = Temperature b = Span

Function description CURRENT OUTPUT	
TIME CONSTANT	Use this function to enter a time constant defining how the current output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** Fixed-point number 0.01...100.00 s **Factory setting:** 1.00 s
FAILSAFE MODE	For reasons of safety it is advisable to ensure that the current output assumes a predefined state in the event of a fault. The setting you select here affects only the current output. It has no effect on other outputs and the display (e.g. totalizer). **Options:** MIN. CURRENT Depending on the setting selected in the CURRENT SPAN function (see Page 20). If the current range is: 0-20 mA (25 mA) → Output current = 0 mA 4-20 mA (25 mA) → Output current = 2 mA 4-20 mA (25 mA) HART → Output current = 2 mA 0-20 mA (NAMUR) → Output current = 0 mA 4-20 mA (NAMUR) → Output current = 2 mA 4-20 mA HART (NAMUR) → Output current = 2 mA MAX. CURRENT Depending on the setting selected in the CURRENT SPAN function (see Page 20). If the current range is: 0-20 mA (25 mA) → Output current = 25 mA 4-20 mA (25 mA) → Output current = 25 mA 4-20 mA (25 mA) HART → Output current = 25 mA 0-20 mA (NAMUR) → Output current = 22 mA 4-20 mA (NAMUR) → Output current = 22 mA 4-20 mA HART (NAMUR) → Output current = 22 mA HOLD VALUE Measured value output is based on the last measured value saved before the fault occurred. ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored. **Factory setting:** MIN. CURRENT
ACTUAL CURRENT	Use this function to view the computed value of the output current. **Display shows:** 0.00...25.00 mA

Function description CURRENT OUTPUT	
SIMULATION CURRENT	Use this function to activate simulation of the current output. **Options:** OFF ON **Factory setting:** OFF Note! • The “SIMULATION CURRENT OUTPUT” message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the actual measured values are output correctly via the other outputs. Caution: The setting is not saved if the power supply fails.
VALUE SIMULATION CURRENT	Note! This function is not available unless the SIMULATION CURRENT function is active (= ON). Use this function to define a selectable value (e.g. 12 mA) to be output at the current output. This value is used to test downstream devices and the flowmeter itself. **User input:** floating-point number: 0.00...25.00 mA **Factory setting:** 0.00 mA Caution: The setting is not saved if the power supply fails.

9 Group PULSE/FREQUENCY OUTPUT

Function description PULSE/FREQUENCY OUTPUT	
OPERATION MODE	Use this function to configure the output as a pulse or frequency output. The functions available in this function group vary, depending on which option you select here. **Options:** PULSE FREQUENCY **Factory setting:** PULSE
ASSIGN FREQUENCY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to assign a measured variable to the frequency output. **Options:** OFF MASS FLOW VOLUME FLOW DENSITY TEMPERATURE **Factory setting:** MASS FLOW ✎ Note! If you select OFF, the only functions shown in this function group are ASSIGN FREQUENCY and OPERATION MODE.
END VALUE FREQUENCY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to define a full scale frequency for the frequency output. You define the associated measured value of the measuring range in the VALUE F HIGH function described on Page 26. **User input:** 4-digit fixed-point number: 2...1000 Hz **Factory setting:** 1000 Hz Example: • VALUE F HIGH = 1000 kg/h, full scale frequency = 1000 Hz: i.e. a frequency of 1000 Hz is output at a flow of 1000 kg/h. • VALUE F HIGH = 3600 kg/h, full scale frequency = 1000 Hz: i.e. a frequency of 1000 Hz is output at a flow of 3600 kg/h. ✎ Note! In the FREQUENCY operating mode the output signal is symmetrical (on/off ratio = 1:1). At low frequencies the pulse duration is limited to a maximum of 2 seconds, i.e. the on/off ratio is no longer symmetrical.

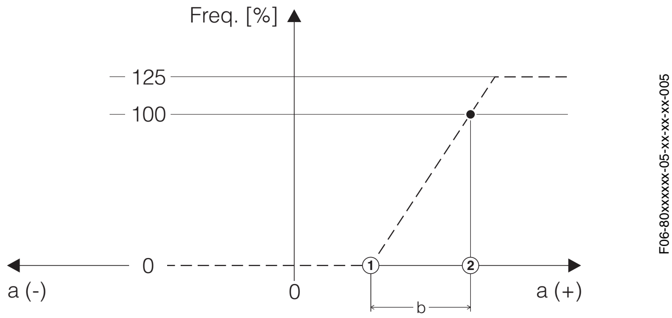
Function description PULSE/FREQUENCY OUTPUT	
VALUE F LOW	✎ Note! This function is not available unless the DENSITY or TEMPERATURE option was selected in the ASSIGN FREQUENCY function. Use this function to assign a value to the start value frequency (0 Hz), (see "Setting the span by means of the f-min. and f-max. value" on Page 26). **Option:** 5-digit floating-point number (with sign for the TEMPERATURE measured variable) **Factory setting:** 0.5 [kg/l] or –50 [°C]
VALUE F HIGH	Use this function to assign a value to the END VALUE FREQUENCY, (see "Setting the span by means of the f-min. and f-max. value" on Page 26). **Option:** 5-digit floating-point number (with sign for the MASS FLOW, VOLUME FLOW and TEMPERATURE measured variables) **Factory setting:** Depends on nominal diameter [kg/h] or 2 [kg/l] or 200 [°C]
Setting the span by means of the f-min. and f-max. value	The span for the measured variable selected in the ASSIGN FREQUENCY function is specified via the VALUE F LOW and VALUE F HIGH functions. The span is defined differently, depending on the measured variable selected: **MASS FLOW and VOLUME FLOW** • The VALUE F LOW function is not available; the value for the zero flow (0 kg/h or 0m^3/h) is assigned to the start value frequency. • The flow value for the end value frequency is defined in the VALUE F HIGH function, (input range –99999 to +99999). The appropriate unit is taken from the UNIT MASS FLOW or UNIT VOLUME FLOW function. Example (for standard measuring mode):  ① = Flow value at which a frequency of 0 Hz should be output (preset, cannot be edited). ② = Flow value at which the, in the function END VALUE FREQUENCY defined, frequency should be output (entry in VALUE F HIGH function). a = Flow b = Span (Continued on next page)

Function description PULSE/FREQUENCY OUTPUT

Setting the span by means of the f-min. and f-max. value (contd)

DENSITY
- The density value for the start value frequency is defined in the VALUE F LOW function, (input range 0.0000 to +99999). The appropriate unit is taken from the UNIT DENSITY function.
- The density value for the end value frequency is defined in the VALUE F HIGH function, (input range 0.0000 to +99999). The appropriate unit is taken from the UNIT DENSITY function.

Example (for standard measuring mode):

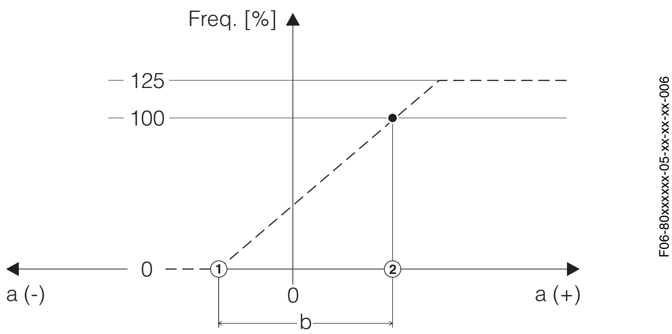


① = Density value at which a frequency of 0 Hz should be output (entry in VALUE F LOW function).
② = Density value at which the, in the function END VALUE FREQUENCY defined, frequency should be output (entry in VALUE F HIGH function).
a = Density
b = Span

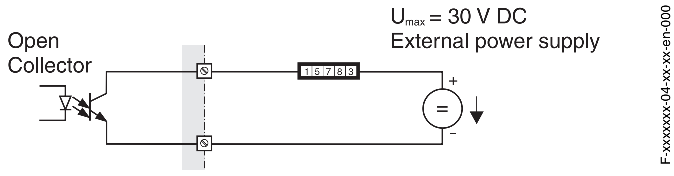
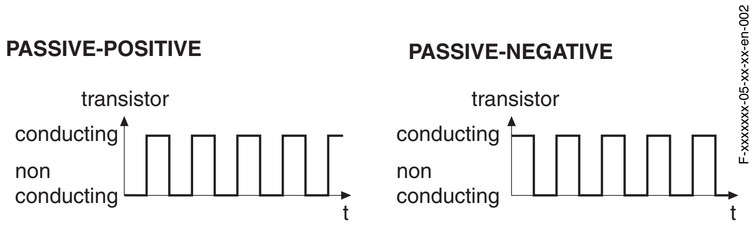
TEMPERATURE
- The temperature value for the 0/4 mA current is defined in the VALUE F LOW function, (input range –99999 to +99999). The appropriate unit is taken from the UNIT TEMPERATURE function.
- The temperature value for the 20 mA current is defined in the VALUE F HIGH function, (input range –99999 to +99999). The appropriate unit is taken from the UNIT TEMPERATURE function.

✎ Note!
Values with different signs **cannot** be entered for the VALUE F LOW and VALUE F HIGH if SYMMETRY is the option selected in the MEASURING MODE function (see Page 44). The message "INPUT RANGE EXCEEDED" appears on the display.

Example (for standard measuring mode):



① = Temperature value at which a frequency of 0 Hz should be output (entry in VALUE F LOW function).
② = Temperature value at which the, in the function END VALUE FREQUENCY defined, frequency should be output (entry in VALUE F HIGH function).
a = Temperature
b = Span

Function description PULSE/FREQUENCY OUTPUT	
OUTPUT SIGNAL	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to select the polarity of the frequency signal. **Options:** PASSIVE - POSITIVE PASSIVE - NEGATIVE **Factory setting:** PASSIVE - POSITIVE **PASSIVE:**  ✎ Note! For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms) 
TIME CONSTANT	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to enter a time constant defining how the frequency output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** floating-point number: 0.00...100.00 s **Factory setting:** 0.00 s

Function description PULSE/FREQUENCY OUTPUT	
FAILSAFE MODE	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. For reasons of safety it is advisable to ensure that the frequency output assumes a predefined state in the event of a fault. Use this function to define this state. The setting you select here affects only the frequency output. It has no effect on other outputs and the display (e.g. totalizer). **Options:** FALLBACK VALUE Output is 0 Hz. FAILSAFE LEVEL Output is the frequency specified in the FAILSAFE VALUE function. HOLD VALUE Measured value output is based on the last measured value saved before the fault occurred. ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored. **Factory setting:** FALLBACK VALUE
FAILSAFE VALUE	✎ Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function and FAILSAFE LEVEL was selected in the FAILSAFE MODE function. Use this function to define frequency that the measuring device outputs in the event of an fault. **User input:** max. 4-digit number: 0...1250 Hz **Factory setting:** 1250 Hz
ACTUAL FREQUENCY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to view the computed value of the output frequency. **Display shows:** 0...1250 Hz

Function description PULSE/FREQUENCY OUTPUT	
SIMULATION FREQUENCY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to activate simulation of the frequency output. **Options:** OFF ON **Factory setting:** OFF ✎ Note! • The "SIMULATION FREQUENCY OUTPUT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the currently measured values are output correctly via the other outputs. Caution: The setting is not saved if the power supply fails.
VALUE SIMULATION FREQUENCY	✎ Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function and the VALUE SIMULATION FREQUENCY function is active (= ON). Use this function to define a selectable frequency value (e.g. 500 Hz) to be output at the frequency output. This value is used to test downstream devices and the flowmeter itself. **User input:** 0...1250 Hz **Factory setting:** 0 Hz Caution: The setting is not saved if the power supply fails.
ASSIGN PULSE	✎ Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to assign a measured variable to the pulse output. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** MASS FLOW ✎ Note! If you select OFF, the only functions shown in this function group are ASSIGN PULSE and OPERATION MODE.

Function description PULSE/FREQUENCY OUTPUT

PULSE VALUE

✎ Note!
This function is not available unless the PULSE setting was selected in the OPERATION MODE function.

Use this function to define the flow at which a pulse is triggered.
These pulses can be totaled by an external totalizer, and the total flow quantity since measuring started can be registered in this way.

User input:
5-digit floating-point number

Factory setting:
Depends on nominal diameter and country,
[value] [dm^3 ...m^3 or US gal...US Mgal] / pulses
corresponding to the factory setting for the pulses value (see Page 53 ff.)

✎ Note!
The appropriate unit is taken from the corresponding UNIT function in the group SYSTEM UNITS (see Page 9).

PULSE WIDTH

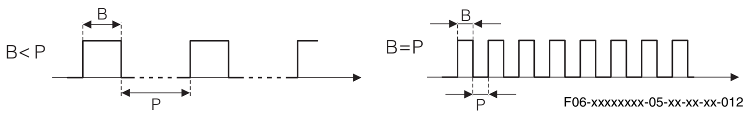
✎ Note!
This function is not available unless the PULSE setting was selected in the OPERATION MODE function.

Use this function to enter the maximum pulse width of the output pulses.

User input:
0.5...2000 ms

Factory setting:
100 ms

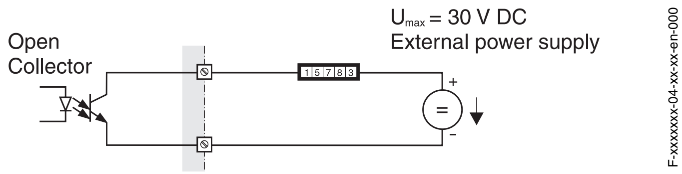
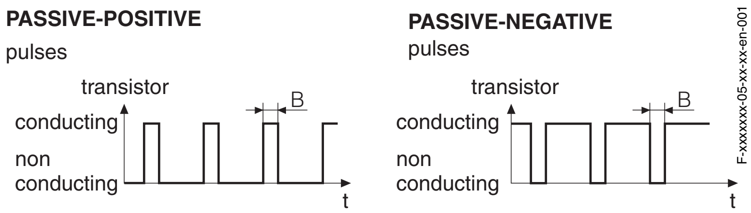
Pulse output is **always** with the pulse width (B) entered in this function.
The intervals (P) between the individual pulses are automatically configured.
However, they must at least correspond to the pulse width (B = P).



B = Pulse width entered (the illustration applies to positive pulses)
P= Intervals between the individual pulses

✎ Note!
When entering the pulse width, select a value that can still be processed by an external totalizer (e.g. mechanical totalizer, PLC, etc.).

☝ Caution:
If the pulse number or frequency resulting from the pulse value entered, (see function PULSE VALUE on Page 31), and from the current flowis too large to maintain the pulse width selected (interval P is smaller than the pulse width B entered), a system error message (pulse memory) is generated after buffering/ balancing time.

Function description PULSE/FREQUENCY OUTPUT	
OUTPUT SIGNAL	✎ Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to configure the output in such a way that it for example matches an external totalizer. According to the application, the direction of the pulses can be selected here. **Options:** PASSIVE - POSITIVE PASSIVE - NEGATIVE **Factory setting:** PASSIVE - POSITIVE **PASSIVE:**  ✎ Note! For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms)  B = Pulse width
FAILSAFE MODE	✎ Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. For reasons of safety it is advisable to ensure that the pulse output assumes a predefined state in the event of a fault. Use this function to define this state. The setting you select here affects only the pulse output. It has no effect on other outputs and the display (e.g. totalizer). **Options:** FALLBACK VALUE Output is 0 pulse. HOLD VALUE Measured value output is based on the last measured value saved before the fault occurred. ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored. **Factory setting:** FALLBACK VALUE

10 Group STATUS OUTPUT

Function description STATUS OUTPUT	
This group is not available unless the measuring device is fitted with a status output.	
ASSIGN STATUS	Use this function to assign a switching function to the status output. **Options:** OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE or NOTICE MESSAGE EMPTY PIPE DETECTION (only if function is active) FLOW DIRECTION LIMIT MASS FLOW LIMIT VOLUME FLOW LIMIT DENSITY LIMIT TEMPERATURE **Factory setting:** FAULT MESSAGE ✎ Note! • The behaviour of the status output is of the quiescent-current type, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. • Please read and comply with the information on the switching characteristics of the status output (see Page 35, 36). • If you select OFF, the only function shown in this function group is this function, in other words ASSIGN STATUS.
ON-VALUE	✎ Note! This function is not available unless LIMIT MASS FLOW, LIMIT VOLUME FLOW, LIMIT TEMPERATURE, LIMIT DENSITY or FLOW DIRECTION was selected in the ASSIGN STATUS function. Use this function to assign a value to the switch-on point (status output conductive). The value can be greater or less than the switch-off point. Positive and negative values are permissible. **User input:** 5-digit floating-point number **Factory setting:** 0 [kg/h] or 0 [m^3/h] or 2 [kg/l] or 200 [°C]
OFF-VALUE	✎ Note! This function is not available unless LIMIT MASS FLOW, LIMIT VOLUME FLOW, LIMIT TEMPERATURE, LIMIT DENSITY was selected in the ASSIGN STATUS function. Use this function to assign a value to the switch-off point (status output not conductive). The value can be greater or less than the switch-on point. Positive and negative values are permissible. **User input:** 5-digit floating-point number **Factory setting:** 0 [kg/h] or 0 [m^3/h] or 2 [kg/l] or 200 [°C]

Function description STATUS OUTPUT	
TIME CONSTANT	Use this function to enter a time constant defining how the status output reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). The purpose of damping, therefore, is to prevent the status output changing state continuously in response to fluctuations in flow. **User input:** 5-digit floating-point number: 0.00...100.00 s **Factory setting:** 0.00 s
ACTUAL STATUS	Use this function to check the current status of the status output. **Display shows:** NOT CONDUCTIVE CONDUCTIVE
SIMULATION SWITCH POINT	Use this function to activate simulation of the status output. **Options:** OFF ON **Factory setting:** OFF Note! • The "SIMULATION STATUS OUTPUT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measured values are output correctly via the other outputs. Caution: The setting is not saved if the power supply fails.
VALUE SIMULATION SWITCH POINT	Note! This function is not available unless the ON setting was selected in the SIMULATION SWITCH POINT function. Use this function to define the switching response of the status output during the simulation. This value is used to test downstream devices and the flowmeter itself. **User input:** NOT CONDUCTIVE CONDUCTIVE **Factory setting:** NOT CONDUCTIVE Caution: The setting is not saved if the power supply fails.

10.1 Information on the response of the status output

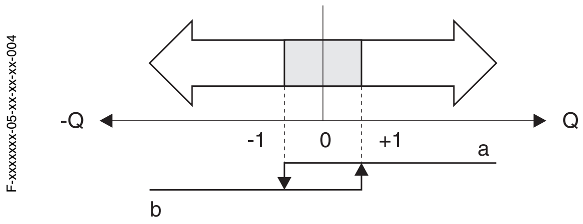
General

If you have configured the status output for “LIMIT” or “FLOW DIRECTION”, you can define the requisite switching points in the ON-VALUE and OFF-VALUE functions. When the measured variable in question reaches one of these predefined values, the status output signal switches as shown in the illustrations below.

Status output configured for direction of flow

The value you entered in the ON-VALUE function defines the switching points for the positive and negative directions of flow.
If, for example, the switching point you define is = 1 kg/h, the status output is not conductive at –1 kg/h and is conductive at +1 kg/h. Set the switching point to 0 if your process calls for direct switchover (no switching hysteresis).
If low flow cut off is used, it is advisable to set hysteresis to a value greater than or equal to the low flow cut off rate.

Switch-off / switch-on point

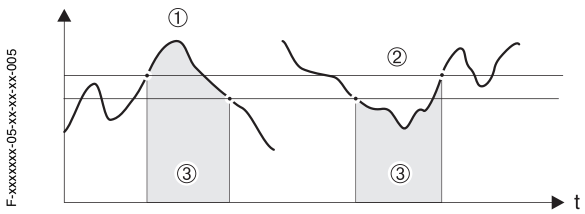


a = Status output conductive
b = Status output not conductive

Status output configured for limit value

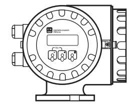
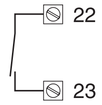
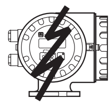
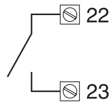
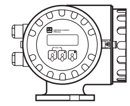
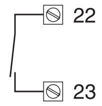
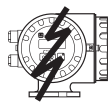
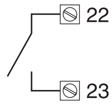
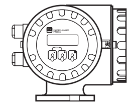
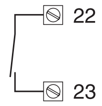
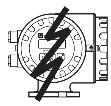
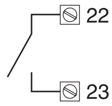
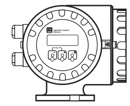
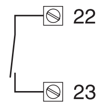
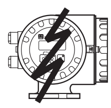
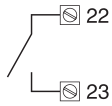
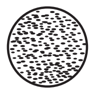
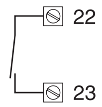
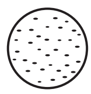
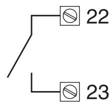
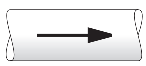
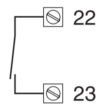
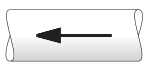
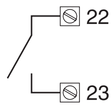
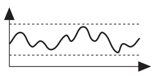
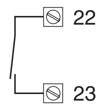
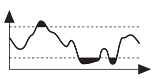
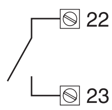
The status output signal switches as soon as the measured variable falls below or exceeds a defined switching point. Application: Monitoring flow or process-related boundary conditions.

Measured variable



① = ON ≤ OFF-VALUE (maximum safety)
② = ON > OFF-VALUE (minimum safety)
③ = Status output off (not conductive)

10.2 Switching action of the status output

Function	State		Open Collector (Transistor)	
ON (operation)	System in measuring mode		conductive	
	System not in measuring mode (power supply failure)		not conductive	
Fault message	System OK		conductive	
	(System or process error) Fault → Error response of outputs, inputs and totalizer		not conductive	
Notice message	System OK		conductive	
	(System or process error) Fault → Continuation of measuring		not conductive	
Fault message or Notice message	System OK		conductive	
	(System or process error) Fault → Response to error or Info → Continuation of measuring		not conductive	
Empty pipe detection (EPD)	Fluid density above response level, e.g. full measuring tube		conductive	
	Fluid density below response level, e.g. empty measuring tube		not conductive	
Flow direction	forward		conductive	
	reverse		not conductive	
Limit value • mass flow • volume flow • density • temperature	Limit value not overshot or undershot		conductive	
	Limit value overshot or undershot		not conductive	

11 Group STATUS INPUT

Function description STATUS INPUT	
This group is not available unless the measuring device is fitted with a status input I/O module.	
ASSIGN STATUS INPUT	Use this function to assign a switching function to the status input. **Options:** OFF RESET TOTALIZER POSITIVE ZERO RETURN ZEROPOINT ADJUSTMENT **Factory setting:** OFF ✎ Note! Positive zero return is active as long as the active level is available at the status input (continuous signal). All other assignments react to a change in level (pulse) at the status input.
ACTIVE LEVEL	Use this function to define whether the assigned function (see ASSIGN STATUS INPUT function) is released when the signal level is present (HIGH) or not present (LOW). **Options:** HIGH LOW **Factory setting:** HIGH
MINIMUM PULSE WIDTH	Use this function to define a minimum width which the input pulse must achieve in order to trigger the defined switching function. **User input:** 20...100 ms **Factory setting:** 50 ms
SIMULATION STATUS INPUT	Use this function to activate simulation of the status input, in other words to trigger the function assigned to the status input (see the ASSIGN STATUS INPUT function on Page 33). **Options:** OFF ON **Factory setting:** OFF ✎ Note! • The “SIMULATION STATUS INPUT” message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measured values are output correctly via the outputs. Caution: The setting is not saved if the power supply fails.

Function description STATUS INPUT	
VALUE SIMULATION STATUS INPUT	✎ Note! This function is not available unless the ON setting was selected in the SIMULATION STATUS INPUT function. Use this function to select the level to be assumed at the status input during the simulation. **Options:** HIGH LOW **Factory setting:** LOW Caution: The setting is not saved if the power supply fails.

12 Group COMMUNICATION

Function description COMMUNICATION	
TAG NAME	Use this function to enter a tag name for the measuring device. You can edit and read this tag name at the local display or via the HART protocol. **User input:** max. 8-character text, permissible: A-Z, 0-9, +,–, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _" (without text)
TAG DESCRIPTION	Use this function to enter a tag description for the measuring device. You can edit and read this tag description at the local display or via the HART protocol. **User input:** max. 16-character text, permissible: A-Z, 0-9, +,–, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _" (without text)
BUS ADDRESS	Use this function to define the address for the exchange of data with the HART protocol. **User input:** 0...15 **Factory setting:** 0 ✎ Note! Addresses 1...15: a constant 4 mA current is applied.
HART PROTOCOL	Use this function to display if the HART protocol is active. **Anzeige:** OFF = HART protocol not aktive ON = HART protocol aktive ✎ Note! The HART protocol can be activated with the selection 4-20 mA HART resp. 4-20 mA (25 mA) HART in the CURRENT SPAN function (see Page 20).
WRITE PROTECTION	Use this function to check whether the measuring device can be write accessed. **Display shows:** OFF = Data exchange is possible ON = Data exchange disabled (an activation is at present not available) **Factory setting:** OFF
MANUFACTURER ID	Use this function to view the manufacturer ID in decimal numerical format. **Display shows:** 17 = (≅ 11 hex) for Endress+Hauser
DEVICE ID	Use this function to view the device ID in hexadecimal numerical format. **Display shows:** 50 = (≅ 80 dez) for Promass 80

13 Group PROCESS PARAMETER

<table>
<tr><th colspan="2">Function description PROCESS PARAMETER</th></tr>
<tr><td>ASSIGN LOW FLOW CUT OFF</td><td>Use this function to assign the switching point for the low flow cut off.

Options:
OFF
MASS FLOW
VOLUME FLOW

Factory setting:
MASS FLOW</td></tr>
<tr><td>ON VALUE LOW FLOW CUT OFF</td><td>Use this function to assign the on value for the low flow cut off.
Low flow cut off is active if the setting is a value not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active.

User input:
5-digit floating-point number

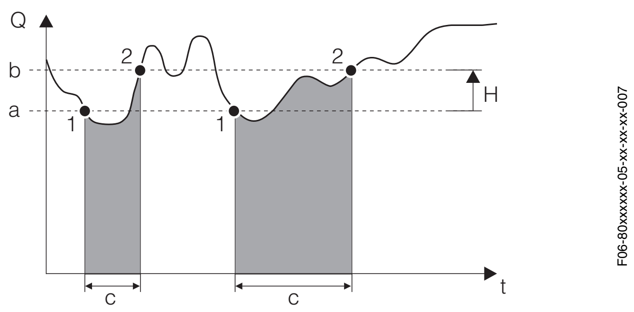
Factory setting:
depends on nominal diameter

✎ Note!
The appropriate unit is taken from the corresponding UNIT function in the group SYSTEM UNITS (see Page 9).</td></tr>
<tr><td>OFF VALUE LOW FLOW CUT OFF</td><td>Use this function to enter the switch-off point for low flow cut off.
Enter the switch-off point as a positive hysteresis value from the switch-on point.

User input:
Integer 0...100%

Factory setting:
50%

Example:



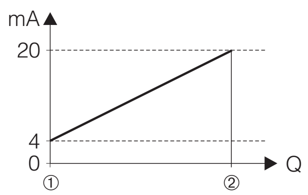
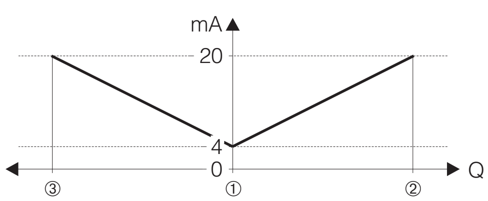
Q = Flow [volume/time]
t = Time
H = Hysteresis
a = ON VALUE LOW FLOW CUT OFF = 200 g/h
b = OFF VALUE LOW FLOW CUT OFF = 10%
c = Low flow cut off active
1 = Low flow cut off is switched on at 200 g/h
2 = Low flow cut off is switched off at 220 g/h</td></tr>
</table>

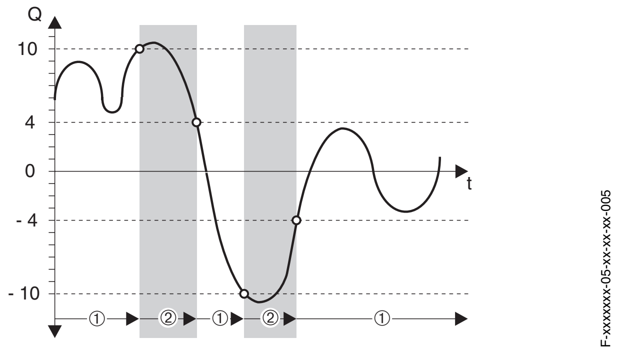
Function description PROCESS PARAMETER	
EMPTY PIPE DETECTION (EPD)	Use this function to activate the empty pipe detection (EPD). With empty measuring tubes the density of the fluid falls below a specified value (see EPD VALUE LOW function). **Options:** OFF ON **Factory setting:** OFF Caution: • Select a correspondingly low EPD VALUE LOW so that the difference to the effective density of the fluid is sufficiently large enough. This ensures that totally empty measuring tubes and not partially filled ones are detected. • For gas measurement we strongly recommend to switch off empty pipe detection.
EPD VALUE LOW	Note! This function is not available unless the ON selection was selected in the EMPTY PIPE DETECTION (EPD) function. Use this function to set an lower threshold for the measured density value, in order to detect possible problems in the process indicated by too low density. **User input:** 5-digit floating-point number **Factory setting:** 0.2000 g/cc
EPD VALUE HIGH	Note! This function is not available unless the ON selection was selected in the EMPTY PIPE DETECTION (EPD) function. Use this function to set an upper threshold for the measured density value. **User input:** 5-digit floating-point number **Factory setting:** 6.0000 g/cc
EPD RESPONSE TIME	Use this function to enter the time span for which the criteria for an empty pipe have to be satisfied without interruption before a notice message or fault message is generated. **User input:** fixed-point number: 1.0...60.0 s **Factory setting:** 1.0 s

Function description PROCESS PARAMETER	
ZERO POINT ADJUST	This function enables a zero point adjustment to be automatically carried out. The new zero point determined by the measuring system is adopted by the ZERO POINT function (see Page 47). **Options:** CANCEL START **Factory setting:** CANCEL Caution: Before carrying out the calibration, please refer to BA 057D/06/en "Promass 80 Operating Instructions" where a detailed description of the zero point adjustment is given. Note! • Programming is locked during zero point adjustment and the display shows: "ZERO ADJUST RUNNING". • If the zero point adjustment is not possible, e.g. with a flow velocity > 0.1 m/s, or has been cancelled, then the alarm message "ZERO ADJUST NOT POSSIBLE" is shown on the display. • If the Promass 80 measuring electronics are fitted with a status input, then the zero point can also be activated by using this input. • After Zero point adjustment is completed, the new zero point can be called up with the E key. If the E key is pressed again, you return to the ZERO POINT ADJUST function.
DENSITY SET VALUE	In this function, enter the density set value of the particular fluid for which you want to carry out a field density adjustment. **User input:** 5 digit floating-point number, incl. units (corresponding to 0.1...5.9999 kg/l) Note! • The preset density entered here should not vary from the actual fluid density by a more than ±10%. • The appropriate unit is taken from the corresponding UNIT function in the group SYSTEM UNITS (see Page 9).
MEASURE FLUID	In this function the actual density of the fluid is measured for the density adjustment. **Options:** CANCEL START

Function description PROCESS PARAMETER	
DENSITY ADJUST	With this function a density adjustment can be carried out on site. The density set value will thus be recalculated and stored. This ensures that the values dependent on density calculations (e.g. volume flow) are as accurate as possible. Caution: Before carrying out a density adjustment, please refer to BA 057D/06/en “Promass 80 Operating Instructions” where a detailed description of the density adjustment is given. Note! The density adjustment can be executed if: • The sensor does not accurately measure the density which the operator expects based on laboratory trials. • The characteristics of the fluid are outside the measuring points set at the factory or reference conditions under which the flowmeter has been calibrated. • The plant is used solely for measuring a fluid whose density is to be determined very accurately under constant conditions. **User input:** CANCEL DENSITY ADJUST **Factory setting:** CANCEL
RESTORE ORIGINAL	With this function the original density coefficient determined at the factory are restored. **Options:** NO YES **Factory setting:** NO
PRESSURE MODE	Use this function to configure an automatic pressure correction. In this way, the effect of a pressure deviation between the calibration and process pressures on the measured error for mass flow is compensated for, (see also Operating Instructions *PROline promass 80*, BA 057D/06/en, Accuracy Chapter). **Options:** OFF FIX (A fixed process pressure for pressure correction is specified) **Factory setting:** OFF
PRESSURE	Note! This function is not available unless FIX was selected in the PRESSURE MODE function. Use this function to enter the value for the process pressure which should be used during pressure correction. **User input:** 7-digit floating-point number **Factory setting:** 0 bar g Note! The appropriate unit is taken from the function group SYSTEM UNITS (see Page 9).

14 Group SYSTEM PARAMETER

Function description SYSTEM PARAMETER	
INSTALLATION DIRECTION SENSOR	Use this function to reverse the sign of the measured variable, if necessary. **Options:** NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) **Factory setting:** NORMAL ✎ Note! Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate).
MEASURING MODE	Use this function to define the measuring mode for all outputs and the internal totalizer. **Options:** STANDARD SYMMETRY **Factory setting:** STANDARD The responses of the individual outputs and the internal totalizer in each of the measuring modes are described in detail below: **Current and frequency output** STANDARD The output signals of the current and frequency output are proportional to the measured variable. The flow components outside the scaled measuring range (between VALUE 0_4 mA or VALUE F LOW ① and the VALUE 20 mA or VALUE F HIGH ②) are not taken into account for signal output, but a message “CURRENT RANGE AT FULL SCALE VALUE” or “FREQUENCY RANGE AT FULL SCALE VALUE” is issued. Example for current output:  F-xxxxxxx-05-xx-xx-xx-003 SYMMETRY The output signals of the current and frequency output are independent of the direction of flow (absolute amount of the measured variable). The “VALUE 20 mA” or “VALUE F HIGH” ③ (e.g. backflow) corresponds to the mirrored VALUE 20 mA or VALUE F HIGH ② (e.g. flow). Example for current output:  F-xxxxxxx-05-xx-xx-xx-007

Function description SYSTEM PARAMETER	
MEASURING MODE (Continuation)	**Pulse output** STANDARD Only positive flow components are totaled. Negative components are not taken into account. SYMMETRY Positive and negative flow components are taken into account. ✎ Note! The direction of flow can be output via the configurable status output. **Status output** ✎ Note! Only if in the ASSIGN STATUS function the LIMIT option is selected. STANDARD The status output signal switches at the defined switching points. SYMMETRY The status output signal switches at the defined switching points, irrespective of the sign. In other words, if you define a switching point with a positive sign the status output signal switches as soon as the value is reached in the negative direction (negative sign) (see illustration). Example for the SYMMETRY measuring mode: Switch-on point: Q = 4 Switch-off point: Q = 10 ① = Status output switched on (conductive) ② = Status output switched off (non-conductive)  **Totalizer** STANDARD Only positive flow components are totaled. Negative components are not taken into account. SYMMETRY The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered.

Function description SYSTEM PARAMETER	
POSITIVE ZERO RETURN	Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. This setting acts on all functions and outputs of the measuring device. **Options:** OFF ON (signal output is set to zero flow value, temperature and density are output normally) **Factory setting:** OFF
DENSITY DAMPING	The density filter allows the sensitivity of the density measuring signal to be lowered with respect to variations in the density of the fluid, e.g. with inhomogeneous liquids. **User input:** max. 5-digit number, including unit: 0.00...100.00 s **Factory setting:** 0.00 s ✎ Note! The damping acts on all functions and outputs of the measuring device.
FLOW DAMPING	Using the interference blanking (= time constant for exponential filter) the sensitivity of the flow measurement signal can be reduced with respect to transient flows and interference peaks; e.g. with fluid containing solids or gas bubbles, etc. **User input:** 0...100 s **Factory setting:** 0 s ✎ Note! The damping acts on all functions and outputs of the measuring device.

15 Group SENSOR DATA

Function description SENSOR DATA	
All sensor data, including calibration factor, zero point, nominal diameter, etc. are set at the factory. All the sensor's parameter settings are saved on the S-DAT™ memory chip. Caution: Under normal circumstances you should not change these parameter settings, because changes affect numerous functions of the entire measuring facility in general, and the accuracy of the measuring system in particular. Consequently, most of the functions described below can be accessed only by entering a special **service code**, which is not the same as your private code number. Contact the E+H service organization if you have any questions about these functions.	
K-FACTOR	This function shows the current calibration factor for the sensor. **Factory setting:** depends on nominal diameter and calibration Note! If the service code is used to call this function, this value can be edited.
ZERO POINT	This function shows the current zero-point correction value for the sensor. The zero-point correction factor is calculated and set at the factory. **User input:** max. 5-digit number: –99999...+99999 **Factory setting:** depends on calibration
NOMINAL DIAMETER	This function shows the nominal diameter for the sensor. The nominal diameter depends on the size of the sensor and is set at the factory. **Factory setting:** depends on the size of the sensor Note! If the service code is used to call this function, this value can be edited.
TEMPERATURE COEFFICIENT KM	This function shows the temperatur coefficient KM.
TEMPERATURE COEFFICIENT KM 2	This function shows the temperatur coefficient KM 2.
TEMPERATURE COEFFICIENT KT	This function shows the temperatur coefficient KT.
CALIBRATION COEFFICIENT KD 1	This function shows the calibration coefficient KD 1.
CALIBRATION COEFFICIENT KD 2	This function shows the calibration coefficient KD 2.

Function description SENSOR DATA	
DENSITY COEFFICIENT C 0	This function shows the actual density coefficient C 0. Caution: A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFFICIENT C 1	This function shows the actual density coefficient C 1. Caution: A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFFICIENT C 2	This function shows the actual density coefficient C 2. Caution: A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFFICIENT C 3	This function shows the actual density coefficient C 3. Caution: A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFFICIENT C 4	This function shows the actual density coefficient C 4. Caution: A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFFICIENT C 5	This function shows the actual density coefficient C 5. Caution: A density adjustment can alter the calibration value of this coefficient.
MINIMAL TEMPERATURE MEASURED	Display of the lowest fluid temperature measured.
MAXIMAL TEMPERATURE MEASURED	Display of the highest fluid temperature measured.
MINIMAL TEMPERATURE CARRIER TUBE	Display of the lowest carrier tube temperature measured.
MAXIMAL TEMPERATURE CARRIER TUBE	Display of the highest carrier tube temperature measured.

16 Group SUPERVISION

Function description SUPERVISION	
ACTUAL SYSTEM CONDITION	Use this function to check the current system status. **Display shows:** "SYSTEM OK" or the fault / notice message with the highest priority.
PREVIOUS SYSTEM CONDITION	Use this function to view the fifteen most recent fault and notice messages since measuring last started. **Display shows:** The 15 most recent fault or notice messages.
ASSIGN SYSTEM ERROR	Use this function to view all system messages and the associated error categories (fault message or notice message). If you select a single system fault you can change its error category. **Display shows:** List of system errors ✎ Note! • Press the E key twice to call the ERROR CATEGORY function. • Use the key combination or select CANCEL in the system error list to exit the function.
ERROR CATEGORY	Use this function to define whether a system fault triggers a notice message or a fault message. If you select "FAULT MESSAGES", all outputs respond to a fault in accordance with their defined error response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note! • Press the E key twice to call the ASSIGN SYSTEM ERROR function. • Use the key combination to exit the function.
ASSIGN PROCESS ERROR	Use this function to view all process errors and the associated error categories (fault message or notice message). If you select a single process error you can change its error category. **Display shows:** List of process errors ✎ Note! • Press the E key twice to call the ERROR CATEGORY function. • Use the key combination or select CANCEL in the process error list to exit the function.

Function description SUPERVISION	
ERROR CATEGORY	Use this function to define whether a process error triggers a notice message or a fault message. If you select “FAULT MESSAGES”, all outputs respond to a fault in accordance with their defined error response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) Note! • Press the E key twice to call the ASSIGN PROCESS ERROR function. • Use the key combination to exit the function.
ALARM DELAY	Use this function to define a time span for which the criteria for an error have to be satisfied without interruption before an error or notice message is generated. Depending on the setting and the type of fault, this suppression acts on: • Displa • Current output • Frequency output • Status output **User input:** 0...100 s (in steps of one second) **Factory setting:** 0 s Caution: If this function is activated fault and notice messages are delayed by the time corresponding to the setting before being forwarded to the higher-order controller (process controller, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If fault and notice messages cannot be suppressed, a value of 0 seconds must be entered here.
SYSTEM RESET	Use this function to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (restart without interrupting line supply) **Factory setting:** NO
TROUBLESHOOTING	Use this function to rectify errors in the EEPROM (Error message AMP SW-EEPROM, # 012). The EEPROM is divided into a number of blocks. Only blocks which an error has occurred are shown. Select the block in question and press the E key to clear the error. Note! When you clear an error in a block, the parameters of the block you select are reset to their factory settings.

17 Group SIMULATION SYSTEM

Function description SIMULATION SYSTEM	
SIMULATION FAILSAFE MODE	Use this function to set all inputs, outputs and totalizer to their defined fault response modes, in order to check whether they respond correctly. During this time, the words “SIMULATION FAILSAFE MODE” appear on the display. **Options:** OFF ON **Factory setting:** OFF
SIMULATION MEASURAND	Use this function to set all inputs, outputs and totalizer to their defined flow-response modes, in order to check whether they respond correctly. During this time, the words “SIMULATION MEASURAND” appear on the display. **Options:** OFF MASS FLOW VOLUME FLOW DENSITY TEMPERATURE **Factory setting:** OFF Caution: • The measuring device cannot be used for measuring while this simulation is in progress. • The setting is not saved if the power supply fails.
VALUE SIMULATION MEASURAND	Note! This function is not available unless the SIMULATION MEASURAND function is active. Use this function to define a selectable value (e.g. 12 kg/s). This value is used to test downstream devices and the flowmeter itself. **User input:** 5-digit floating-point number **Factory setting:** 0 Caution: The setting is not saved if the power supply fails.

18 Group SENSOR VERSION

Function description SENSOR VERSION	
SERIAL NUMBER	Use this function to view the serial number of the sensor.
SENSOR TYPE	Use this function to view the sensor type (e.g. Promass F).
SOFTWARE REVISION NUMBER S-DAT	Use this function to view the software revision number of the S-DAT.

19 Group AMPLIFIER VERSION

Function description AMPLIFIER VERSION	
SOFTWARE REVISION NUMBER AMPLIFIER	Use this function to view the software revision number of the amplifier.
I/O MODUL TYPE	Use this function to view the I/O type (input/output type).
SOFTWARE REVISION NUMBER I/O	Use this function to view the software revision number of the I/O module.

20 Factory settings

20.1 SI units (not for USA and Canada)

20.1.1 Low flow cut off, full scale value, pulse value

Nominal diameter [mm]	Low flow cut off (approx. v = 0.04 m/s)		Full scale value (approx. v = 2 m/s)		Pulse value (approx. 2 pulse/s at 2 m/s)	
1	0.08	kg/h	4	kg/h	0.001	kg/p
2	0.40	kg/h	20	kg/h	0.010	kg/p
4	1.80	kg/h	90	kg/h	0.010	kg/p
8	8.00	kg/h	400	kg/h	0.100	kg/p
15	26.00	kg/h	1300	kg/h	0.100	kg/p
15 FB	72.00	kg/h	3600	kg/h	1.000	kg/p
25	72.00	kg/h	3600	kg/h	1.000	kg/p
25 FB	180.00	kg/h	9000	kg/h	1.000	kg/p
40	180.00	kg/h	9000	kg/h	1.000	kg/p
40 FB	300.00	kg/h	15000	kg/h	10.000	kg/p
50	300.00	kg/h	15000	kg/h	10.000	kg/p
80	720.00	kg/h	36000	kg/h	10.000	kg/p
100	1200.00	kg/h	60000	kg/h	10.000	kg/p
* DN 15, 25, 40 “FB” = Full bore versions Promass I						

20.1.2 Language

Country	Language
Australia	English
Austria	Deutsch
Belgium	Francais
Denmark	Dansk
Finland	Suomi
France	Francais
Germany	Deutsch
Great Britain	English
Hong Kong	English
Hungary	English
India	English
Instruments International	English
Italy	Italiano
Japan	Japanese
Malaysia	English
Netherland	Nederlands
Norway	Norsk
Singapore	English
South Africa	English
Spain	Espanol
Sweden	Svenska
Switzerland	Deutsch
Thailand	English

20.1.3 Density, length, temperature

	Unit
Density	kg/l
Length	mm
Temperature	°C

20.2 US units (only for USA and Canada)

20.2.1 Low flow cut off, full scale value, pulse value

Nominal diameter [mm]	Low flow cut off (approx. v = 0.04 m/s)		Full scale value (approx. v = 2 m/s)		Pulse value (approx. 2 pulse/s at 2 m/s)	
1	0.003	lb/min	0.15	lb/min	0.002	lb/p
2	0.015	lb/min	0.75	lb/min	0.020	lb/p
4	0.066	lb/min	3.30	lb/min	0.020	lb/p
8	0.300	lb/min	15.00	lb/min	0.200	lb/p
15	1.000	lb/min	50.00	lb/min	0.200	lb/p
15 FB	2.600	lb/min	130.00	lb/min	2.000	lb/p
25	2.600	lb/min	130.00	lb/min	2.000	lb/p
25 FB	6.600	lb/min	330.00	lb/min	2.000	lb/p
40	6.600	lb/min	330.00	lb/min	2.000	lb/p
40 FB	11.000	lb/min	550.00	lb/min	20.000	lb/p
50	11.000	lb/min	550.00	lb/min	20.000	lb/p
80	26.000	lb/min	1300.00	lb/min	20.000	lb/p
100	44.000	lb/min	2200.00	lb/min	20.000	lb/p
* DN 15, 25, 40 “FB” = Full bore versions Promass I						

20.2.2 Language, density, length, temperature

	Unit
Language	English
Density	g/cc
Length	INCH
Temperature	°F

21 Index of key words

F (continued)

Europe

Austria
❑ Endress+Hauser Ges.m.b.H.
Wien
Tel. (01) 88056-0, Fax (01) 88056-35

Belarus
❑ Belorgsintez
Minsk
Tel. (0172) 508473, Fax (0172) 508583

Belgium / Luxembourg
❑ Endress+Hauser N.V.
Brussels
Tel. (02) 2480600, Fax (02) 2480553

Bulgaria
INTERTECH-AUTOMATION
Sofia
Tel. (02) 664869, Fax (02) 9631389

Croatia
❑ Endress+Hauser GmbH+Co.
Zagreb
Tel. (01) 6637785, Fax (01) 6637823

Cyprus
I+G Electrical Services Co. Ltd.
Nicosia
Tel. (02) 484788, Fax (02) 484690

Czech Republic
❑ Endress+Hauser GmbH+Co.
Praha
Tel. (026) 6784200, Fax (026) 6784179

Denmark
❑ Endress+Hauser A/S
Søborg
Tel. (70) 131132, Fax (70) 132133

Estonia
ELVI-Aqua
Tartu
Tel. (7) 441638, Fax (7) 441582

Finland
❑ Endress+Hauser Oy
Helsinki
Tel. (0204) 83160, Fax (0204) 83161

France
❑ Endress+Hauser S.A.
Huningue
Tel. (389) 696768, Fax (389) 694802

Germany
❑ Endress+Hauser Messtechnik GmbH+Co.
Weil am Rhein
Tel. (07621) 975-01, Fax (07621) 975-555

Great Britain
❑ Endress+Hauser Ltd.
Manchester
Tel. (0161) 2865000, Fax (0161) 9981841

Greece
I & G Building Services Automation S.A.
Athens
Tel. (01) 9241500, Fax (01) 9221714

Hungary
Mile Ipari-Elektro
Budapest
Tel. (01) 4319800, Fax (01) 4319817

Iceland
BIL ehf
Reykjavik
Tel. (05) 619616, Fax (05) 619617

Ireland
Flomeaco Company Ltd.
Kildare
Tel. (045) 868615, Fax (045) 868182

Italy
❑ Endress+Hauser S.p.A.
Cernusco s/N Milano
Tel. (02) 921921, Fax (02) 92107153

Latvia
Rino TK
Riga
Tel. (07) 315087, Fax (07) 315084

Lithuania
UAB "Agava"
Kaunas
Tel. (07) 202410, Fax (07) 207414

Netherland
❑ Endress+Hauser B.V.
Naarden
Tel. (035) 6958611, Fax (035) 6958825

Norway
❑ Endress+Hauser A/S
Tranby
Tel. (032) 859850, Fax (032) 859851

Poland
❑ Endress+Hauser Polska Sp. z o.o.
Warszawy
Tel. (022) 7201090, Fax (022) 7201085

Portugal
Tecnisis, Lda
Cacém
Tel. (21) 4267290, Fax (21) 4267299

Romania
Romconseng S.R.L.
Bucharest
Tel. (01) 4101634, Fax (01) 4112501

Russia
❑ Endress+Hauser Moscow Office
Moscow
Tel. (095) 1587564, Fax (095) 1589871

Slovakia
Transcom Technik s.r.o.
Bratislava
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Endress+Hauser
The Power of Know How

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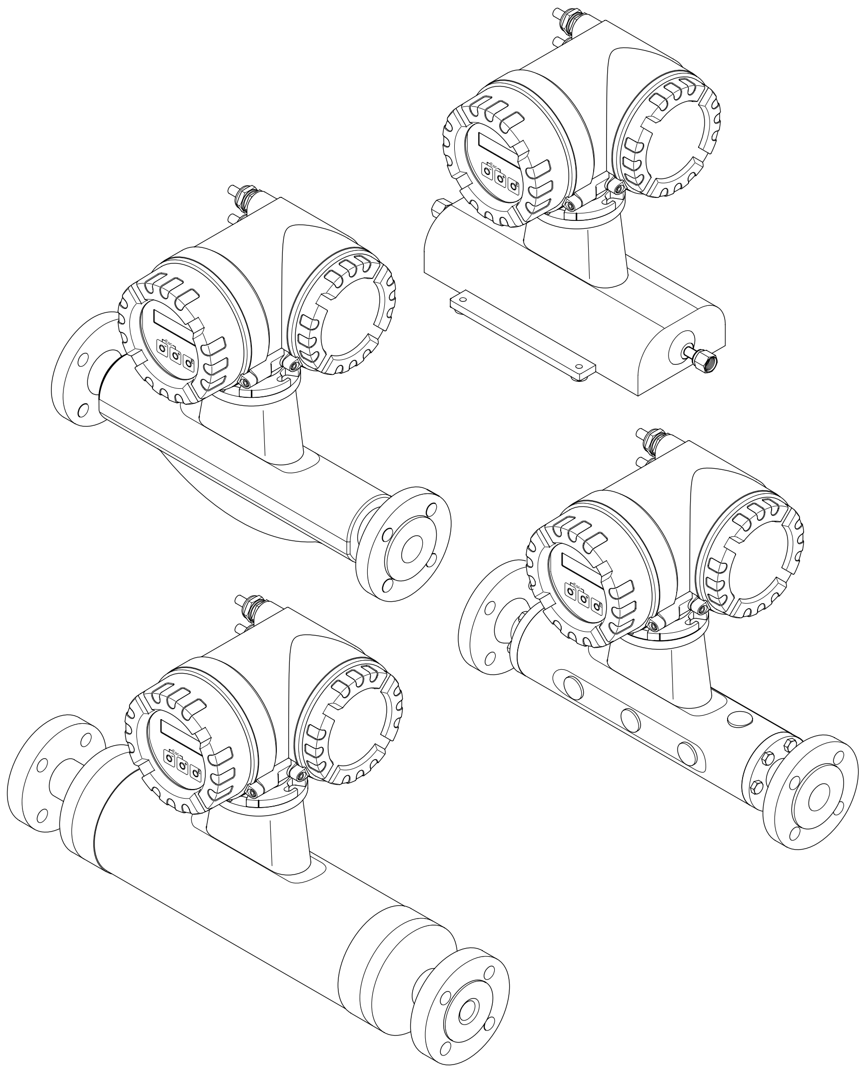
BA 058D/06/en/11.01
FM+SGML 6.0

BA 057D/06/en/11.00
50098468

Valid as of software version:
V 1.00.XX (amplifier)
V 1.00.XX (communication)

promass 80
Coriolis Mass Flow Measuring System

Operating Instructions



PRO line
Evolution in flow

Endress + Hauser
The Power of Know How

Brief operating instructions

These brief operating instructions show you how to configure your measuring device quickly and easily:

Safety instructions	Page 7

▼

Installation	Page 13

▼

Wiring	Page 23

▼

Switching on the measuring device	Page 37

▼

Display and operating elements	Page 31 ff.

▼

Commissioning with "QUICK SETUP"	Page 38
You can commission your measuring device quickly and easily, using the special "Quick Setup" menu. It enables you to configure important basic functions using the local display, for example display language, measured variables, units of measures, type of signal, etc. The following functions can be configured separately as necessary: – Zero point adjustment – Density calibration – Configuration of the current output (active/passive)	

▼

Customer specific configuration	Page 32 ff.
Complex measuring operations necessitate additional functions that you can configure as necessary with the aid of the function matrix, and customise to suit your process parameters. ✎ Note: All functions are described in detail, as is the function matrix itself, in the **"Description of Device Functions"** manual, which is a separate part of this Operating Instruction.	

▼
▼

Trouble-shooting	Page 49 ff.
Always start trouble-shooting with the checklist on Page 49, if faults occur after start-up or during operation. The routine takes you directly to the cause of the problem and the appropriate remedial measures. **Returning devices** If you return a measuring device to Endress+Hauser for repair or calibration, you must enclose the duly completed "Safety regulation" form with the device. You will find a preprinted blank of the "Safety regulation" form at the back of this manual.	

“QUICK SETUP” commissioning

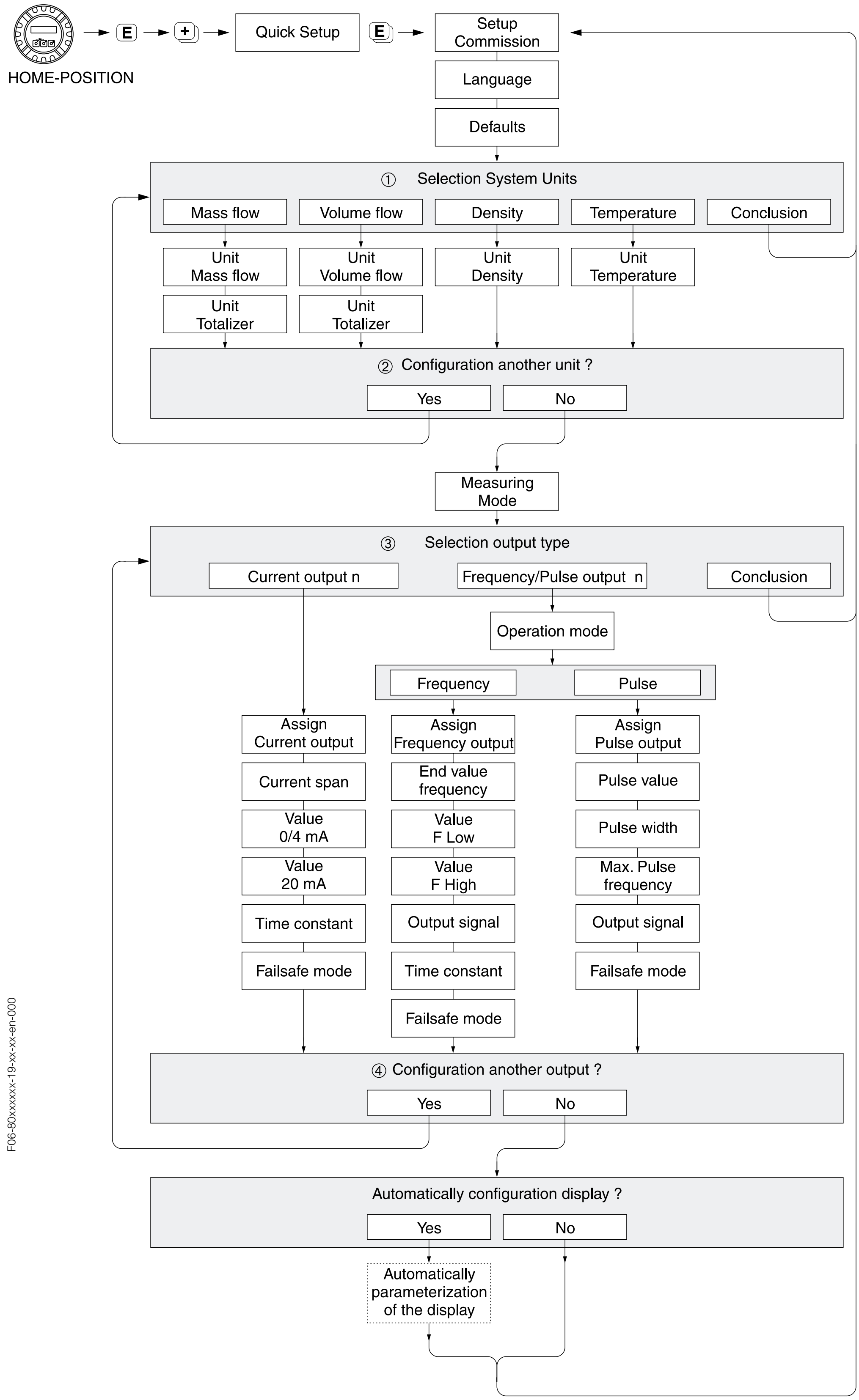


Table of contents

1 Safety instructions

1.1 Designated use

The measuring device described in this Operating Instruction is to be used only for measuring the mass flow rate of fluids and gases. At the same time, the system also measures fluid density and fluid temperature. These parameters are then used to calculate other variables such as volume flow. Fluids with widely differing properties can be measured, for example:

- Chocolate, condensed milk, liquid sugar
- Oils, fats
- Acids, alkalis, lacquers, paints, solvents and cleaning agents
- Pharmaceuticals, catalysts, inhibitors
- Suspensions
- Gases, liquefied gases, etc.

The manufacturer accepts no liability for damages resulting from incorrect use or use not as designated.

1.2 Installation, commissioning and operation

Note the following points:
- Installation, connection to the electricity supply, commissioning and maintenance of the device must be carried out by trained, qualified specialists authorised to perform such work by the facility's owner operator. The specialist must have read and understood this Operating Instruction and must follow the instructions it contains.
- The device must be operated by persons authorised and trained by the facility's owner-operator. Strict compliance with the instructions in the Operating Instruction is mandatory.
- Endress+Hauser will be happy to assist in clarifying the chemical resistance properties of parts wetted by special fluids, including fluids used for cleaning. However the user is responsible for the choice of fluid wetted materials for their in-process resistance to corrosion. The manufacturer refuses to accept liability.
- The installer must ensure that the measuring system is correctly wired in accordance with the wiring diagrams. The transmitter must be grounded, unless the power supply is galvanically insulated.
- Invariably, local regulations governing the opening and repair of electrical devices apply.

1.3 Operational safety

Note the following points:
- Measuring systems for use in hazardous environments are accompanied by separate “Ex documentation”, which is an *integral part* of this Operating Instruction. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory. The symbol on the front of this supplementary Ex documentation indicates the approval and the test center (Ex Europe, FM USA, SP Canada).
- The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326, and NAMUR recommendation NE 21.
- The manufacturer reserves the right to modify technical data without prior notice. Your E+H distributor will supply you with current information and updates to this Operating Instruction.

1.4 Return

The following procedures must be carried out before a flowmeter requiring repair or calibration, for example, is returned to Endress+Hauser:

- Always enclose a duly completed “Safety regulation” form. Only then can Endress+Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EN 91/155/EEC.
- Remove all residues. Pay special attention to the grooves for seals and crevices which could contain residues. This is particularly important if the substance is hazardous to health, e.g. flammable, toxic, caustic, carcinogenic, etc.
  With Promass A and Promass M the threaded process connections must first be removed from the sensor and then cleaned.

Note:
You will find a preprinted blank of the “Safety regulation” form at the back of this manual.

Warning:
- Do not return a measuring device if you are not absolutely certain that all traces of hazardous substances have been removed, e.g. substances which have penetrated crevices or diffused through plastic.
- Costs incurred for waste disposal and injury (burns, etc.) due to inadequate cleaning will be charged to the owner operator.

1.5 Notes on safety conventions and icons

The devices are designed to meet state-of-the-art safety requirements, have been tested, and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations in accordance with EN 61010 “Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures”. They can, however, be a source of danger if used incorrectly or for other than the designated use.
Consequently, always pay particular attention to the safety instructions indicated in this Operating Instruction by the following icons:

Warning:
“Warning” indicates an action or procedure which, if not performed correctly, can result in injury or a safety hazard. Comply strictly with the instructions and proceed with care.

Caution:
“Caution” indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.

Note:
“Note” indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

2 Identification

2.1 Device designation

The “Promass 80” flow measuring system consists of the following components:
- Promass 80 transmitter
- Promass F, Promass M, Promass A or Promass I sensor

In the *compact version*, transmitter and sensor form a single mechanical unit; in the *remote version* they are installed separately.

2.1.1 Nameplate of the transmitter

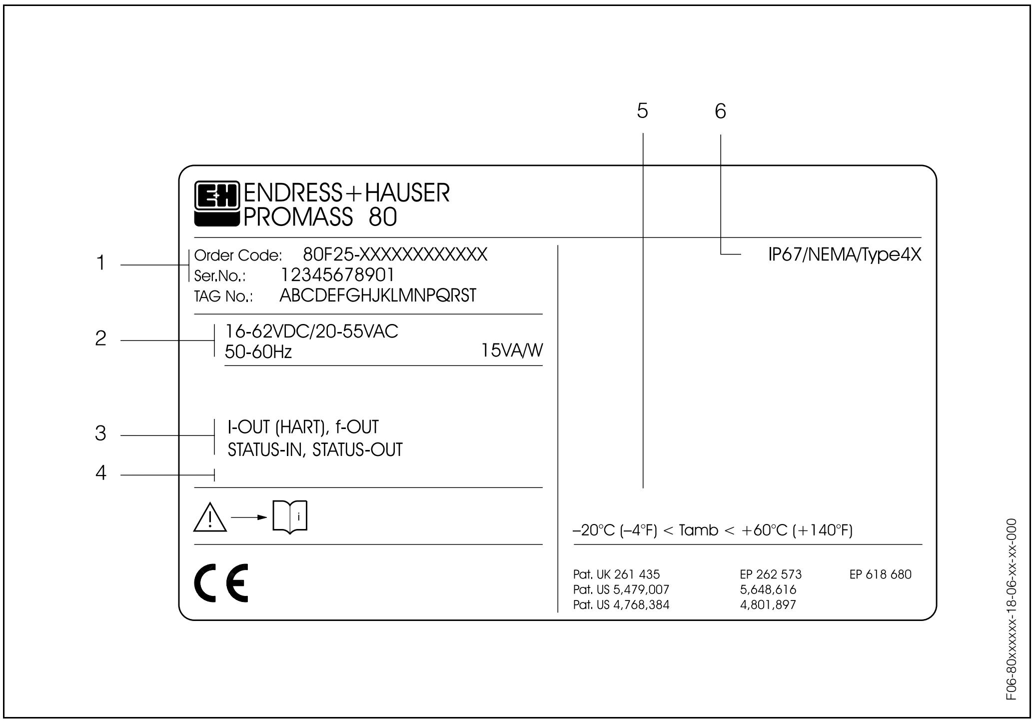


Fig. 1: Nameplate specifications for the “Promass 80” transmitter (example)

1 *Ordering code/serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits.*
2 *Power supply / frequency: 16...62 V DC / 20...55 V AC / 50...60 Hz*
Power consumption: 15 VA / W
3 *Available inputs / outputs:*
I-OUT (HART): with current output (HART)
f-OUT: with pulse/frequency output
STATUS-IN: with status input (auxiliary input)
STATUS-OUT: with status output (switching output)
4 *Reserved for information on special products*
5 *Ambient temperature range*
6 *Degree of protection*

2.1.2 Nameplate of the sensor

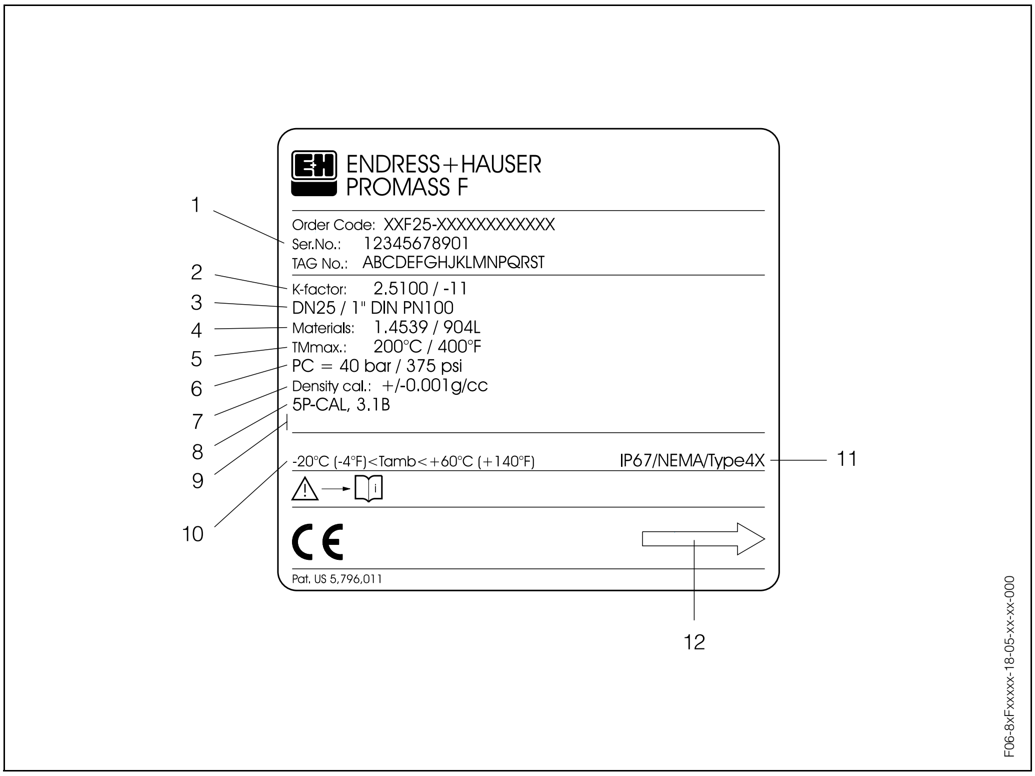


Fig. 2: Nameplate specifications for the "Promass F" sensor (example)

1	*Ordering code/serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits.*
2	*Calibration factor: 2.510; zero point: –11*
3	*Nominal diameter: DN 25 / 1"* *Pressure rating: DIN PN 100 bar*
4	*Material of measuring tubes: Stainless steel 1.4539/904L*
5	*TMmax +200 °C / +400 °F (max. fluid temperature)*
6	*Pressure range of secondary containment: max. 40 bar (375 psi)*
7	*Accuracy of density measurement: ± 0.001 g/cc*
8	*Additional information (examples):* *– With 5-point calibration* *– With 3.1 B certification for fluid wetted materials*
9	*Reserved for information on special products*
10	*Ambient temperature range*
11	*Degree of protection*
12	*Flow direction*

2.2 CE mark, declaration of conformity

The devices are designed to meet state-of-the-art safety requirements, have been tested, and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations in accordance with EN 61010 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures".
The measuring system described in this Operating Instruction thus complies with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

2.3 Registered trademarks

KALREZ ®, VITON ®
are registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP ®
is a registered trademark of Ladish & Co., Inc., Kenosha, USA

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HART ®
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S-DAT™, FieldTool™, FieldCheck™, Applicator™
are registered trademarks of Endress+Hauser Flowtec AG, Reinach, CH

3 Installation

3.1 Incoming acceptance, transport and storage

3.1.1 Incoming acceptance

On receipt of the goods, check the following points:
- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

3.1.2 Transport

The following instructions apply to unpacking and to transporting the device to its final location:

- Transport the devices in the containers in which they are delivered.
- The covers or caps fitted to the process connections prevent mechanical damage to the sealing faces and the ingress of foreign matter to the measuring tube during transportation and storage. Consequently, do not remove these covers or caps until immediately before installation.
- Do not lift measuring devices of nominal diameters DN 40...100 by the transmitter housing or the connection housing in the case of the remote version (Fig. 3). Use webbing slings slung round the two process connections. Do not use chains, as they could damage the housing.
- In the case of the Promass M / DN 80 sensor, use only the lifting eyes on the flanges to lift the assembly.

Warning:
Risk of injury if the measuring device slips. The center of gravity of the assembled measuring device might be higher than the points around which the slings are slung.
At all times, therefore, make sure that the device does not unexpectedly turn around its axis or slip.

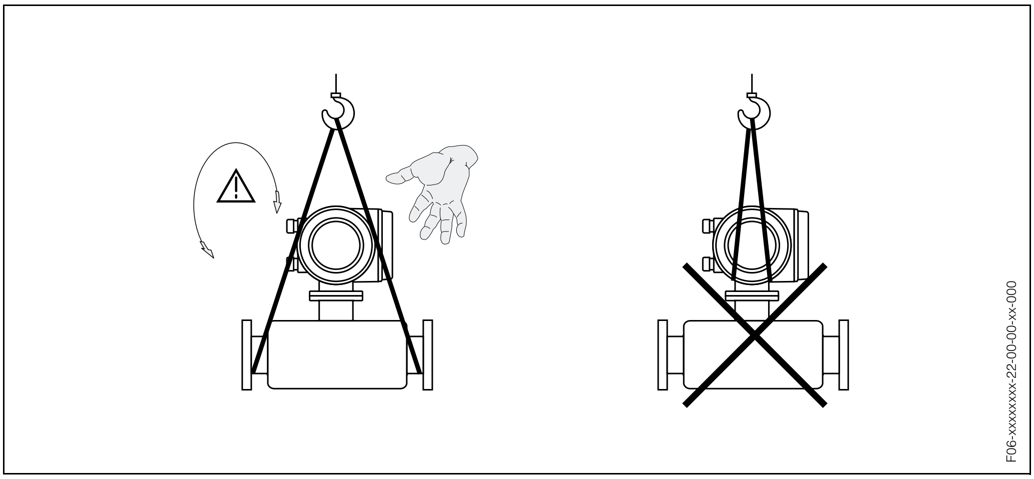


Fig. 3: Instructions for transporting sensors with DN 40...100

3.1.3 Storage

Note the following points:
- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The permissible storage temperature is –40...+80 °C (preferably +20 °C).
- Do not remove the protective covers or caps on the process connections until you are ready to install the device.

3.2 Installation conditions

Note the following points:

- No special measures such as supports are necessary. External forces are absorbed by the construction of the instrument, for example the secondary containment.
- The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe vibrations.
- No special precautions need to be taken for fittings which create turbulence (valves, elbows, T-pieces, etc.), as long as no cavitation occurs.
- For mechanical reasons and in order to protect the pipe, it is advisable to support heavy sensors.

3.2.1 Dimensions

Dimensions and the fitting lengths of the transmitter and sensor are on Page 84 ff.

3.2.2 Mounting location

Entrained air or gas bubbles in the measuring tube can result in an increase in measuring errors. Avoid the following locations:

- Highest point in a run. Risk of air accumulating.
- Directly upstream from an open pipe outlet in a down pipe.

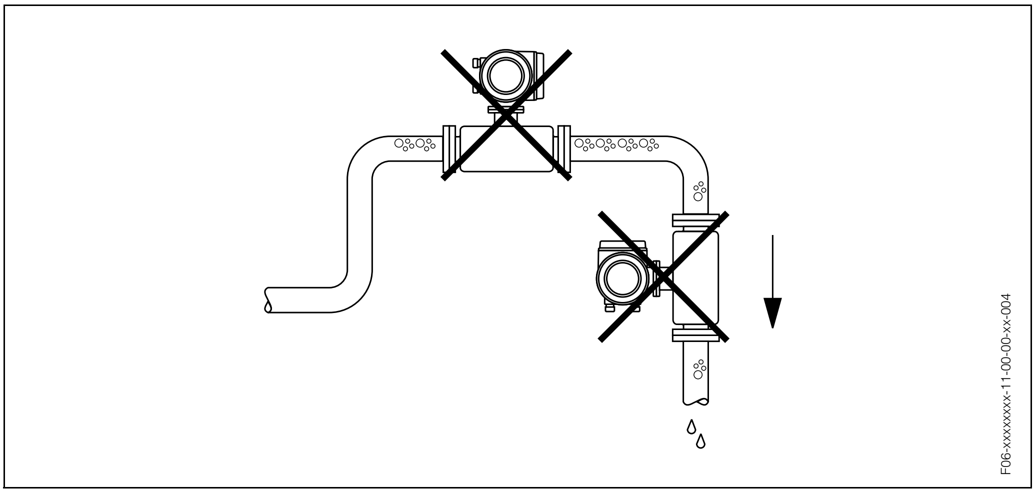


Fig. 4: Mounting location

The proposed configuration in Fig. 5, however, permits installation in an open down pipe. Pipe restrictors or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor from running empty while measurement is in progress.

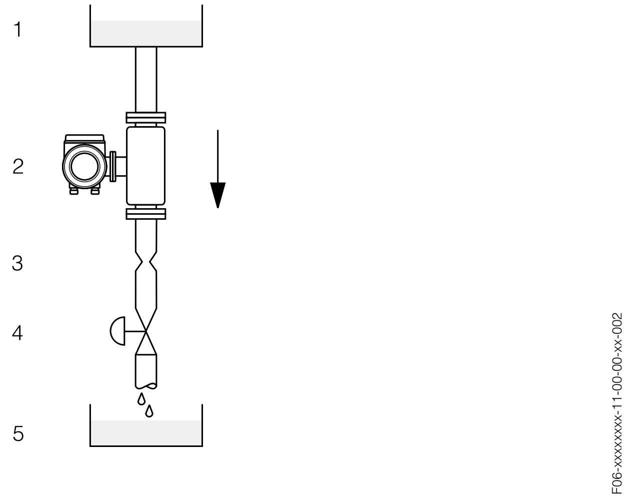


Fig. 5: Installation in a down pipe (e.g. for batching applications)

1 Supply tank
2 Sensor
3 Orifice, pipe restrictions (see Table)
4 Valve
5 Batching tank

Promass F, M / DN	8	15	25	40	50	80	100
Ø orifice / pipe restriction	6 mm	10 mm	14 mm	22 mm	28 mm	50 mm	65 mm

Promass A / DN	1	2	4
Ø orifice / pipe restriction	0.8 mm	1.5 mm	3.0 mm

Promass I / DN	8	15	15 [1)]	25	25 [1)]	40	40 [1)]	50
Ø orifice / pipe restriction	6 mm	10 mm	15 mm	14 mm	24 mm	22 mm	35 mm	28 mm
[1)] DN 15, 25, 40 “FB” = Full bore versions of Promass I								

System pressure
It is important to ensure that cavitation does not occur, because it would influence the oscillation of the measuring tube. No special measures need to be taken for fluids which have properties similar to water under normal conditions.
In the case of liquids with a low boiling point (hydrocarbons, solvents, liquefied gases) or in suction lines, it is important to ensure that pressure does not drop below the vapour pressure and that the liquid does not start to boil. It is also important to ensure that the gases that occur naturally in many liquids do not outgas. Such effects can be prevented when system pressure is sufficiently high.

Consequently, it is generally best to install the sensor:
- downstream from pumps (no risk of partial vacuum),
- at the lowest point in a vertical pipe.

3.2.3 Orientation

Orientation Promass A

Vertical:
Recommended orientation with upward direction of flow. When fluid is not flowing, entrained solids will sink down and gases will rise away from the measuring tube. The measuring tubes can be completely drained and protected against solids build-up.

Horizontal:
When installation is correct the transmitter housing is above or below the pipe. This arrangement means that no gas and air accumulations and solid deposits can accumulate in the curved measuring tube (single-tube system).
Do not install the sensor in such a way that it is suspended in the pipe, in other words without support or attachment. This is to avoid excessive strain at the process connection. The base plate of the sensor housing is designed for mounting on a tabletop, wall or post.

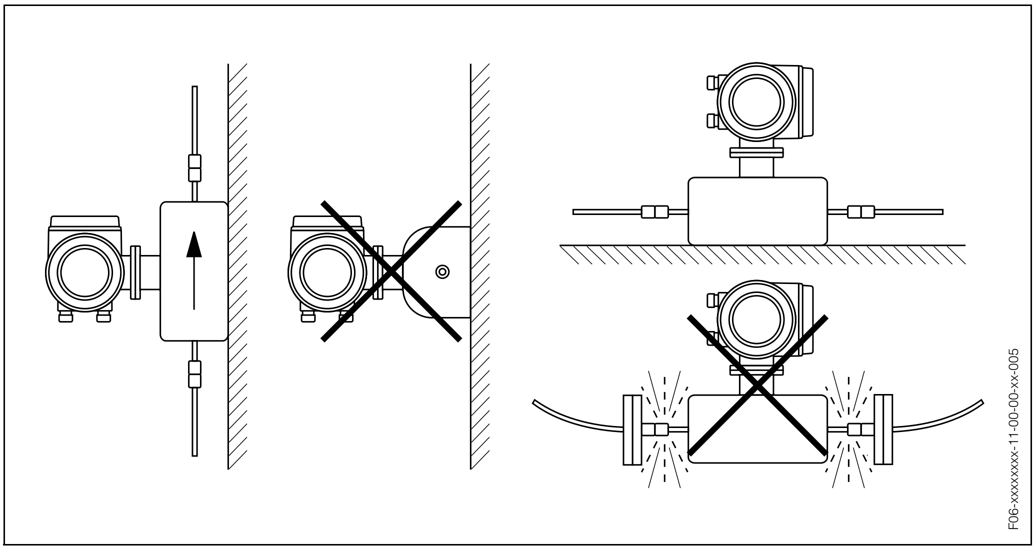


Fig. 6: Vertical and horizontal orientation (Promass A)

Orientation Promass F, M, I

Vertical:
Recommended orientation with upward direction of flow (View 1). When fluid is not flowing, entrained solids will sink down and gases will rise away from the measuring tube. The measuring tubes can be completely drained and protected against solids build-up.

Horizontal (Promass F, Promass M):
The measuring tubes of Promass M and F must be horizontal and beside each other. When installation is correct the transmitter housing is above or below the pipe (Views 2, 3). Always avoid having the transmitter housing in the same horizontal plane as the pipe.

Horizontal (Promass I):
Promass I can be installed in any orientation in a horizontal piping run.

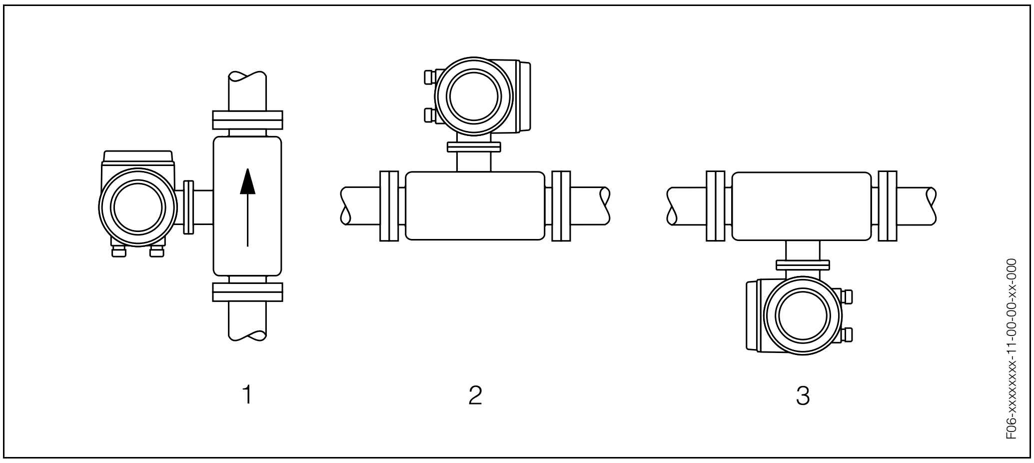


Fig. 7: Orientation Promass F, M, I

Caution:
The measuring tubes of Promass F are slightly curved. The position of the sensor, therefore, has to be matched to the fluid properties when the sensor is installed horizontally (Fig. 8)

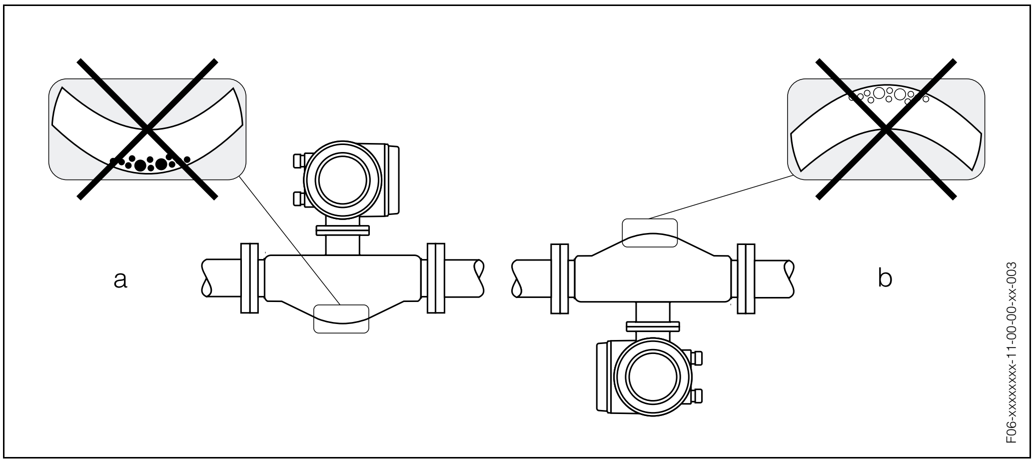


Fig. 8: Promass F installed horizontally

a Not suitable for fluids with entrained solids. Risk of solids accumulating.
b Not suitable for outgassing fluids. Risk of air accumulating.

Fluid temperature
In order to ensure that the maximum permissible ambient temperature for the transmitter (–20...+60 °C) is not exceeded, we recommend the following orientations:

High fluid temperature
- Vertical piping: installation in accordance with Fig. 7 / View 1
- Horizontal piping: installation in accordance with Fig. 7 / View 3

Low fluid temperature
- Vertical piping: installation in accordance with Fig. 7 / View 1
- Horizontal piping: installation in accordance with Fig. 7 / View 2

3.2.4 Heating, thermal insulation

Some fluids require suitable measures to avoid heat transfer at the sensor.
A wide range of materials can be used to provide the required thermal insulation. Heating can be electric, e.g. with heated elements, or by means of hot water or steam pipes made of copper. Special heating jackets are available for all sensors on request.

Caution:
Risk of electronics overheating!
- Consequently, make sure that the adapter between sensor and transmitter and the connection housing of the remote version always remain free of insulating material. Note that a certain orientation might be required, depending on the fluid temperature (see Section 3.2.3 “Fluid temperature”).
- Information on permissible temperature ranges → Page 73.

3.2.5 Inlet and outlet runs

There are no installation requirements regarding inlet and outlet runs. If possible, install the sensor well clear of fittings such as valves, T-pieces, elbows, etc.

3.2.6 Vibrations

The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe vibrations. Consequently, the sensors require no special measures for attachment.

3.2.7 Limiting flow

See the information on Page 65 and 74.

3.3 Installation instructions

3.3.1 Turning the transmitter housing

Turning the aluminium field housing

⚠ Warning:
The turning mechanism in devices with EEx d/de or FM/CSA Cl. I Div. 1 classification is not the same as that described here. The procedure for turning these housings is described in the Ex-specific documentation.

1. Loosen the two securing screws.
2. Turn the bayonet catch as far as it will go.
3. Carefully lift the transmitter housing as far as it will go.
4. Turn the transmitter housing to the desired position (max. 2 x 90° in either direction).
5. Lower the housing into position and re-engage the bayonet catch.
6. Retighten the two securing screws.

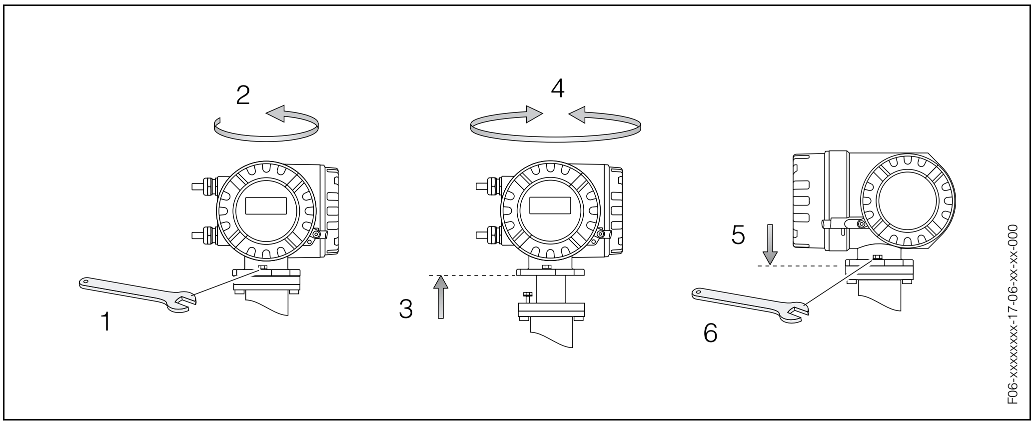


Fig. 9: Turning the transmitter housing (aluminium field housing)

Turning the stainless steel field housing

1. Loosen the two securing screws.
2. Carefully lift the transmitter housing as far as it will go.
3. Turn the transmitter housing to the desired position (max. 2 x 90° in either direction).
4. Lower the housing into position.
5. Retighten the two securing screws.

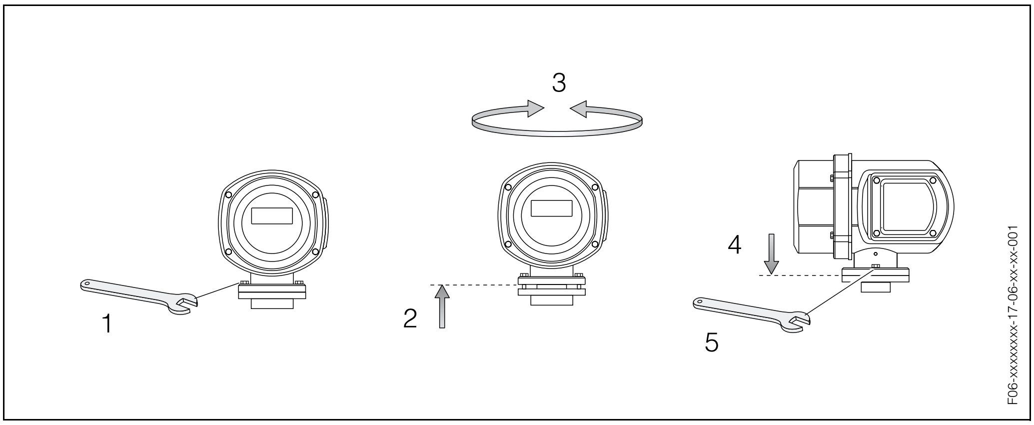


Fig. 10: Turning the transmitter housing (stainless steel field housing)

3.3.2 Installing the wall-mount transmitter housing

There are various ways of installing the wall-mount transmitter housing:

Without mounting set:
- Mounted directly on the wall

With mounting set:
This kit can be ordered separately from E+H as an accessory (see Page 47) and it allows for a number of installation options:

- Wall mounting
- Pipe mounting
- Installation in control panel

Direct wall mounting (without mounting set)

Caution:
- Make sure that ambient temperature does not go beyond the permissible range (–20...+60 °C). Install the device at a shady location. Avoid direct sunlight.
- Always install the wall-mount housing in such a way that the cable entries are pointing down.

1. Drill the holes as illustrated in Fig. 11.
2. Remove the cover of the connection compartment (a).
3. Push the two securing screws (b) through the appropriate bores (c) in the housing.
   – Securing screws (M6): max. Ø 6.5 mm
   – Screw head: max. Ø 10.5 mm
4. Secure the transmitter housing to the wall as indicated.
5. Screw the cover of the connection compartment (a) firmly onto the housing.

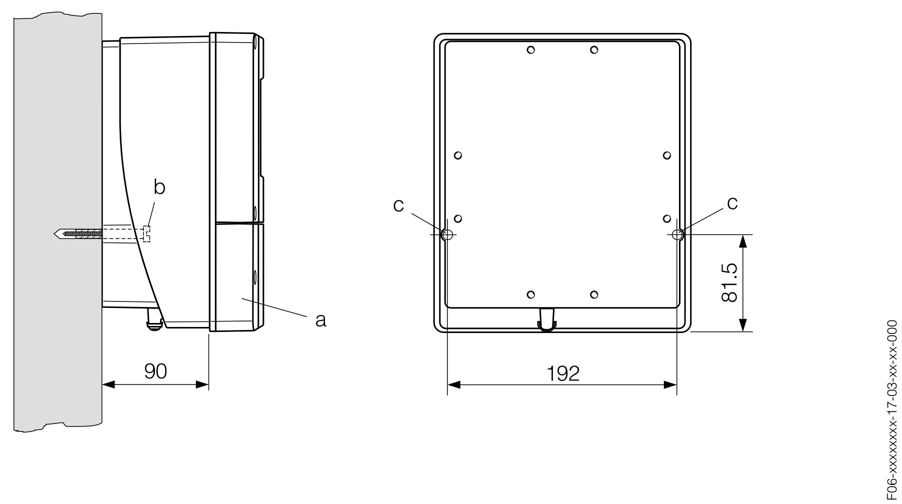


Fig. 11: Mounted directly on the wall

3.3.3 Turning the local display

1. Remove the cover of the electronics compartment.
2. Press the side latches on the display module and remove it from the electronics compartment cover plate.
3. Rotate the display to the desired position (max. 4 x 45° in each direction), and reset it into the electronics compartment cover plate.
4. Screw the cover of the electronics compartment firmly onto the transmitter housing.

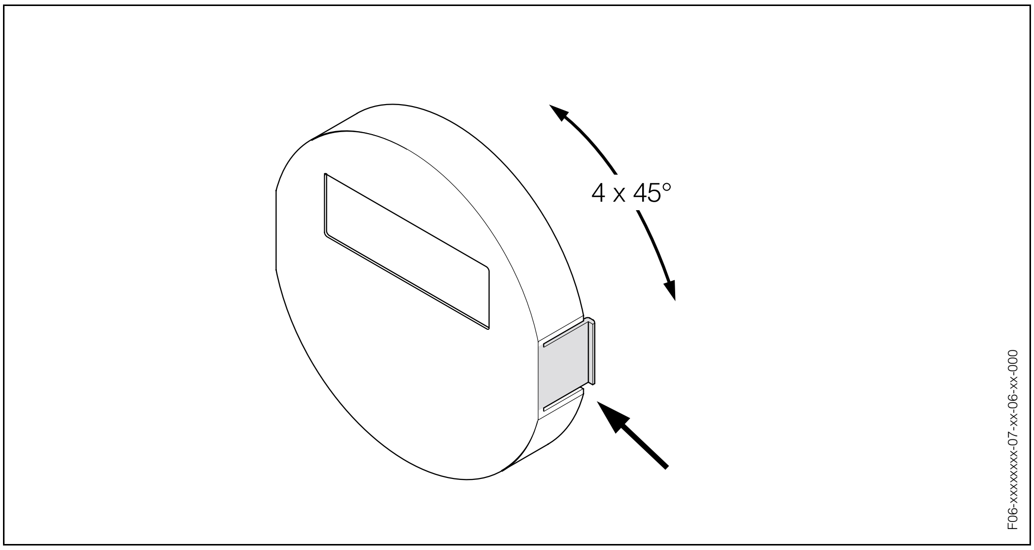


Fig. 12: Turning the local display (field housing)

3.4 Post installation check

Perform the following checks after installing the measuring device in the pipe:

Device condition and specifications	Notes
Is the device damaged (visual inspection)?	–
Does the device correspond to specifications at the measuring point, including process temperature and pressure, ambient temperature, measuring range, etc.?	see Page 65 ff.
Installation	Notes
Does the arrow on the sensor nameplate match the direction of flow through the pipe?	–
Are the measuring point number and labeling correct (visual inspection)?	–
Is the orientation chosen for the sensor correct, in other words suitable for sensor type, fluid properties (outgassing, with entrained solids) and fluid temperature?	see Page 14 ff.
Process environment / process conditions	Notes
Is the measuring device protected against moisture and direct sunlight?	–

4 Wiring

Warning:
When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to this Operating Instruction. Please do not hesitate to contact your E+H representative if you have any questions.

4.1 Connecting the remote version

4.1.1 Connecting the sensor

Warning:
- Risk of electric shock. Switch off the power supply before opening the device. Do not install or wire the device while it is connected to the power supply. Failure to comply with this precaution can result in irreparable damage to the electronics.
- Risk of electric shock. Connect the protective conductor to the ground terminal on the housing before the power supply is applied.
- For the remote version, always make sure that you connect the sensor only to the transmitter having the same serial number. Communication errors can occur if the devices are not connected in this way.

1. Remove the cover (a) of the connection compartment from the transmitter and the sensor by loosening the screws.
2. Feed the connecting cable (b) through the appropriate cable entries.
3. Establish the connections between sensor and transmitter in accordance with the wiring diagram:
   → Fig. 13
   → wiring diagram inside cover
4. Secure the cover (a) on the sensor connection housing and on the transmitter housing.

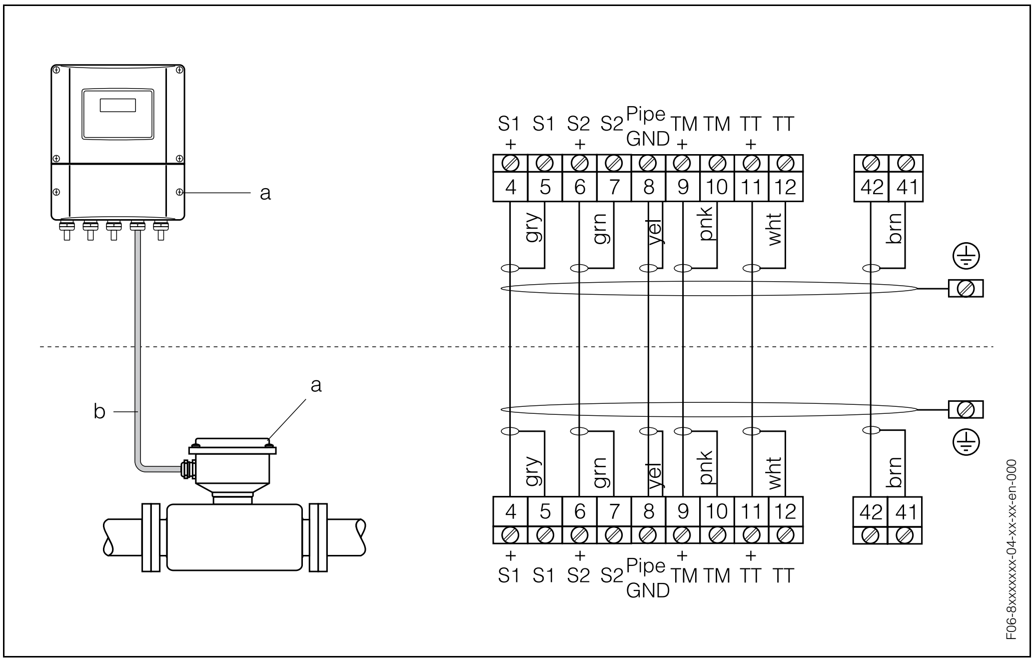


Fig. 13: Connecting the remote version

a Covers of the connection compartments (transmitter, sensor)
b Connecting cable (signal cable)

4.1.2 Cable specifications

The specifications of the cable connecting the transmitter and the sensor of the remote version are as follows:

- 6 x 0.38 mm^2 PVC cable with common shield and individually shielded cores.
- Conductor resistance: ≤ 50 Ω/km
- Capacitance: core/shield: ≤ 420 pF/m
- Cable length: max. 20 m
- Permanent operating temperature: max. +105 °C

4.2 Connecting the measuring unit

4.2.1 Connecting the transmitter

Warning:
- Risk of electric shock. Switch off the power supply before opening the device. Do not install or wire the device while it is connected to the power supply. Failure to comply with this precaution can result in irreparable damage to the electronics.
- Risk of electric shock. Connect the protective conductor to the ground terminal on the housing before the power supply is applied (not necessary if the power supply is galvanically isolated).
- Compare the specifications on the nameplate with the local voltage supply and frequency. The national regulations governing the installation of electrical equipment also apply.

1. Remove the cover of the connection compartment (f) from the transmitter housing.
2. Feed the power supply cable (a) and signal cables (b) through the appropriate cable entries.
3. Connect the cables in accordance with the wiring diagram:
   – Wiring diagram, aluminium housing → Fig. 14
   – Wiring diagram, stainless steel housing → Fig. 15
   – Wiring diagram, wall-mount housing → Fig. 16
   – Terminal assignment → Page 27
4. Screw the cover of the connection compartment (f) firmly onto the transmitter housing.

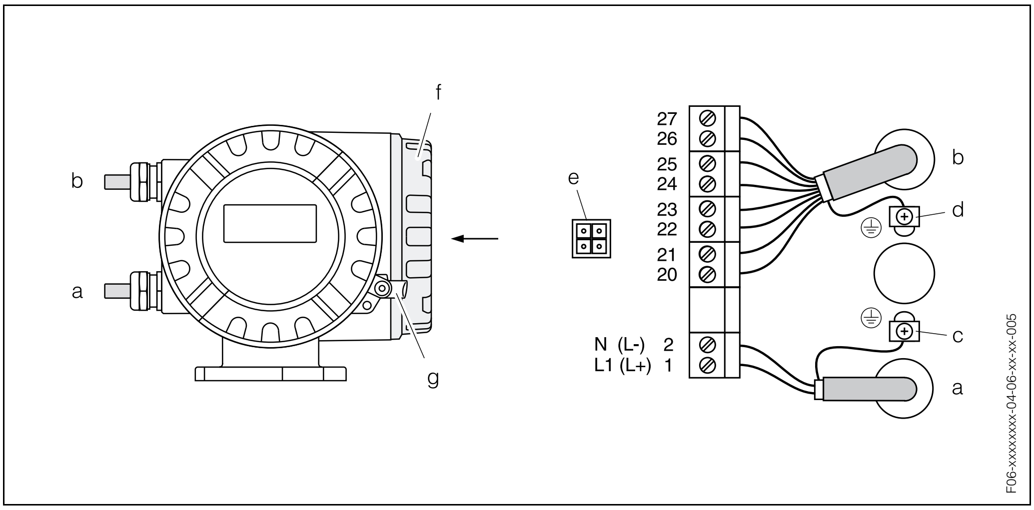


Fig. 14: Connecting the transmitter (aluminium field housing). Cable cross-section: max. 2.5 mm^2

a Cable for power supply: 85...260 V AC, 20...55 V AC, 16...62 V DC
Terminal No. 1: L1 for AC, L+ for DC
Terminal No. 2: N for AC, L– for DC
b Signal cable: Terminals Nos. 20–27 → Page 27
c Ground terminal for protective conductor
d Ground terminal for signal cable shield
e Service adapter for connecting service interface FXA 193 (FieldCheck™, FieldTool™)
f Cover of the connection compartment
g Securing Clamp

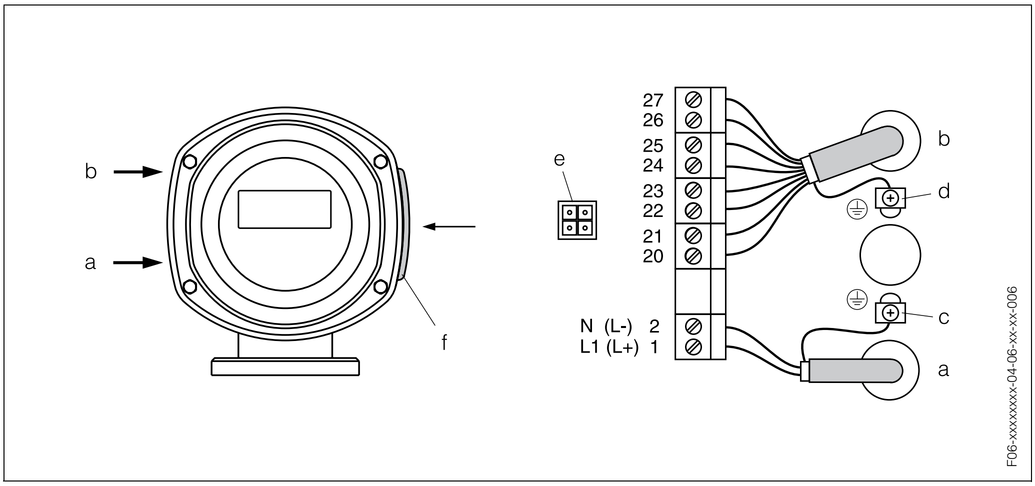


Fig. 15: Connecting the transmitter (stainless steel field housing). Cable cross-section: max. 2.5 mm²

- a *Cable for power supply: 85...260 V AC, 20...55 V AC, 16...62 V DC*
  Terminal No. 1: L1 for AC, L+ for DC
  Terminal No. 2: N for AC, L– for DC
- b *Signal cable: Terminals Nos. 20–27 → Page 27*
- c *Ground terminal for protective conductor*
- d *Ground terminal for signal cable shield*
- e *Service adapter for connecting service interface FXA 193 (FieldCheck™, FieldTool™)*
- f *Cover of the connection compartment*

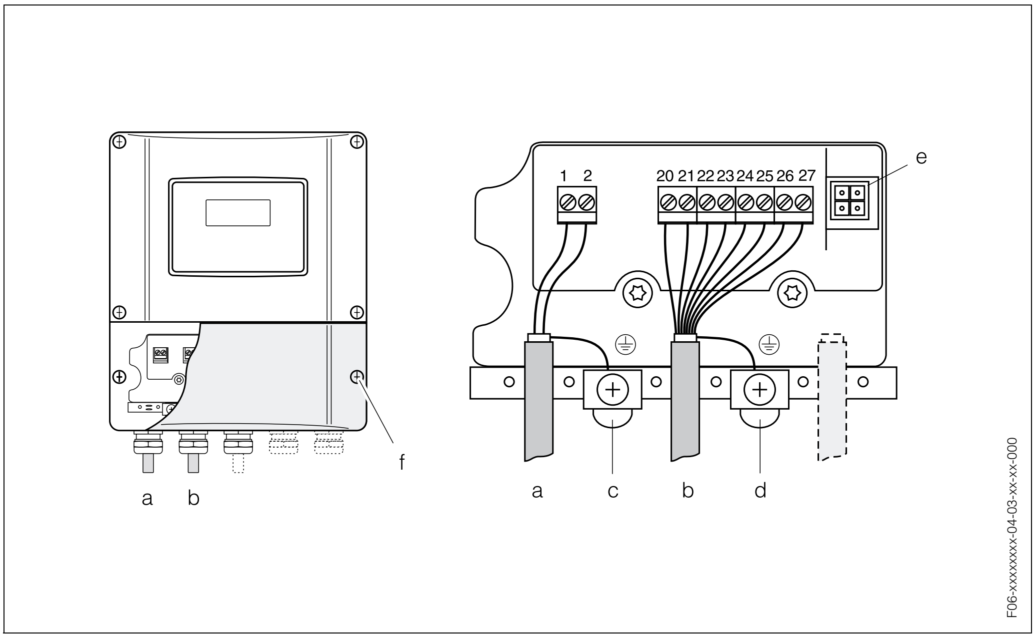


Fig. 16: Connecting the transmitter (wall-mount housing). Cable cross-section: max. 2.5 mm²

- a *Cable for power supply: 85...260 V AC, 20...55 V AC, 16...62 V DC*
  Terminal No. 1: L1 for AC, L+ for DC
  Terminal No. 2: N for AC, L– for DC
- b *Signal cable: Terminals Nos. 20–27 → Page 27*
- c *Ground terminal for protective conductor*
- d *Ground terminal for signal cable shield*
- e *Service adapter for connecting service interface FXA 193 (FieldCheck™, FieldTool™)*
- f *Cover of the connection compartment*

4.2.2 Terminal assignment

	Terminal Nos. (inputs/outputs)			
Order variant	**20 – 21**	**22 – 23**	**24 – 25**	**26 – 27**
80***-***********A	–	–	Frequency output	Current output HART
80***-***********D	Status input	Status output	Frequency output	Current output HART

Status input (Auxiliary input)
galvanically isolated, 3...30 V DC, R_i = 5 kΩ, configurable

Status output
Open collector, max. 30 V DC / 250 mA, galvanically isolated, configurable

Frequency output (passive)
Open collector, galvanically isolated, 30 V DC, 250 mA
- Frequency output: full scale frequency 2...1000 Hz (fmax = 1250 Hz), on/off ratio 1:1, pulse width max. 10 s
- Pulse output: pulse value and pulse polarity selectable, max. pulse width adjustable (0.05...2 s), max. pulse frequency selectable

Current output HART (active/passive)
galvanically isolated, active: 0/4...20 mA, R_L < 700 Ω, HART: $R_L \geq$ 250 Ω,
passive: 4...20 mA, max. 30 V DC, $R_i \leq$ 150 Ω

4.2.3 HART connection

Users have the following connection options at their disposal:
- Direct connection to transmitter by means of terminals 26 / 27.
- Connection by means of the 4...20 mA circuit.

Note:
- The measuring loop's minimum load must be at least 250 Ω.
- The CURRENT SPAN function must be set either to "4–20 mA HART" or to "4–20 mA (25 mA) HART" (factory setting).

Connection of the HART handheld communicator
See also the documentation issued by the HART Communication Foundation, and in particular HCF LIT 20: "HART, a technical summary".

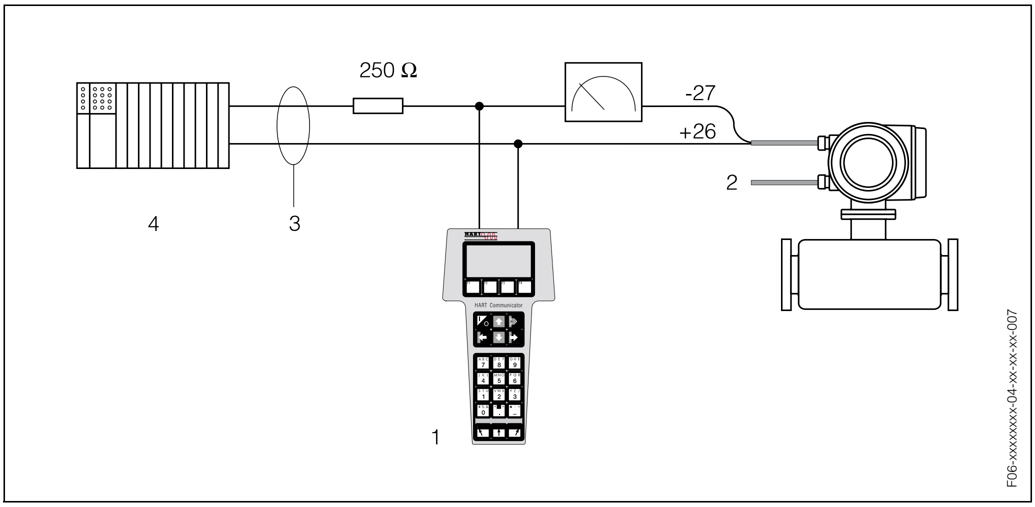


Fig. 17: Electrical connection of the HART handheld communicator:
1 = HART communicator, 2 = power supply, 3 = shield, 4 = other evaluation devices or PLC with passive input

Connection of a PC with an operating software
In order to connect a personal computer with an operating software (e.g. "FieldTool™"), a HART modem (e.g. "Commubox FXA 191") is needed.
See also the documentation issued by the HART Communication Foundation, and in particular HCF LIT 20: "HART, a technical summary".

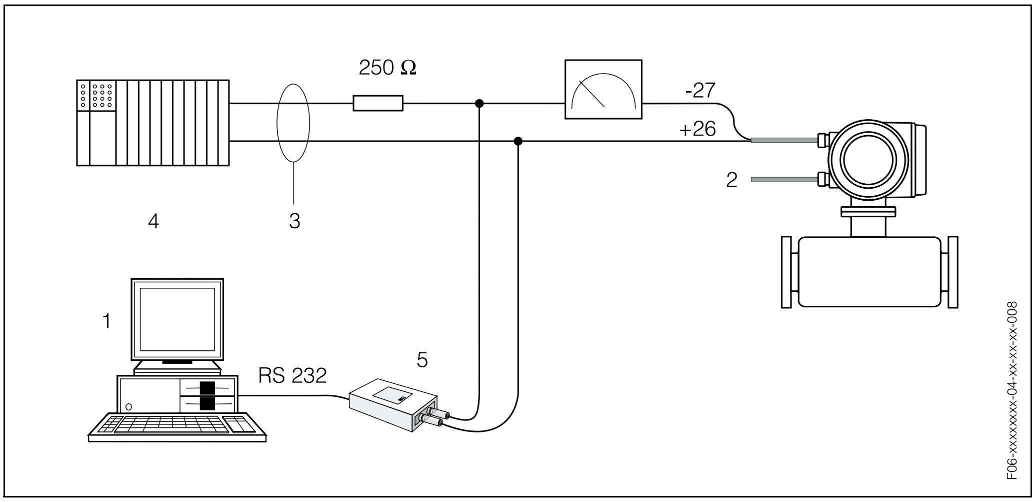


Fig. 18: Electrical connection of a PC with an operating software:
1 = PC with an operating software, 2 = power supply, 3 = shield, 4 = other evaluation devices or PLC with passive input, 5 = HART modem, e.g. Commubox FXA 191

4.3 Potential equalisation

No special measures for potential equalisation are required.

✎ Note:
For instruments for use in hazardous areas, observe the corresponding guidelines in the specific Ex documentation.

4.4 Degree of protection

The devices fulfill all the requirements for IP 67. Compliance with the following points is mandatory following installation in the field or servicing, in order to ensure that IP 67 protection is maintained:

- The housing seals must be clean and undamaged when inserted into their grooves. The seals must be dried, cleaned or replaced if necessary.
- All threaded fasteners and screw covers must be firmly tightened.
- The cables used for connection must be of the specified outside diameter (see Page 67).
- Firmly tighten the cable entries (Fig. 19).
- The cables must loop down before they enter the cable entries ("water trap", Fig. 19). This arrangement prevents moisture from penetrating the entry. Always install the measuring device in such a way that the cable entries do not point up.
- Remove all unused cable entries and insert plugs instead.
- Do not remove the grommet from the cable entry.

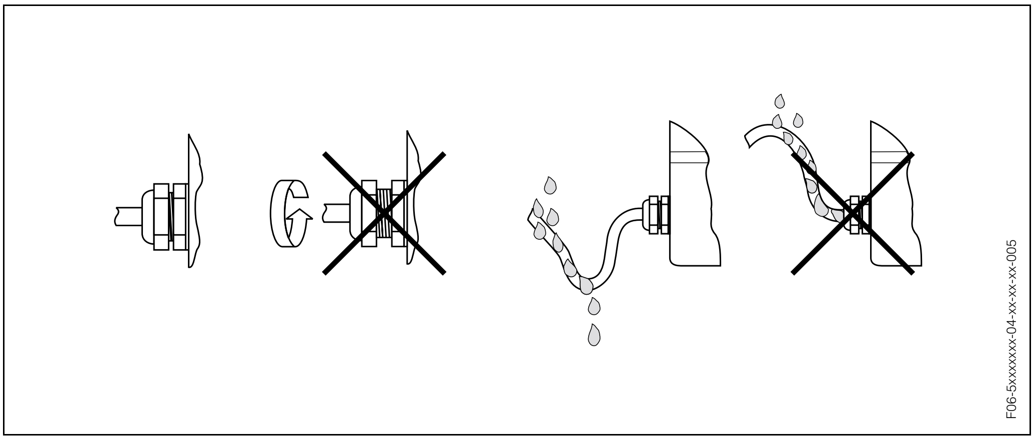


Fig. 19: Installation instructions, cable entries

4.5 Post connection check

Perform the following checks after completing electrical installation of the measuring device:

Device condition and specifications	Notes
Are cables or the device damaged (visual inspection)?	–
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	85...260 V AC (45...65 Hz) 20...55 V AC (45...65 Hz) 16...62 V DC
Do the cables comply with the specifications?	see Page 24, 67
Do the cables have adequate strain relief?	–
Cables correctly segregated by type? Without loops and crossovers?	–
Are the power supply and signal cables correctly connected?	See the wiring diagram inside the cover of the terminal compartment
Are all screw terminals firmly tightened?	–
Are all cable entries installed, firmly tightened and correctly sealed? Cables looped as "water traps"?	see Page 29
Are all housing covers installed and firmly tightened?	–

5 Operation

5.1 Display and operating elements

The local display enables you to read all important parameters directly at the measuring point and configure the device.

The display consists of two lines; this is where measured values and/or status variables (direction of flow, empty pipe, bar graph, etc.) are displayed. You can change the assignment of display lines to different variables to suit your needs and preferences (→ see the “Description of Device Functions” manual).

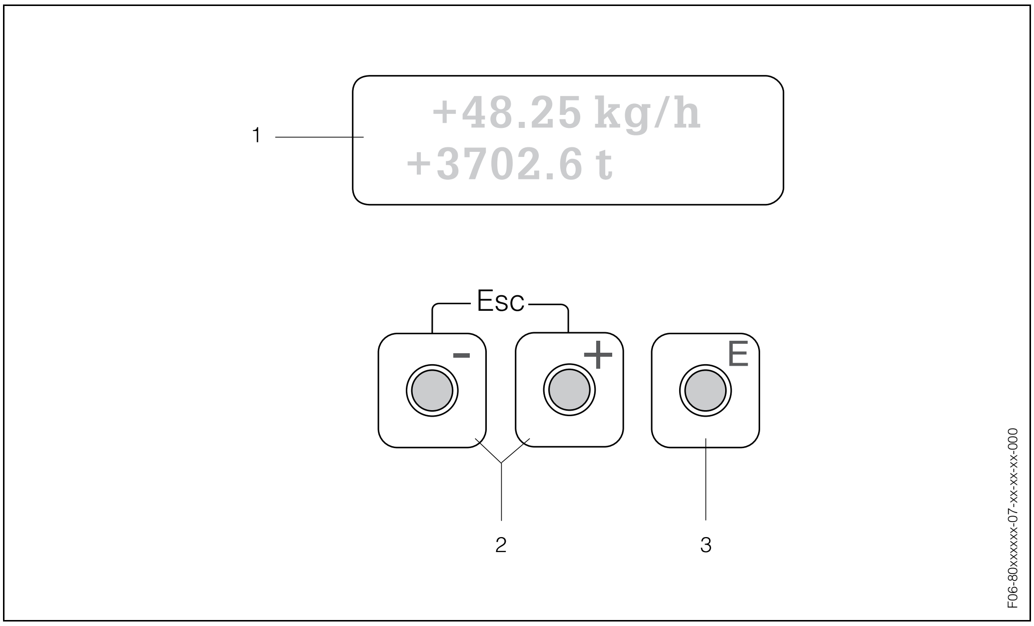


Fig. 20: Display and operating elements

Liquid crystal display (1)
The backlit, two-line liquid crystal display shows measured values, dialog texts, fault messages and notice messages. The display as it appears when normal measuring is in progress is known as the HOME position (operating mode).
- *Upper display line: shows primary measured values, e.g. mass flow in [kg/h] or in [%].*
- *Lower display line: shows additional measured variables and status variables, e.g. totalizer reading in [t], bar graph, measuring point designation.*

Plus/minus keys (2)
- *Enter numerical values, select parameters*
- *Select different function groups within the function matrix*

Press the +/– keys simultaneously to trigger the following functions:
- *Exit the function matrix step by step → HOME position*
- *Press and hold down +/– keys for longer than 3 seconds → Return directly to HOME position*
- *Cancel data entry*

Enter key (3)
- *HOME position → Entry into the function matrix*
- *Save the numerical values you input or settings you change*

5.2 Brief operating instruction to the function matrix

Note:
- See the general notes on Page 33.
- Function descriptions → see the "Description of Device Functions" manual

1. HOME position → E → Enter the function matrix
2. Select a function group (e.g. CURRENT OUTPUT 1)
3. Select a function (e.g. TIME CONSTANT)

   Change parameter / enter numerical values:
   +- → select or enter: enable code, parameters, numerical values
   E → save your entries

4. Exit the function matrix:
   – Press and hold down Esc key (-+) for longer than 3 seconds → HOME position
   – Repeatedly press Esc key (-+) → return step by step to HOME position

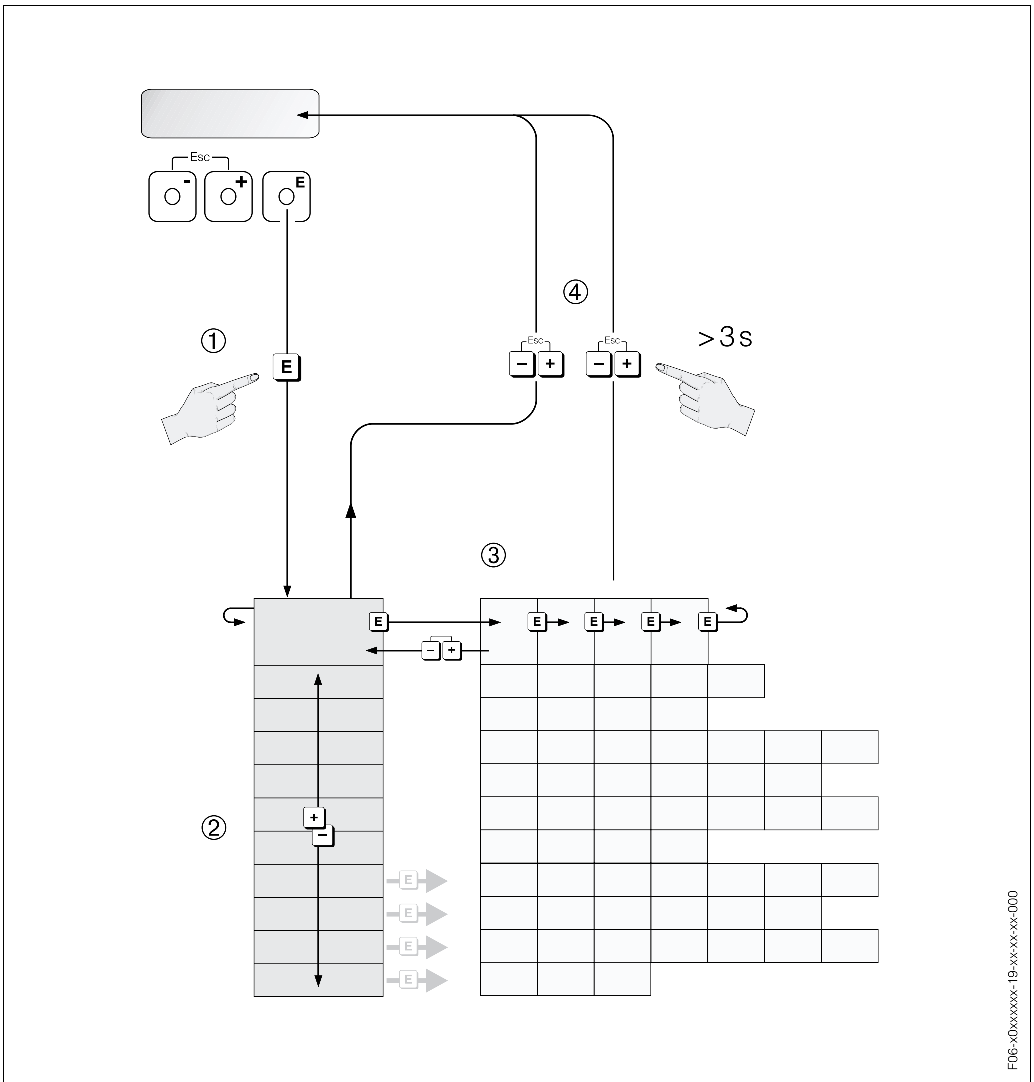


Fig. 21: Selecting functions and configuring parameters (function matrix)

5.2.1 General notes

The Quick Setup menu (see Page 38) contains the default settings that are adequate for commissioning.
Complex measuring operations on the other hand necessitate additional functions that you can configure as necessary and customise to suit your process parameters. The function matrix, therefore, comprises a multiplicity of additional functions which, for the sake of clarity, are arranged in a number of function groups.

Comply with the following instructions when configuring functions:
- You select functions as described on Page 32.
- You can switch off certain functions (OFF). If you do so, related functions in other function groups will no longer be displayed.
- Certain functions prompt you to confirm your data entries. Press +- to select "SURE [YES]" and press E again to confirm. This saves your setting or starts a function, as applicable.
- Return to the HOME position is automatic if no key is pressed for 5 minutes.
- Programming mode is disabled automatically if you do not press a key within 60 seconds following automatic return to the HOME position.

✎ Note:
- The transmitter continues to measure while data entry is in progress, i.e. the current measured values are output via the signal outputs in the normal way.
- If the power supply fails all preset and parameterised values remain safely stored in the EEPROM.

Caution:
All functions are described in detail, as is the function matrix itself, in the **"Description of Device Functions"** manual, which is a separate part of this Operating Instruction.

5.2.2 Enabling the programming mode

The function matrix can be disabled. Disabling the function matrix rules out the possibility of inadvertent changes to device functions, numerical values or factory settings. A numerical code (factory setting = 80) has to be entered before settings can be changed. If you use a code number of your choice, you exclude the possibility of unauthorised persons accessing data (→ see the "Description of Device Functions" manual).

Comply with the following instructions when entering codes:
- If programming is disabled and the +- keys are pressed in any function, a prompt for the code automatically appears on the display.
- If "0" is entered as the customer's code, programming is always enabled.
- The E+H service organisation can be of assistance if you mislay your personal code.

Caution:
Changing certain parameters such as all sensor characteristics, for example, influences numerous functions of the entire measuring system, particularly measuring accuracy. There is no need to change these parameters under normal circumstances and consequently, they are protected by a special code known only to the E+H service organisation. Please contact Endress+Hauser if you have any questions.

5.2.3 Disabling the programming mode

Programming is disabled if you do not press a key within 60 seconds following automatic return to the HOME position.
You can also disable programming in the "ACCESS CODE" function by entering any number (other than the customer's code).

5.3 Display of error messages

Type of error
Errors that occur during commissioning or measuring are displayed immediately. If two or more system or process errors occur, the error with the highest priority is the one shown on the display. The measuring system distinguishes between two types of error:

- *System error:* this group includes all device errors, for example communication errors, hardware errors, etc. → see Page 50
- *Process error:* this group includes all application errors, for example empty pipe, etc. → see Page 53

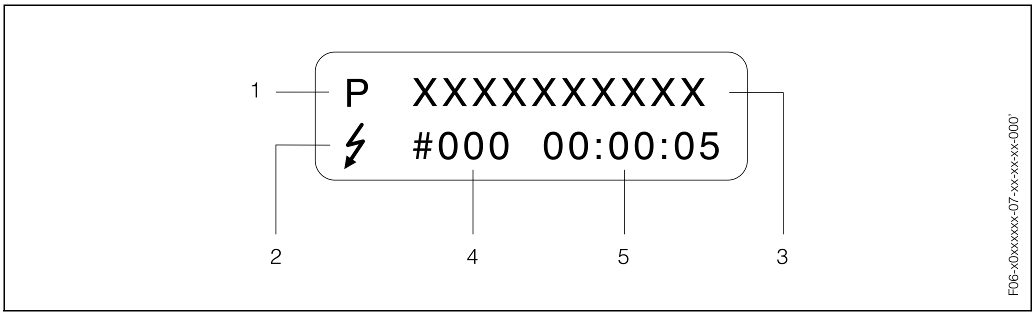


Fig. 22: Error messages on the display (example)

1 *Error type: P = process error, S = system error*
2 *Error message type: ϟ = fault message, ! = notice message (definition: see below)*
3 *Error designation: e.g. FLUID INHOM. = fluid is not homogeneous*
4 *Error number: e.g. # 702*
5 *Duration of most recent error occurrence (in hours, minutes and seconds)*

Error message types
Users have the option of weighting system and process errors differently, by defining them as **"Fault messages"** or **"Notice messages"**. You can define messages in this way with the aid of the function matrix (see the "Description of Device Functions" manual). Serious system errors, e.g. module defects, are always identified and classified as "fault messages" by the measuring device.

Notice message (!)
- Displayed as → Exclamation mark (!), error type (S: system error, P: process error).
- The error in question has no effect on the inputs or outputs of the measuring device.

Fault message (ϟ)
- Displayed as → Lightning flash *(ϟ),* error type (S: system error, P: process error).
- The error in question has a direct effect on the inputs or outputs.
  The response of the inputs or outputs (failsafe mode) can be defined by means of functions in the function matrix (see Page 56).

✎ Note:
For security reasons, error messages should be output via the status output.

5.4 Communication

In addition to local operation, the measuring device can also be configured and measured values obtained by means of the HART protocol. You have two options:
- Operation with the “HART Communicator DXR 275” universal handheld terminal.
- Operation by means of a personal computer using operating software (e.g. “FieldTool™”) and a HART modem (e.g. “Commubox FXA 191”).

5.4.1 HART Communicator DXR 275

Selecting device functions with a HART Communicator is a process involving a number of menu levels and a special HART function matrix (see the “Description of Device Functions” manual).
Note:
- The HART protocol requires the “4–20 mA HART” or “4–20 mA (25 mA) HART” setting in the CURRENT SPAN function (current output).
- The HART manual in the carrying case of the HART Communicator contains more detailed information on the device.

5.4.2 FieldTool™ operating program

FieldTool™ is a universal service and configuration software package designed for the PROline measuring devices. Connection is by means of the PROline service interface (service adapter) with a Commubox FXA 193 or the HART interface with a Commubox FXA 191.

The functionality of FieldTool™ includes the following:
- Configuration of device functions
- Visualisation of measuring values (including data logging)
- Data backup of device parameters
- Measuring point documentation

✎ Note:
You can find more information on FieldTool™ in the following E+H document:
- System Information: SI 031D/06/en “FieldTool™”

6 Commissioning

6.1 Function check

Make sure that all final checks have been completed before you start up your measuring point:
- Checklist for “Post installation check” → Page 21
- Checklist for “Post connection check” → Page 30

6.2 Commissioning

6.2.1 Switching on the measuring device

Once the function checks have been successfully completed, it is time to switch on the power supply. The device is now operational.
The measuring device performs a number of power on self-tests. As this procedure progresses the following sequence of messages appears on the local display:

PROMASS 80 **START-UP**	Start-up message
▼	
SW AMPLIFIER **XX.XX.XX**	Current software version (example)
▼	
SYSTEM OK **→ OPERATION**	Beginning of normal measuring mode

Normal measuring mode commences as soon as start-up completes. Various measured value and/or status variables appear on the display (HOME position).

Note:
If start-up fails, an error message indicating the cause is displayed.

6.2.2 Quick Setup "Commissioning"

This Quick Setup menu guides you systematically through the setup procedure for all the major device functions that have to be configured for standard measuring operation.

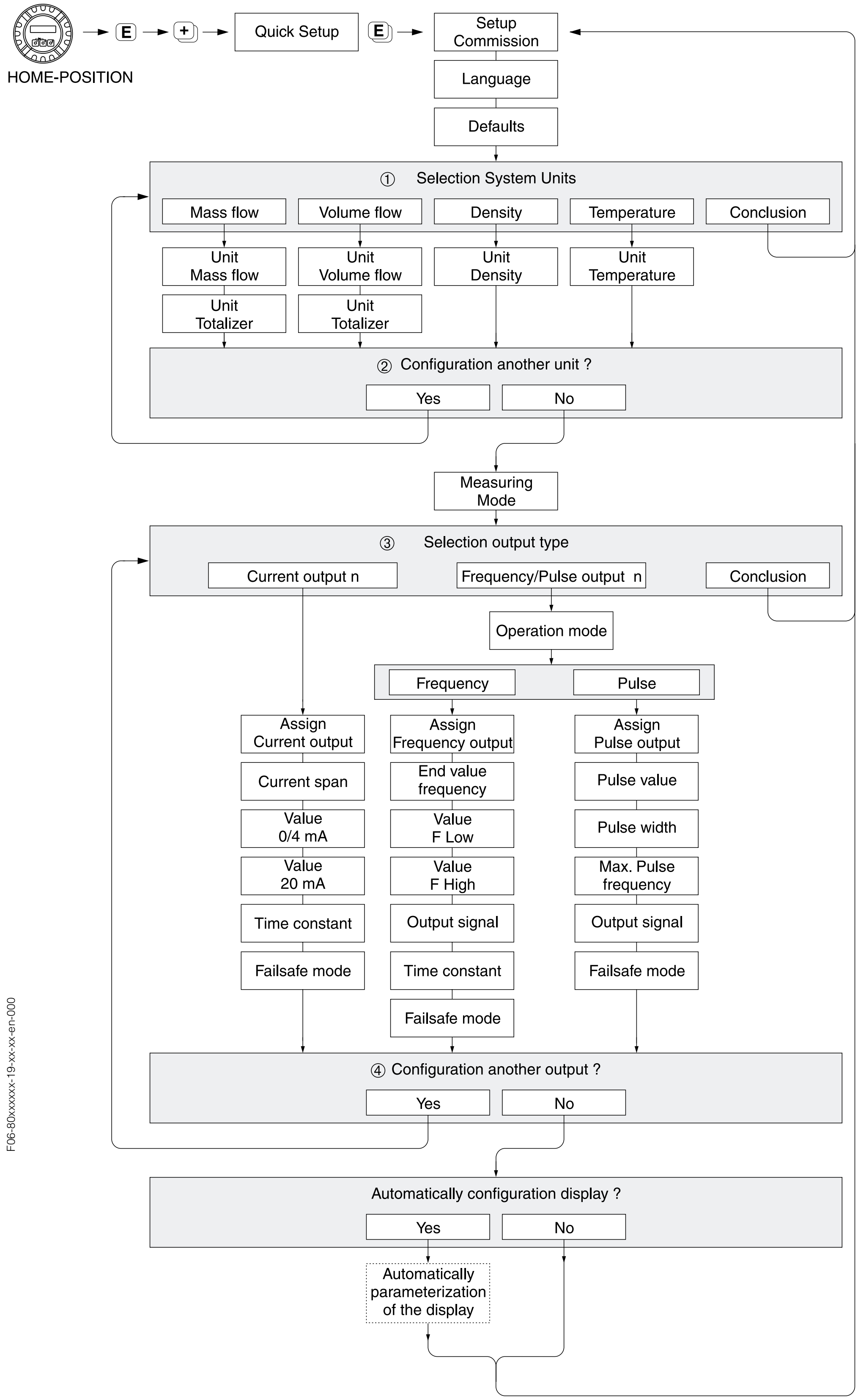


Fig. 23: Quick Setup menu for straightforward configuration of the major device functions

6.2.3 Zero point adjustment

All Promass measuring devices are calibrated with state-of-the-art technology. The zero point obtained in this way is printed on the nameplate. Calibration takes place under reference operating conditions (see Page 69). Consequently, the zero point adjustment is generally **not** necessary for Promass.

Experience shows that the zero point adjustment is advisable only in special cases:
- To achieve highest measuring accuracy also with very small flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high viscosity fluids).

Preconditions for a zero point adjustment
Note the following before you perform a zero point adjustment:
- A zero point adjustment can be performed only with fluids that contain no gas or solid contents.
- A Zero point adjustment is performed with the measuring tubes completely filled and at zero flow (v = 0 m/s). This can be achieved, for example, with shut-off valves upstream and/or downstream of the sensor or by using existing valves and gates (Fig. 24):
  – Normal operation → valves 1 and 2 open
  – Zero point adjustment *with* pump pressure → valve 1 open / valve 2 closed
  – Zero point adjustment *without* pump pressure → valve 1 closed / valve 2 open

Caution:
- If the fluid is very difficult to measure (e.g. containing entrained solids or gas) it may prove impossible to obtain a stable zero point despite repeated zero point adjustments. In instances of this nature, please contact your E+H service center.
- You can view the currently valid zero point value using the "ZERO POINT" function (see the "Description of Device Functions" manual).

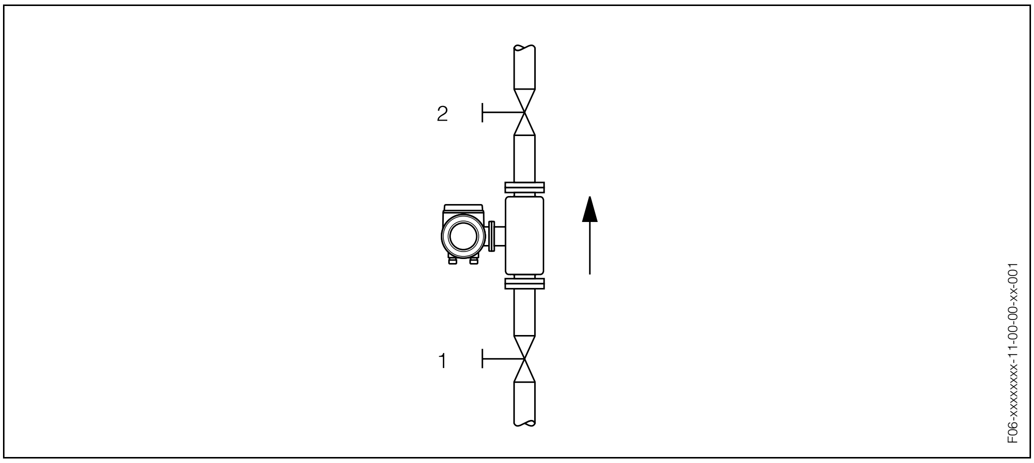


Fig. 24: Zero point adjustment and shut-off valves

Performing a zero point adjustment

1. Operate the system until operating conditions have settled.
2. Stop the flow (v = 0 m/s).
3. Check the shut-off valves for leaks.
4. Check that operating pressure is correct.
5. Perform a zero point adjustment as follows:

Key	Procedure	Display text
E	HOME position → Enter the function matrix	>GROUP SELECTION < MEASURED VARIABLES
+ −	Select the “PROCESS PARAMETER” function group	>GROUP SELECTION < PROCESS PARAMETER
E	Select the “ZERO ADJUST.” function	ZERO ADJUST. CANCEL
+ −	When you press +/– you are automatically prompted to enter the code if the function matrix is still disabled.	CODE ENTRY 0
+ −	Enter the code (80 = default)	CODE ENTRY 80
E	Confirm the code as entered. The “ZERO ADJUST” function reappears on the display.	PROGRAMMING ENABLED ZERO ADJUST. CANCEL
+ −	Select “START”	ZERO ADJUST. YES
E	Confirm the entry by pressing the Enter key. The confirmation prompt appears on the display.	ZERO ADJUST. SURE? [NO]
+ −	Select “YES”.	ZERO ADJUST. SURE? [YES]
E	Confirm the entry by pressing the Enter key. Zero point adjustment now starts. While zero point adjustment is in progress, the display shown here is visible for 30...60 seconds. If the flow of fluid in the pipe exceeds 0.1 m/s, an error message appears on the display: “A: ZERO ADJUST NOT POSSIBLE” When the zero point adjustment completes, the “ZERO ADJUST.” function reappears on the display.	S: ZERO ADJUSTMENT RUNNING ZERO ADJUST. CANCEL
E	After actuating the Enter key, the new zeropoint value is displayed.	ZERO POINT
Esc − +	Press +/– simultaneously → HOME position	

6.2.4 Density adjustment

Measuring accuracy in determining fluid density has a direct effect on calculating volume flow. Density adjustment, therefore, is necessary under the following circumstances:

- The sensor does not measure exactly the density value that the user expects on the basis of laboratory analyses.
- The fluid properties are outside the measuring points set at the factory, or the reference operating conditions used to calibrate the measuring device.
- The system is used exclusively to measure a fluid's density which must be registered to a high degree of accuracy under constant conditions.

Performing a density adjustment

Caution:

- On-site density adjustment can be performed only if the user has very detailed knowledge of the fluid density, obtained for example from detailed laboratory analyses.
- The target density value specified in this way must not deviate from the measured fluid density by more than ±10%.
- An error in defining the target density affects all calculated density and volume functions.
- A density adjustment changes the factory density calibration values or the calibration values set by the service technician.

The functions outlined in the instructions below are described in detail in the "Description of Device Functions" manual.

1. Fill the sensor with fluid. Make sure that the measuring tubes are completely filled and that liquids are free of gas bubbles.
2. Wait until the temperature difference between fluid and measuring tube has equalised. The time you have to wait for equalisation depends on the fluid and the temperature level.
3. Select the density adjustment function:
   HOME → E → + → PROCESSPARAMETER → E → DENSITY SET VALUE
   – When you press +− you are automatically prompted to enter the code if the function matrix is still disabled. Enter the code.
   – Use +− to enter the fluid's target density and press E to save this value (input range = actual density value ±10%).
4. Press E and select the "MEASURE FLUID" function.
   Use +− to select "START" and press E. Then, the message "DENSITY ADJUST RUNNING" appears for approx. 10 seconds on the display. During this time Promass measures the current density of the fluid (measured density value).
5. Press E and select the "DENSITY ADJUST" function.
   Use +− to select "DENSITY ADJUST" and press E. Promass compares the measured density value with the specified value and calculates the new density coefficient.

   Caution:
   If a density adjustment does not complete correctly, you can select the "RESTORE ORIGINAL" function to reactivate the default density coefficient.

6. Use Esc − + to return to the HOME position (press +/– simultaneously).

6.2.5 Current output: active/passive

The current output is configured as "active" or "passive" by means of various jumpers on the I/O board.

Warning:
Risk of electric shock. Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.

1. Switch off power supply.
2. Remove the I/O board → Page 59, 61
3. Set the jumpers in accordance with Fig. 25.

   Caution:
   Risk of destroying the measuring device. Set the jumpers exactly as shown in Fig. 25. Incorrectly set jumpers can cause overcurrents that would destroy either the measuring device or external devices connected to it.

4. Installation of the I/O board is the reverse of the removal procedure.

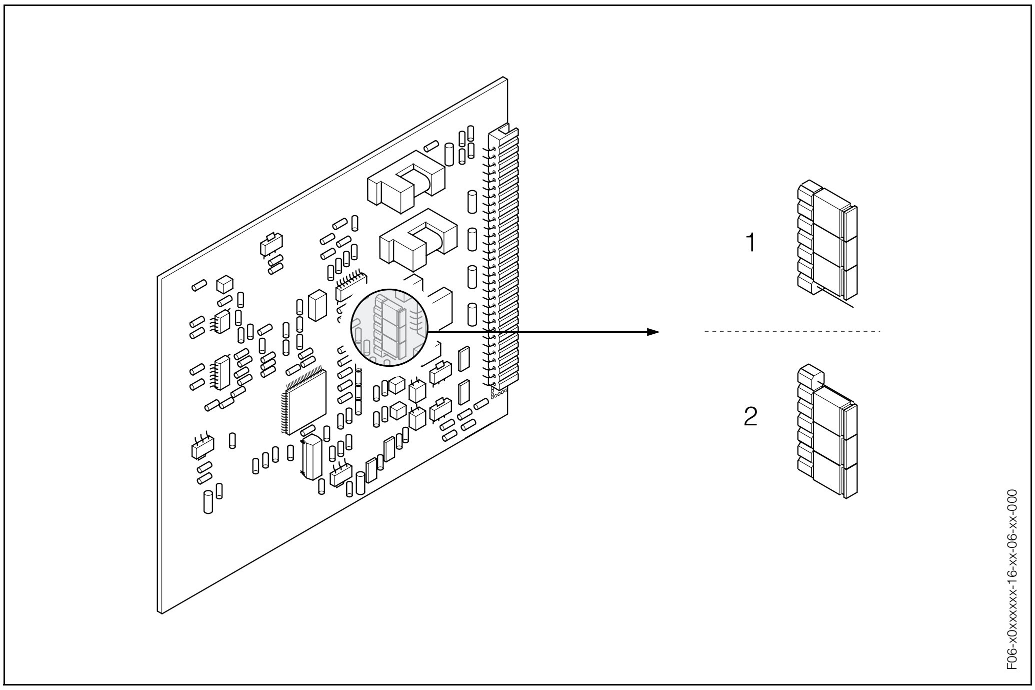


Fig. 25: Configuring the current output (I/O board)

1 Active current output (default)
2 Passive current output

6.2.6 Purging and pressure monitoring connections

In case a danger of measuring tube failure exists due to process characteristics, e.g. with corrosive process fluids, we recommend the use of sensors whose secondary containment is equipped with special pressure monitoring connections (ordering option). With the help of these connections, fluid collected in the secondary containment in the event of tube failure can be bled off. This is especially important in high pressure gas applications.
These connections can also be used for gas purging (gas detection).

Caution:
The following instructions apply to handling sensors with purge or pressure monitoring connections:
- The secondary containment is filled with dry nitrogen (N_2). Do not open the purge connections unless the containment can be filled immediately with a dry inert gas.
- Use only low gauge pressure to purge. Maximum pressure: 5 bar

7 Maintenance

The Promass 80 flow measuring system requires no special maintenance.

Exterior cleaning
When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing and the seals.

Cleaning with pigs (Promass I)
If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube and process connection into account (see Page 119 ff.).

Replacing seals
Under normal circumstances, fluid wetted seals of the Promass A and Promass M sensors do not require replacement. Replacement is necessary only in special circumstances, for example if aggressive or corrosive fluids are incompatible with the seal material.

✎ Note:
- The period between changes depends on the fluid properties and on the frequency of cleaning cycles in the case of CIP/SIP cleaning.
- Replacement seals (accessories) → Page 47.

8 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. The E+H service organisation can provide detailed information on the order codes of your choice.

Accessory	Description	Ordering code
Transmitter Promass 80	Transmitter for replacement or for stock. Use the order code to define the following specifications: – Approvals – Degree of protection / version – Cable entries – Display / power supply / operation – Software – Outputs / inputs	80XXX – XXXXX * * * * * *
Installation set for transmitter	Mounting set for remote version. Suitable for: – Wall mounting – Pipe mounting – Installation in control panel	DK8WM – *
Post mounting set for the Promass A sensor	Post mounting set for the Promass A	DK8AS – * *
Mounting set for the Promass A sensor	Mounting set for Promass A, comprising: – 2 process connections (see Page 113 ff.) – Seals	DK8MS – * * * * * *
Set of seals for sensor	For replacement of the seals of the Promass M and Promass A sensors. Set consists of two seals.	DKS – * * *
HART Communicator DXR 275 handheld terminal	Handheld terminal for remote parameterisation and for obtaining measured values via the current output HART (4...20 mA). Contact your E+H representative for more information.	DXR275 – * * * * * *
Applicator ™	Software for selecting and configuring flowmeters. Applicator™ can be downloaded from the Internet or ordered on CD-ROM for installation on a local PC. Contact your E+H representative for more information.	DKA80 – *
FieldTool ™	Configuration and service software for flowmeters in the field: – Commissioning, maintenance analysis – Configuring flowmeters – Service functions – Visualisation of process data – Trouble-shooting – Controlling the “FieldCheck™” tester/simulator Contact your E+H representative for more information.	DXS10 – * * * * *

Accessory	Description	Ordering code
FieldCheck ™	Tester/simulator for testing flowmeters in the field. When used in conjunction with the “FieldTool™” software package, test results can be imported into a database, printed and used for official certification. Contact your E+H representative for more information.	DXC10 – * *

9 Trouble-shooting

9.1 Trouble-shooting instructions

Always start trouble-shooting with the checklists below, if faults occur after start-up or during operation. The routine takes you directly to the cause of the problem and the appropriate remedial measures.

Check the display	
No display visible and no output signals present.	1. Check the power supply → terminals 1, 2 2. Check the power line fuse → Page 63 85...260 V AC: 0.8 A slow-blow / 250 V 20...55 V AC and 16...62 V DC: 2 A slow-blow / 250 V 3. Measuring electronics defective → order spare parts → Page 58
No display visible, but output signals are present.	1. Check whether the ribbon cable connector of the display module is correctly plugged into the amplifier board → Page 60, 62 2. Display module defective → order spare parts → Page 58 3. Measuring electronics defective → order spare parts → Page 58
Display texts are in a foreign language.	Switch off power supply. Press and hold down both the +/– keys and switch on the measuring device. The display text will appear in English (default) and is displayed at maximum contrast.
Measured value indicated, but no signal at the current or pulse output	Measuring electronics defective → order spare parts → Page 58

▼

<table>
<tr><th colspan="2">Error messages on display</th></tr>
<tr><td colspan="2">Errors which occur during commissioning or measuring operation are displayed immediately.
Error messages consist of a variety of icons. The meanings of these icons are as follows:
– Error type: S = system error, P = process error
– Error message type: ϟ = fault message, ! = notice message
– MEDIUM INHOM. = error designation, e.g. fluid is not homogeneous
– 03:00:05 = duration of error occurrence (in hours, minutes and seconds)
– # 702 = error number

Caution:
• Also observe the information on Page 34 ff.!
• The measuring system interprets simulations and positive zero return as system errors, but displays them as notice message only.</td></tr>
<tr><td>Error number:
No. 001 – 400
No. 601 – 699</td><td>System error (device error) has occurred → Page 50</td></tr>
<tr><td>Error number:
No. 500 – 600
No. 700 – 750</td><td>Process error (application error) has occurred → Page 53</td></tr>
</table>

▼

Other error (without error message)	
Some other error has occurred.	Diagnosis and rectification → Page 55

9.2 System error messages

Caution:
In the event of a serious fault, a flowmeter might have to be returned to the manufacturer for repair. The procedures on Page 8 must be carried out before you return a flowmeter to Endress+Hauser.
Always enclose a duly completed "Safety regulation" form. You will find a preprinted form at the back of this manual.

Type	Error message / No.	Cause	Remedy / spare part
Serious system errors are always recognized by the instrument as "Fault message", and are shown as a lightning flash on the display. Fault messages immediately affect the inputs and outputs. Simulations and positive zero return, on the other hand, are classed and displayed as notice messages. Also observe the information on → Page 34 ff. and 56. S = System error ϟ = Fault message (with an effect on the inputs and outputs) ! = Notice message (without an effect on the inputs and outputs)			
S ϟ	CRITICAL FAILURE # 001	Serious device error	Replace the amplifier board. Spare parts → Page 58
S ϟ	AMP HW EEPROM # 011	Amplifier: Defective EEPROM	Replace the amplifier board. Spare parts → Page 58
S ϟ	AMP SW EEPROM # 012	Amplifier: Error accessing EEPROM data	The EEPROM data blocks in which an error has occurred are displayed in the "RESTORE DATA FAILURE" function. Press Enter to acknowledge the errors in question; default values are automatically inserted instead of the errored parameter values. ✎ Note: The measuring device has to be restarted if an error has occurred in a totalizer block (see error No. 111 / CHECKSUM TOTAL).
S ϟ	SENSOR HW DAT # 031	Sensor: 1. S-DAT™ is defective. 2. S-DAT™ is not plugged into the I/O board or is missing.	1. Replace the S-DAT™. Spare parts → Page 58 Check the spare part set number to ensure that the new, replacement DAT is compatible with the measuring electronics. 2. Plug the S-DAT™ into the I/O board → Page 60, 62

Type	Error message / No.	Cause	Remedy / spare part
S ϟ	SENSOR SW DAT # 032	Sensor: Error accessing the calibration values stored in the S-DAT™.	1. Check whether the S-DAT™ is correctly plugged into the amplifier board → Page 60, 62 2. Replace the S-DAT™ if it is defective. Spare parts → Page 58 Before replacing the DAT, check that the new, replacement DAT is compatible with the measuring electronics. Check the: – Spare part set number – Hardware revision code 3. Replace measuring electronics boards if necessary. Spare parts → Page 58
S ϟ	A / C COMPATIB. # 051	The I/O board and the amplifier board are not compatible.	Use only compatible modules and boards. Check the compatibility of the modules used. Check the: – Spare part set number – Hardware revision code
S ϟ	CHECKSUM TOTAL # 111	Totalizer checksum error	1. Restart the measuring device 2. Replace the amplifier board if necessary. Spare parts → Page 58
S ϟ	COMMUNICATION I/O # 261	No data reception between amplifier and I/O board or faulty internal data transfer.	Check the BUS contacts
S ϟ	CURRENT RANGE # 351	Current output: Flow is out of range.	1. Change the upper or lower limit setting, as applicable. 2. Increase or reduce flow, as applicable.
S ϟ	FREQUENCY RANGE # 355	Frequency output: Flow is out of range.	1. Change the upper or lower limit setting, as applicable. 2. Increase or reduce flow, as applicable.
S ϟ	PULSE RANGE # 359	Pulse output: Pulse output frequency is out of range.	1. Increase the setting for pulse weighting 2. Increase the max. pulse frequency, if the totalizer can handle a higher number of pulses. 3. Reduce flow.
S ϟ	FREQ. LIM # 379 / 380	The measuring tube oscillation frequency is outside the permitted range. Causes: – Damaged measuring tube – Sensor defective or damaged	Contact your E+H service organisation.

Type	Error message / No.	Cause	Remedy / spare part
S ϟ	FLUIDTEMP. LIM # 381/ 382	The temperature sensor on the measuring tube is likely defective.	Check the following electrical connections before you contact your E+H service organisation: – Verify that the sensor signal cable connector is correctly plugged into the amplifier board. → Page 60, 62. – Remote version: Check sensor and transmitter terminal connections No. 9 and 10 → Page 23.
S ϟ	CARR. TEMP. LIM # 383 / 384	The temperature sensor on the carrier tube is likely defective.	Check the following electrical connections before you contact your E+H service organisation: – Verify that the sensor signal cable connector is correctly plugged into the amplifier board → Page 60, 62. – Remote version: Check sensor and transmitter terminal connections No. 11 and 12 → Page 23.
S ϟ	EL. DYN. SENSOR # 385 / 386 / 387	One of the measuring tube exciter coils (inlet or outlet) is likely defective.	Check the following electrical connections before you contact your E+H service organisation: – Verify that the sensor signal cable connector is correctly plugged into the amplifier board → Page 60, 62. – Remote version: Check sensor and transmitter terminal connections No. 4, 5, 6 and 7 → Page 23.
S ϟ	AMP. FAULT # 388 / 389/ 390	Amplifier error	Contact your E+H service organisation.
S !	POSITIVE ZERO RETURN # 601	Positive zero return active. Caution: This message has the highest display priority.	Switch off positive zero return
S !	SIM. CURR. OUT. # 611	Simulation current output active	Switch off simulation
S !	SIM. FREQ. OUT. # 621	Simulation frequency output active	Switch off simulation
S !	SIM. PULSE # 631	Simulation pulse output active	Switch off simulation
S !	SIM. STATUS OUT # 641	Simulation status output active	Switch off simulation
S !	SIM. STATUS IN # 671	Simulation status input active	Switch off simulation
S !	SIM. FAILSAFE # 691	Simulation of response to error (outputs) active	Switch off simulation
S !	SIM. MEASURAND # 692	Simulation of measuring variables (e.g. mass flow)	Switch off simulation

9.3 Process error messages

Type	Error message / No.	Cause	Remedy
Process errors can be defined as either “Fault” or “Notice” messages and can thereby be weighted differently. Determination of this is done via the function matrix (see the “Description of Device Functions” Manual). The error types listed in the following correspond to the factory settings. Also observe the information on → Page 34 ff. and 56 P = Process error ϟ = Fault message (with an effect on the inputs and outputs) ! = Notice message (without an effect on the inputs and outputs)			
P ϟ	OSC. AMP. LIM. # 586	The fluid properties do not allow a continuation of the measurement. Causes: – Extremely high viscosity – Process fluid is very inhomogeneous (gas or solid content)	Change or improve process conditions.
P ϟ	TUBE NOT OSC # 587	Extreme process conditions exist. The measuring system can therefore not be started.	Change or improve process conditions.
P ϟ	NOISE LIMIT # 588	Overdriving of the internal analog to digital converter. Causes: – Cavitation – Extreme pressure pulses – High gas flow velocity A continuation of the measurement is no longer possible!	Change or improve process conditions, e.g. by reducing the flow velocity.
P !	EMPTY PIPE # 700	The process fluid density is outside the upper or lower limit values set in the “EPD” function Causes: – Air in the measuring tube – Partly filled measuring tube	1. Ensure that there is no gas content in the process liquid. 2. Adapt the values in the “EPD” function to the current process conditions.
P !	EXC. CURR. LIM. # 701	The maximum current value for the measuring tube exciter coils has been reached, since certain process fluid characteristics are extreme, e.g. high gas or solid content. The instrument continues to work correctly.	In particular with outgassing fluids and/or increased gas content, the following measures are recommended to increase system pressure: 1. Install the instrument at the outlet side of a pump. 2. Install the instrument at the lowest point of an ascending pipeline. 3. Install a flow restriction, e.g. reducer or orifice, downstream from the instrument.

Type	Error message / No.	Cause	Remedy
P !	FLUID INHOM. # 702	Frequency control is not stable, due to inhomogeneous process fluid, e.g. gas or solid content.	In particular with outgassing fluids and/or increased gas content, the following measures are recommended to increase system pressure: 1. Mount the instrument at the outlet side of a pump. 2. Mount the instrument at the lowest point of an ascending pipeline. 3. Install a flow restriction, e.g. reducer or orifice, downstream from the instrument.
P !	NOISE LIMIT # 703 / 704	Overdriving of the internal analog to digital converter. Causes: – Cavitation – Extreme pressure pulses – High gas flow velocity A continuation of the measurement is still possible!	Change or improve process conditions, e.g. by reducing the flow velocity.
P !	FLOW LIMIT # 705	The mass flow is too high. The electronics' measuring range will be exceeded.	Reduce flow
P !	ADJ. ZERO FAIL # 731	The zero point adjustment is not possible or has been cancelled.	Make sure that zero point adjustment is carried out at “zero flow” only (v = 0 m/s) → Page 39.

9.4 Process errors without messages

Symptoms	Rectification
Remark: You may have to change or correct certain settings of the function matrix in order to rectify faults. The functions outlined below, such as DISPLAY DAMPING, for example, are described in detail in the "Description of Device Functions" manual.	
Measured value reading fluctuates even though flow is steady.	1. Check the fluid for presence of gas bubbles. 2. In the "TIME CONSTANT" function (CURRENT OUTPUT) → increase the value 3. In the "DISPLAY DAMPING" function (USER INTERFACE) → increase the value
Measured value reading shown on display, even though the fluid is at a standstill and the measuring tube is full.	1. Check the fluid for presence of gas bubbles. 2. Activate the "ON-VAL. LF-CUTOFF" function (PROCESS PARAMETER), i.e. enter or increase the value for the creepage.
The fault cannot be rectified or some other fault not described above has occured. In these instances, please contact your E+H service organisation.	The following options are available for tackling problems of this nature: **Request the services of an E+H service technician** If you contact our service organisation to have a service technician sent out, please be ready with the following information: – Brief description of the fault – Nameplate specifications (Page 9 ff.): Order code and serial number **Returning devices to E+H** The procedures on Page 8 must be carried out before you return a flowmeter requiring repair or calibration to Endress+Hauser. Always enclose a duly completed "Safety regulation" form with the flowmeter. You will find a preprinted "Safety regulation" form at the back of this manual. **Replace transmitter electronics** Components in the measuring electronics defective → order replacement → Page 58

9.5 Response of outputs to errors

Note:
The failsafe mode of totalizers, current, pulse and frequency outputs can be customised by means of various functions in the function matrix. You will find detailed information on these procedures in the “Description of Device Functions” manual.

Positive zero return and failsafe mode:
You can use positive zero return to set the signals of the current, pulse and frequency outputs to their fallback value, for example when measuring has to be interrupted while a pipe is being cleaned. This function takes priority over all other device functions. Simulations, for example, are suppressed.

Failsafe mode of outputs and totalizers		
	Process/system error is present	Positive zero return is activated
Caution: System or process errors defined as “Notice messages” have no effect whatsoever on the inputs and outputs. See the information on Page 34 ff.		
Current output	*MINIMUM CURRENT* 0–20 mA (25 mA) → 0 mA 4–20 mA (25 mA) → 2 mA HART 4–20 mA (25 mA) → 2 mA 0–20 mA → 0 mA 4–20 mA → 2 mA HART 4–20 mA → 2 mA *MAXIMUM CURRENT* 0–20 mA (25 mA) → 25 mA 4–20 mA (25 mA) → 25 mA HART 4–20 mA (25 mA) → 25 mA 0–20 mA (NAMUR) → 22 mA 4–20 mA (NAMUR) → 22 mA HART 4–20 mA (NAMUR) → 22 mA *HOLD VALUE* Last valid value (preceding occurrence of the fault) is output. *ACTUAL VALUE* Fault is ignored, i.e. normal measured value output on the basis of ongoing flow measurement.	Output signal corresponds to “zero flow”
Pulse output	*FALLBACK VALUE* Signal output → no pulses *HOLD VALUE* Last valid value (preceding occurrence of the fault) is output. *ACTUAL VALUE* Fault is ignored, i.e. normal measured value output on the basis of ongoing flow measurement.	Output signal corresponds to “zero flow”

Failsafe mode of outputs and totalizers		
	Process/system error is present	Positive zero return is activated
Frequency output	*FALLBACK VALUE* Signal output → 0 Hz *FAILSAFE LEVEL* Output of the frequency specified in the FAILSAFE VALUE function (No. 4211). *HOLD VALUE* Last valid value (preceding occurrence of the fault) is output. *ACTUAL VALUE* Fault is ignored, i.e. normal measured value output on the basis of ongoing flow measurement.	Output signal corresponds to "zero flow"
Totalizer	*STOP* The totalizers are paused until the error is rectified. *ACTUAL VALUE* The fault is ignored. The totalizers continue to count in accordance with the current flow value. *HOLD VALUE* The totalizers continue to count the flow in accordance with the last valid flow value (before the error occurred).	Totalizer stops
Status output	In the event of a fault or power supply failure: Status output → non-conductive	No effect on status output

9.6 Spare parts

Section 9.1 contains a detailed trouble-shooting guide. The measuring device, moreover, provides additional support in the form of continuous self-diagnosis and error messages.
Fault rectification can entail replacing defective components with tested spare parts. The illustration below shows the available scope of spare parts.

✎ Note:
You can order spare parts directly from your E+H service organisation by providing the serial number printed on the transmitter's nameplate (see Page 9).

Spare parts are shipped as sets comprising the following parts:
- Spare part
- Additional parts, small items (threaded fasteners, etc.)
- Mounting instructions
- Packaging

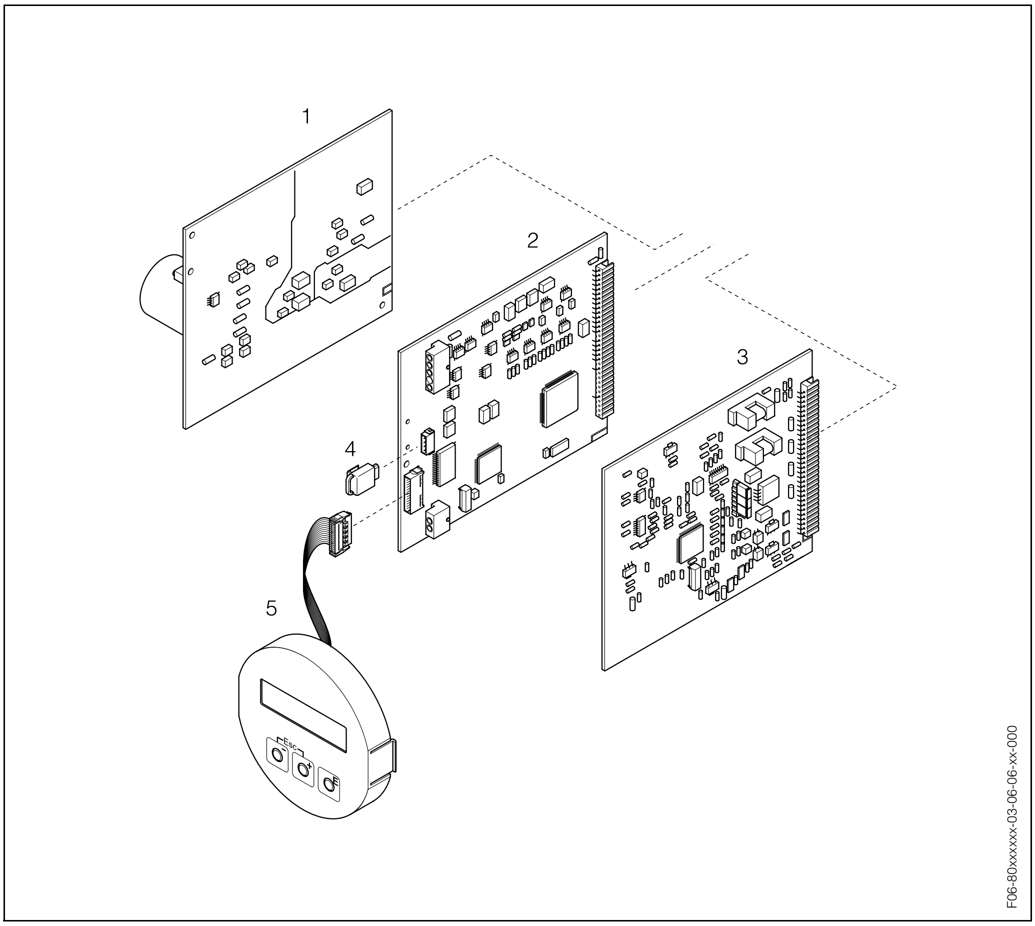


Fig. 26: Spare parts for Promass 80 transmitter (field and wall-mounted housing)

1 Power unit board (85...260 V AC, 20...55 V AC, 16...62 V DC)
2 Amplifier board
3 I/O board (COM module)
4 S-DAT™ (sensor data memory)
5 Display module

9.7 Removing and installing printed circuit boards

Field housing: removing and installing printed circuit boards (Fig. 27)

Warning:
- Risk of electric shock. Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.
- Risk of damaging electronic components (ESD protection). Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface purposely built for electrostatically sensitive devices!

1. Unscrew cover of the electronics compartment from the transmitter housing.
2. Remove the local display (1) as follows:
   – Press in the latches (1.1) at the side and remove the display module.
   – Disconnect the ribbon cable (1.2) of the display module from the amplifier board.
3. Remove the screws and remove the cover (2) from the electronics compartment.
4. Remove power unit board and I/O board (4, 6):
   Insert a thin pin into the hole (3) provided for the purpose and pull the board clear of its holder.
5. Remove amplifier board (5):
   – Disconnect the plug of the sensor signal cable (5.1) including S-DAT™ (5.3) from the board.
   – Disconnect the plug of the excitation current cable (5.2) from the board.
   – Insert a thin pin into the hole (3) provided for the purpose and pull the board clear of its holder.
6. Installation is the reverse of the removal procedure.

   Caution:
   Use only original Endress+Hauser parts.

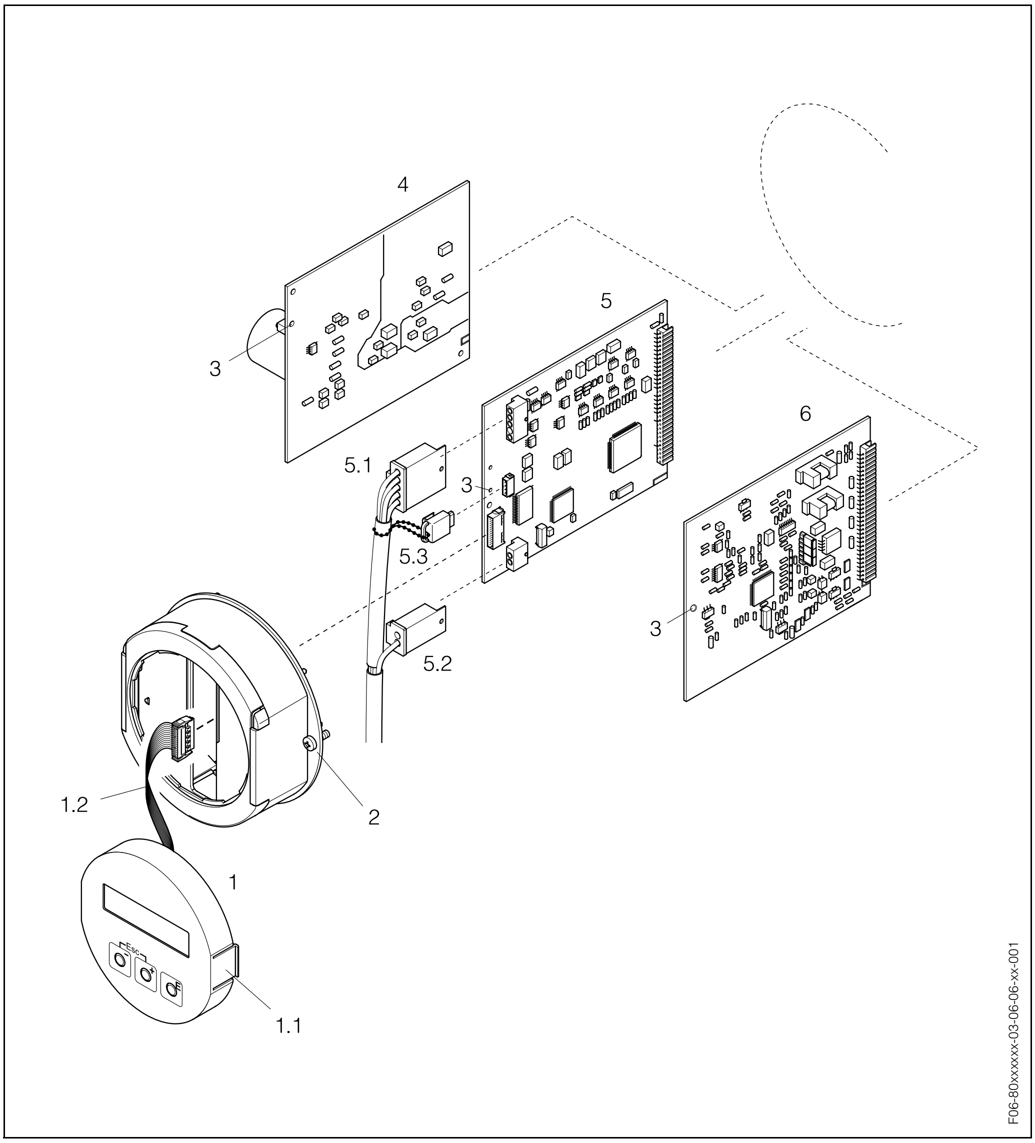


Fig. 27: Field housing: removing and installing printed circuit boards

1 Local display
1.1 Latch
1.2 Ribbon cable (display module)
2 Screws of electronics compartment cover
3 Aperture for installing/removing boards
4 Power unit board
5 Amplifier board
5.1 Signal cable (sensor)
5.2 Excitation current cable (sensor)
5.3 S-DAT™ (sensor data memory)
6 I/O board

Wall-mount housing: removing and installing printed circuit boards (Fig. 28)

Warning:
- Risk of electric shock. Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.
- Risk of damaging electronic components (ESD protection). Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface, purposely built for electrostatically sensitive devices!

1. Remove the screws and open the hinged cover (1) of the housing.
2. Remove the screws securing the electronics module (2). Then push up electronics module and pull it as far as possible out of the wall-mounted housing.
3. Disconnect the following cable plugs from amplifier board (7):
   – Unplug sensor signal cable (7.1) including S-DAT™ (7.3)
   – Unplug excitation current cable (7.2)
   – Unplug ribbon cable (3) of the display module
4. Remove the screws and remove the cover (4) from the electronics compartment.
5. Remove the boards (6, 7, 8):
   Insert a thin pin into the hole (5) provided for the purpose and pull the board clear of its holder.
6. Installation is the reverse of the removal procedure.

Caution:
Use only original Endress+Hauser parts.

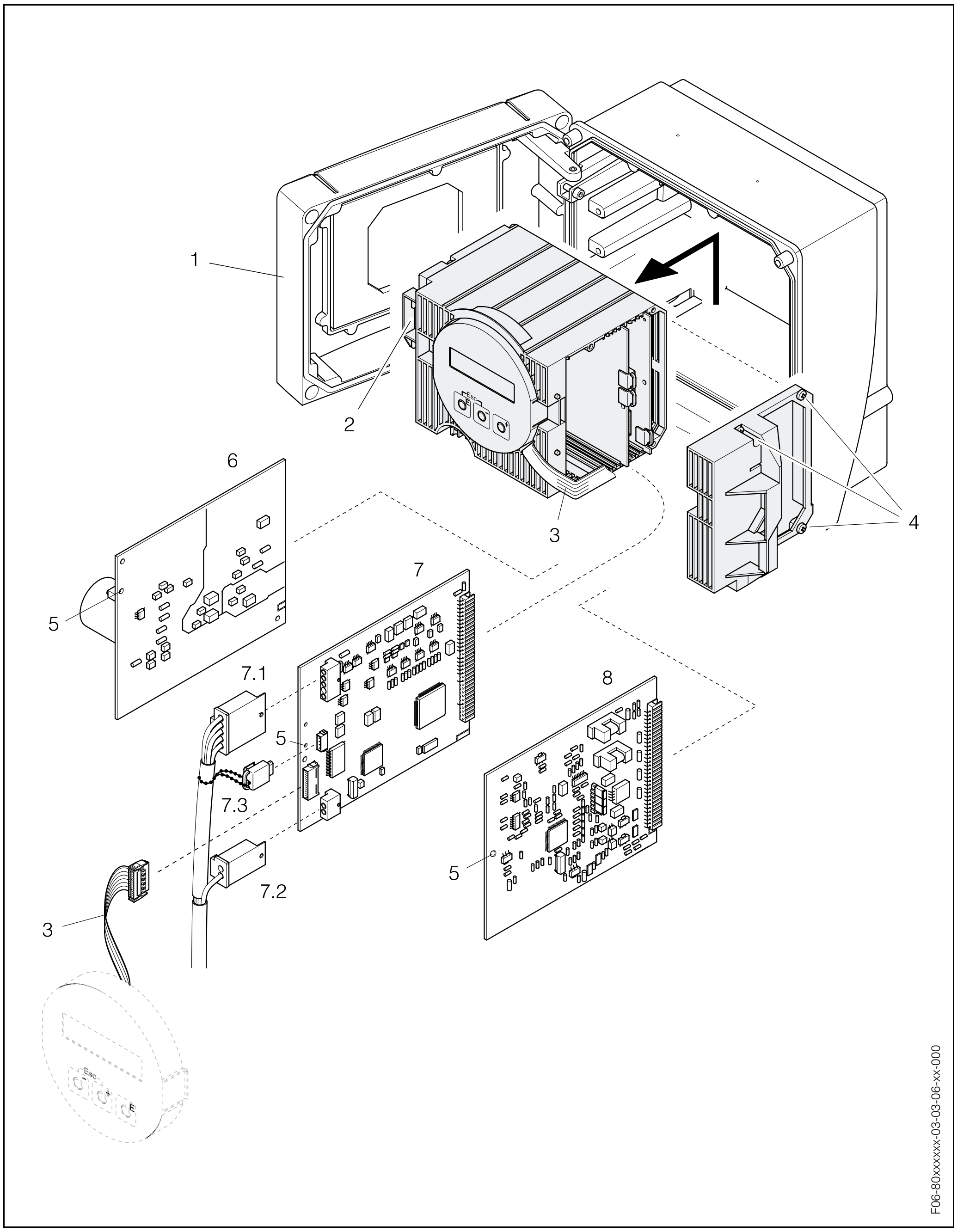


Fig. 28: Wall-mounted housing: removing and installing printed circuit boards

1 Housing cover
2 Electronics module
3 Ribbon cable (display module)
4 Screws of electronics compartment cover
5 Aperture for installing/removing boards
6 Power unit board
7 Amplifier board
7.1 Signal cable (sensor)
7.2 Excitation current cable (sensor)
7.3 S-DAT™ (sensor data memory)
8 I/O board

9.8 Replacing the device fuse

Warning:
Risk of electric shock. Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.

The main fuse is on the power unit board (Fig. 29).
The procedure for replacing the fuse is as follows:

1. Switch off power supply.
2. Remove the power unit board → Page 59, 61
3. Remove cap (1) and replace the device fuse (2).
   Use only fuses of the following type:
   – Power supply 20...55 V AC / 16...62 V DC → 2.0 A slow-blow / 250 V; 5.2 x 20 mm
   – Power supply 85...260 V AC → 0.8 A slow-blow / 250 V; 5.2 x 20 mm
   – Ex-rated devices → see the Ex documentation.
4. Assembly is the reverse of the disassembly procedure.

Caution:
Use only original Endress+Hauser parts.

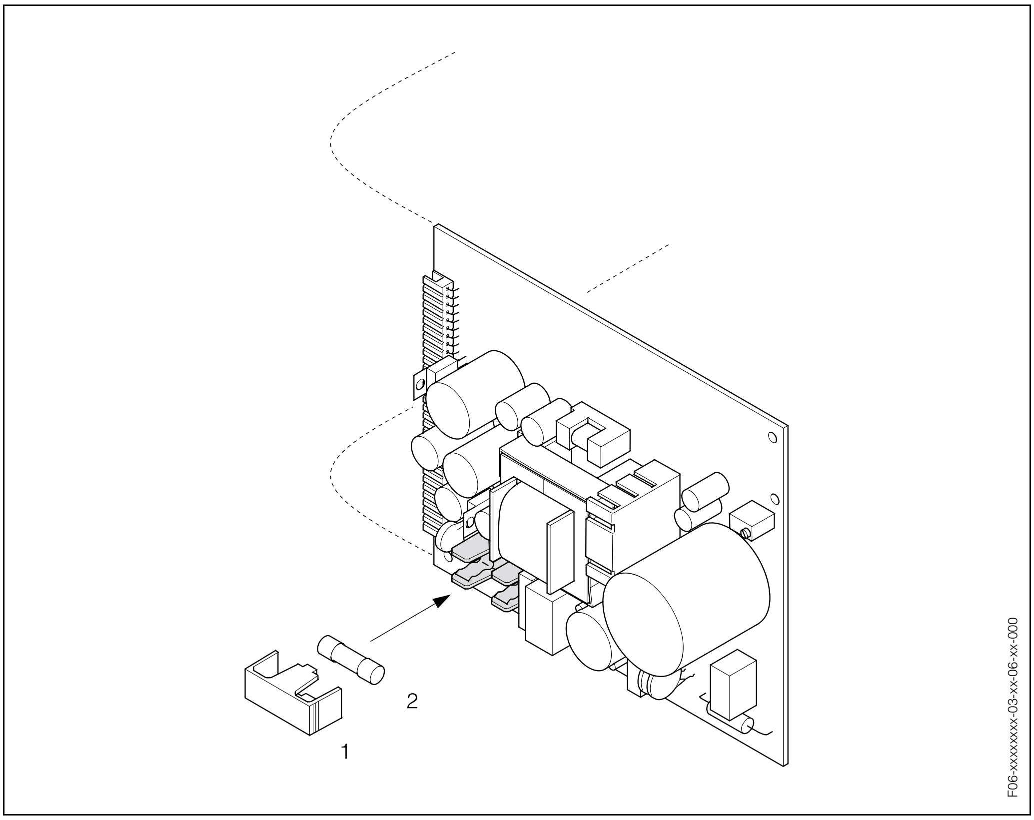


Fig. 29: Replacing the device fuse on the power unit board

1 Protective cap
2 Device fuse

9.9 Software history

Software version / date	Changes to software	Changes to documentation
Amplifier: V 1.00.XX / 11.2000 Communication (I/O): V 1.00.XX / 11.2000	Original software Compatible with: – FieldTool ™ – HART communicator DXR 275 (OS 4.6 and higher) with rev. 1, DD 1.	–

10 Technical data

10.1 Technical data at a glance

10.1.1 Applications

The measuring device is for mass flow and volume flow measurement of liquids and gases in sealed piping systems. Application examples:

- Chocolate, condensed milk, liquid sugar
- Oils, fats
- Acids, alkalis, lacquers, paints, solvents and cleaning agents
- Pharmaceuticals, catalysts, inhibitors
- Suspensions,
- Gases, liquefied gases, etc.

10.1.2 Function and system design

Measuring principle

Mass flow measurement by the Coriolis principle

Measuring system

The measuring system consists of a transmitter and a sensor:
- Promass 80 transmitter
- Promass F, M, A or I sensor

Two versions are available:
- Compact version: transmitter and sensor form a single mechanical unit.
- Remote version: transmitter and sensor are installed separately.

10.1.3 Input

Measured variable

- Mass flow (proportional to the phase difference between two sensors mounted on the measuring tube to register a phase shift in the oscillation)
- Fluid density (proportional to resonance frequency of the measuring tube)
- Fluid temperature (measured with temperature sensors)

Measuring range

Measuring ranges for liquids (Promass F, M):

DN	Range of full scale values (liquids) $\dot{m}_{min(F)} \cdots \dot{m}_{max(F)}$
8	0...2000 kg/h
15	0...6500 kg/h
25	0...18000 kg/h
40	0...45000 kg/h
50	0...70000 kg/h
80	0...180000 kg/h
100	0...350000 kg/h

Measuring ranges for liquids (Promass A):

DN	Range of full scale values (liquids) $\dot{m}_{min(F)} \cdots \dot{m}_{max(F)}$
1	0...20 kg/h
2	0...100 kg/h
4	0...450 kg/h

Measuring ranges for liquids (Promass I):

DN	Range of full scale values (liquids) $\dot{m}_{min(F)} \cdots \dot{m}_{max(F)}$
8	0...2000 kg/h
15	0...6500 kg/h
15 *	0...18000 kg/h
25	0...18000 kg/h
25 *	0...45000 kg/h
40	0...45000 kg/h
40 *	0...70000 kg/h
50	0...70000 kg/h
* DN 15, 25, 40 “FB” = Full bore versions of Promass I	

Measuring ranges for gases:
The full scale values depend on the density of the gas. Use the formula below to calculate the full scale values:

$$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \frac{\rho_{(G)}}{x\ [kg/m^3]}$$

$\dot{m}_{max\ (G)}$ = Max. full scale value for gas [kg/h]
$\dot{m}_{max\ (F)}$ = Max. full scale value for liquid [kg/h]
$\rho_{\ (G)}$ = Gas density in [kg/m^3] under process conditions
x = 160 (Promass F, M, I); x = 32 (Promass A)

Calculation example for gas:
- Sensor type: Promass F, DN 50
- Gas: air with a density of 60.3 kg/m^3 (at 20 °C and 50 bar)
- Measuring range: 70000 kg/h

Max. possible full scale value:

$$\dot{m}_{max(G)} = \frac{\dot{m}_{max(F)} \cdot \rho_{(G)}}{160\ kg/m^3} = \frac{70000\,kg/h \cdot 60.3\ kg/h}{160\ kg/m^3} = 26400\ kg/h$$

Recommended full scale values:
See Page 74 (“Limiting flow”)

Operable flow range	Greater than 1000 :1. Flows above the preset full scale value do not overload the amplifier, i.e. totalizer values are registered correctly.
Input signal	Status input (auxiliary input): U = 3...30 V DC, R_i = 5 kΩ, galvanically isolated. Configurable for: totalizer reset, positive zero return, error message reset, zero point adjustment

10.1.4 Output

Output signal	Current output: Active/passive selectable, galvanically isolated, time constant selectable (0.05...100 s), full scale value selectable, temperature coefficient: typically 0.005% o.r./°C; resolution: 0.5 µA • active: 0/4...20 mA, R_L < 700 Ω (for HART: R_L ≥ 250 Ω) • passive: 4...20 mA, max. 30 V DC, R_i ≤ 150 Ω Pulse / frequency output: Passive, open collector, 30 V DC, 250 mA, galvanically isolated. • Frequency output: full scale frequency 2...1000 Hz (f_{max} = 1250 Hz), on/off ratio 1:1, pulse width max. 10 s • Pulse output: pulse value and pulse polarity selectable, max. pulse width adjustable (0.05...2 s), max. pulse frequency selectable
Signal on alarm	• Current output → failsafe mode selectable • Pulse/frequency output → failsafe mode selectable • Status output → "non-conductive" in the event of fault or power supply failure
Load	see "Output signal"
Switching output	Status output: Open collector, max. 30 V DC / 250 mA, galvanically isolated. Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values
Low flow cutoff	Switch points for low flow cut off are selectable
Galvanic isolation	All circuits for inputs, outputs, and power supply are galvanically isolated from each other.

10.1.5 Auxiliary energy

Electrical connections	see Page 23 ff.
Supply voltage	85...260 V AC, 45...65 Hz 20...55 V AC, 45...65 Hz 16...62 V DC
Potential equalisation	No measures necessary
Cable entries	Power supply and signal cables (inputs/outputs): • Cable entry M20 x 1.5 (8...12 mm) • Threads for cable entries, PG 13.5 (5...15 mm), 1/2" NPT, G 1/2" Connecting cable for remote version: • Cable entry M20 x 1.5 (8...12 mm) • Threads for cable entries, PG 13.5 (5...15 mm), 1/2" NPT, G 1/2"

Cable specifications remote version	• 6 x 0.38 mm^2 PVC cable with common shield and individually shielded cores. • Conductor resistance: ≤ 50 Ω/km • Capacitance: core/shield: ≤ 420 pF/m • Cable length: max. 20 m • Permanent operating temperature: max. +105 °C
Power consumption	AC: <15 VA (including sensor) DC: <15 W (including sensor) Switch-on current: • max. 13.5 A (< 50 ms) at 24 V DC • max. 3 A (< 5 ms) at 260 V AC
Power supply failure	Lasting min. 1 power cycle: • EEPROM saves measuring system data if power supply fails. • S-DAT™ is an exchangeable data storage chip with sensor specific data: nominal diameter, serial number, calibration factor, zero point, etc.

10.1.6 Performance characteristics

Reference operating conditions

Error limits following ISO/DIS 11631:
- 20...30 °C; 2...4 bar
- Calibration systems as per national norms
- Zero point calibrated under operating conditions
- Field density calibrated (or special density calibration)

Maximum measured error

The following values refer to the pulse/frequency output.
Measured error at the current output is typically ±5 μA.

Mass flow (liquid)
Promass F: ±0.15% ± [(zero point stability / measured value) x 100]% o.r.
Promass M: ±0.15% ± [(zero point stability / measured value) x 100]% o.r.
Promass A: ±0.15% ± [(zero point stability / measured value) x 100]% o.r.
Promass I: ±0.20% ± [(zero point stability / measured value) x 100]% o.r.

Mass flow (gas)
Promass F: ±0.50% ± [(zero point stability / measured value) x 100]% o.r.
Promass M: ±0.50% ± [(zero point stability / measured value) x 100]% o.r.
Promass A: ±0.50% ± [(zero point stability / measured value) x 100]% o.r.
Promass I: ±0.50% ± [(zero point stability / measured value) x 100]% o.r.

Volume flow (liquid)
Promass F: ±0.20% ± [(zero point stability / measured value) x 100]% o.r.
Promass M: ±0.25% ± [(zero point stability / measured value) x 100]% o.r.
Promass A: ±0.25% ± [(zero point stability / measured value) x 100]% o.r.
Promass I: ±0.50% ± [(zero point stability / measured value) x 100]% o.r.

o.r. = of reading

Zero point stability (Promass F, M):

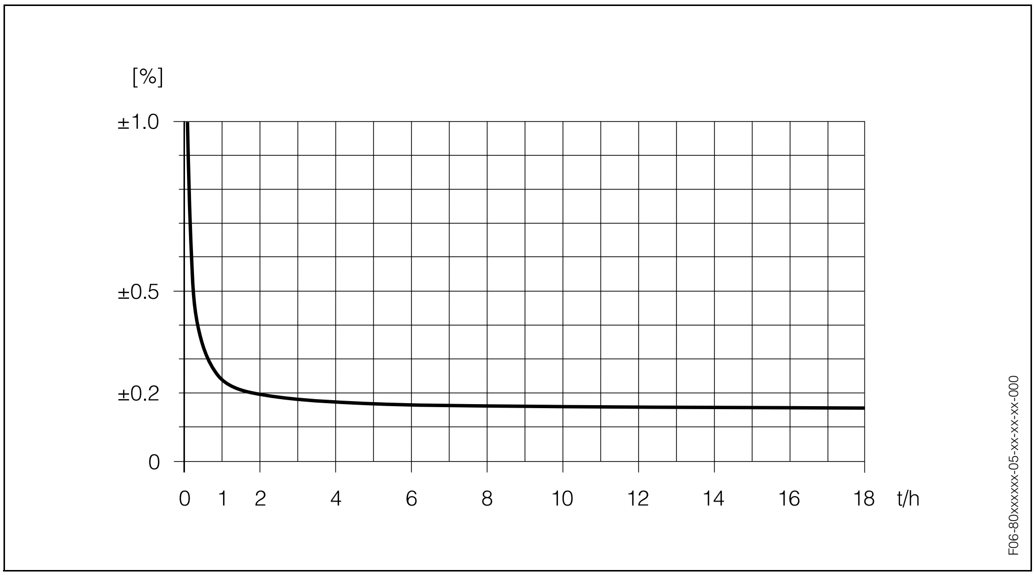
DN	**Maximum full scale value** [kg/h] or [l/h]	**Zero point stability** [kg/h] or [l/h]
8	2000	0.100
15	6500	0.325
25	18000	0.90
40	45000	2.25
50	70000	3.50
80	180000	9.00
100	350000	14.00

Zero point stability (Promass A):

DN	**Maximum full scale value** [kg/h] or [l/h]	**Zero point stability** [kg/h] or [l/h]
1	20	0.0010
2	100	0.0050
4	450	0.0225

Zero point stability (Promass I):

DN	**Maximum full scale value** [kg/h] or [l/h]	**Zero point stability** [kg/h] or [l/h]
DN 8	2000	0.20
DN 15	6500	0.65
DN 15 *	18000	1.8
DN 25	18000	1.8
DN 25 *	45000	4.5
DN 40	45000	4.5
DN 40 *	70000	7.0
DN 50	70000	7.0
* DN 15, 25, 40 “FB” = Full bore versions of Promass I		



Maximum measured error in % of reading (example: Promass 80 F, M / DN 25)

Calculation example (mass flow, liquid):
Given: Promass 80 F / DN 25, flow = 8000 kg/h
Max. measured error: ±0.15% ± [(zero point stability / measured value) x 100]% o.r.

$$\text{Max. measured error} \rightarrow \pm 0.15\% \pm \frac{0.9\ \text{kg/h}}{8000\ \text{kg/h}} \cdot 100\ \% = \pm 0.161\%$$

Density (liquid)

- Standard calibration:
  Promass F: ±0.01 g/cc
  Promass M: ±0.02 g/cc
  Promass A: ±0.02 g/cc
  Promass I: ±0.02 g/cc

- Special density calibration (optional). Calibration range = 0.8...1.8 g/cc, 5...80 °C:
  Promass F: ±0.001 g/cc
  Promass M: ±0.002 g/cc
  Promass A: ±0.002 g/cc
  Promass I: ±0.004 g/cc

- Field density calibration:
  Promass F: ±0.0005 g/cc
  Promass M: ±0.0010 g/cc
  Promass A: ±0.0010 g/cc
  Promass I: ±0.0020 g/cc

Temperature
±0.5 °C ±0.005 x T (T = fluid temperature in °C)

Repeatability

Flow measurement
- Mass flow (liquid):
  ±0.05% ± [1/2 x (zero point stability / measured value) x 100]% o.r.
- Mass flow (gas):
  ±0.25% ± [1/2 x (zero point stability / measured value) x 100]% o.r.
- Volume flow (liquid):
  Promass F: ±0.05% ± [1/2 x (zero point stability / measured value) x 100]% o.r.
  Promass M: ±0.10% ± [1/2 x (zero point stability / measured value) x 100]% o.r.
  Promass A: ±0.10% ± [1/2 x (zero point stability / measured value) x 100]% o.r.
  Promass I: ±0.20% ± [1/2 x (zero point stability / measured value) x 100]% o.r.

o.r. = of reading
Zero point stability: see “Max. measured error”

Calculation example (mass flow, liquid):
Given: Promass 80 F / DN 25, flow = 8000 kg/h
Repeatability: ±0.05% ± [1/2 x (zero point stability / measured value) x 100]% o.r.

$$\text{Repeatability} \rightarrow \pm 0.05\% \pm 1/2 \cdot \frac{0.9\ \text{kg/h}}{8000\ \text{kg/h}} \cdot 100\ \% = \pm 0.0556\%$$

Density measurement (liquid)
Promass F: ±0.00025 g/cc (1 g/cc = 1 kg/l)
Promass M: ±0.0005 g/cc
Promass A: ±0.0005 g/cc
Promass I: ±0.001 g/cc

Temperature measurement
±0.25 °C ±0.0025 x T (T = fluid temperature in °C)

Influence of medium temperature

When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error of the Promass sensor is ±0.0002% of the full scale value / °C.

Influence of medium pressure

The tables below show the effect on accuracy of mass flow due to a difference between calibration pressure and process pressure.

Promass F, M:

DN	**Promass F** % o.r. / bar	**Promass M** % o.r. / bar	**Promass M / high pressure** % o.r. / bar
8	No influence	0.009	0.006
15	No influence	0.008	0.005
25	No influence	0.009	0.003
40	–0.003	0.005	–
50	–0.008	No influence	–
80	–0.009	No influence	–
100	–0.012	–	–
o.r. = of reading			

Promass I:

DN	**Promass I** % o.r. / bar
DN 8	0.006
DN 15	0.004
DN 15 [1]	0.006
DN 25	0.006
DN 25 [1]	No influence
DN 40	No influence
DN 40 [1]	0.006
DN 50	0.006
[1] DN 15, 25, 40 "FB" = Full bore versions of Promass I	

Promass A:
A difference between calibration pressure and process pressure has no effect on measuring accuracy.

10.1.7 Operating conditions (installation)

Installation instructions	see Page 14 ff.
Inlet and outlet runs	There are no installation requirements regarding inlet and outlet runs.
Length of connecting cable	Max. 20 meters (remote version)
System pressure	see Page 15

10.1.8 Operating conditions (environment)

Ambient temperature	–20...+60 °C (sensor, transmitter) Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.
Storage temperature	–40...+80 °C (preferably +20 °C)
Degree of protection	Standard: IP 67 (NEMA 4X) for transmitter and sensor
Shock resistance	According to IEC 68-2-31
Vibration resistance	Acceleration up to 1 g, 10...150 Hz, following IEC 68-2-6
Suitability for CIP cleaning	yes
Suitability for SIP cleaning	yes
Electromagnetic compatibility (EMC)	To EN 61326 and NAMUR recommendation NE 21

10.1.9 Operating conditions (process)

Medium temperature range

Sensor:
- Promass F: –50...+200 °C
- Promass M: –50...+150 °C
- Promass A: –50...+200 °C
- Promass I: –50...+150 °C

Seals:
- Promass F: no internal seals
- Promass M: Viton –15...200 °C; EPDM –40...+160 °C; silicon –60...+200 °C; Kalrez –20...+210 °C; FEP-jacketed: –60...+200 °C
- Promass A (only for mounting sets with threaded connections): Viton –15...200 °C; EPDM –40...+160 °C; silicon –60...+200 °C; Kalrez –20...+210 °C
- Promass I: no internal seals

Limiting medium pressure range (nominal pressure)	Promass F: • Flanges: DIN PN 16...100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K Promass M: • Flanges: DIN PN 40...100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K Promass M (high pressure version): • Measuring tubes, connector, threaded unions: max. 350 bar Promass A: • Threaded unions: max. 160 bar (standard version) max. 400 bar (high pressure version) • Flanges: DIN PN 40...100 / ANSI Cl 150, Cl 300 / JIS 10K Promass I: • Flanges: DIN PN 40...100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K Pressure ranges of secondary containment: • Promass F: DN 8...50: 40 bar or 600 psi; DN 80: 25 bar or 375 psi; DN 100: 16 bar or 250 psi • Promass M: 100 bar or 1500 psi • Promass A: 25 bar or 375 psi • Promass I: 40 bar or 600 psi
Limiting flow	See Page 65 ff. ("Measuring range") Select nominal diameter by optimising between required flow range and permissible pressure loss. See Page 65 ff. for a list of maximum possible full scale values. • The minimum recommended full scale value is approx. $^{1}/_{20}$ of the maximum full scale value. • In most applications, 20...50% of the maximum full scale value can be considered ideal. • Select a lower full scale value for abrasive substances such as fluids with entrained solids (flow velocity < 1 m/s). • For gas measurement the following rules apply: – Flow velocity in the measuring tubes should not be more than half the sonic velocity (0.5 Mach). – The maximum mass flow depends on the density of the gas (see formula on Page 66)

Pressure loss

Pressure loss depends on the fluid properties and on the flow rate.
The following formulas can be used to approximately calculate the pressure loss:

Pressure loss formulas for Promass F and M

Reynolds number	$Re = \dfrac{2 \cdot \dot{m}}{\pi \cdot d \cdot \upsilon \cdot \rho}$
Re ≥ 2300 [1)]	$\Delta p = K \cdot \upsilon^{0.25} \cdot \dot{m}^{1.85} \cdot \rho^{-0.86}$
Re < 2300	$\Delta p = K1 \cdot \upsilon \cdot \dot{m} + \dfrac{K2 \cdot \upsilon^{0.25} \cdot \dot{m}^2}{\rho}$
Δp = pressure loss [mbar] υ = kinematic viscosity [m^2/s] $\dot{m}$ = mass flow [kg/s]	ρ = fluid density [kg/m^3] d = inside diameter of measuring tubes [m] K...K2 = constants (depending on nominal diameter)

1) To compute the pressure loss for gases, always use the formula for Re ≥ 2300.

Pressure loss formulas for Promass A and I

Reynolds number	$Re = \dfrac{4 \cdot \dot{m}}{\pi \cdot d \cdot \upsilon \cdot \rho}$
Re ≥ 2300 [1)]	$\Delta p = K \cdot \upsilon^{0.25} \cdot \dot{m}^{1.75} \cdot \rho^{-0.75} + \dfrac{K3 \cdot \dot{m}^2}{\rho}$
Re < 2300	$\Delta p = K1 \cdot \upsilon \cdot \dot{m} + \dfrac{K3 \cdot \dot{m}^2}{\rho}$
Δp = pressure loss [mbar] υ = kinematic viscosity [m^2/s] $\dot{m}$ = mass flow [kg/s]	ρ = fluid density [kg/m^3] d = inside diameter of measuring tubes [m] K...K3 = constants (depending on nominal diameter)

1) To compute the pressure loss for gases, always use the formula for Re ≥ 2300.

Pressure loss coefficient for Promass F

DN	d [m]	K	K1	K2
8	$5.35 \cdot 10^{-3}$	$5.70 \cdot 10^{7}$	$9.60 \cdot 10^{7}$	$1.90 \cdot 10^{7}$
15	$8.30 \cdot 10^{-3}$	$5.80 \cdot 10^{6}$	$1.90 \cdot 10^{7}$	$10.60 \cdot 10^{5}$
25	$12.00 \cdot 10^{-3}$	$1.90 \cdot 10^{6}$	$6.40 \cdot 10^{6}$	$4.50 \cdot 10^{5}$
40	$17.60 \cdot 10^{-3}$	$3.50 \cdot 10^{5}$	$1.30 \cdot 10^{6}$	$1.30 \cdot 10^{5}$
50	$26.00 \cdot 10^{-3}$	$7.00 \cdot 10^{4}$	$5.00 \cdot 10^{5}$	$1.40 \cdot 10^{4}$
80	$40.50 \cdot 10^{-3}$	$1.10 \cdot 10^{4}$	$7.71 \cdot 10^{4}$	$1.42 \cdot 10^{4}$
100	$51.20 \cdot 10^{-3}$	$3.54 \cdot 10^{3}$	$3.54 \cdot 10^{4}$	$5.40 \cdot 10^{3}$

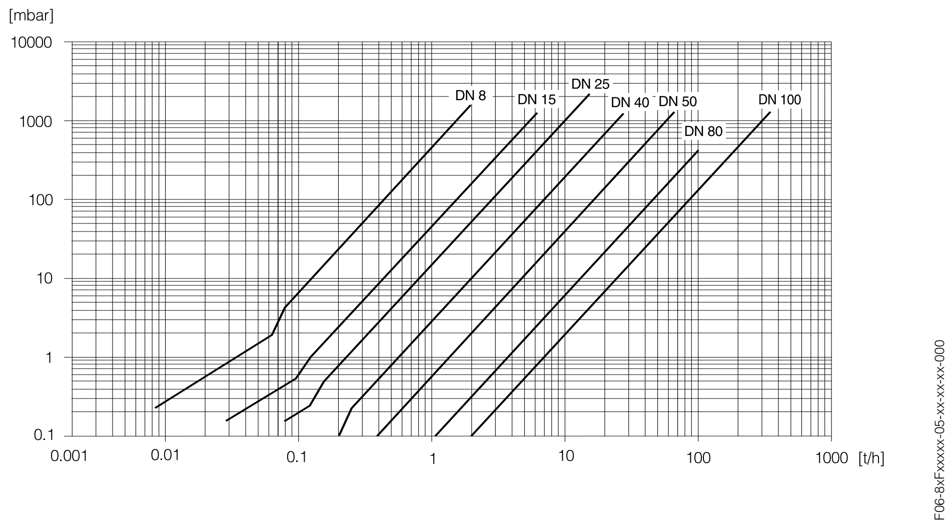


Fig. 30: Pressure loss diagram with water

Pressure loss coefficient for Promass M

DN	d [m]	K	K1	K2
8	$5.53 \cdot 10^{-3}$	$5.2 \cdot 10^{7}$	$8.6 \cdot 10^{7}$	$1.7 \cdot 10^{7}$
15	$8.55 \cdot 10^{-3}$	$5.3 \cdot 10^{6}$	$1.7 \cdot 10^{7}$	$9.7 \cdot 10^{5}$
25	$11.38 \cdot 10^{-3}$	$1.7 \cdot 10^{6}$	$5.8 \cdot 10^{6}$	$4.1 \cdot 10^{5}$
40	$17.07 \cdot 10^{-3}$	$3.2 \cdot 10^{5}$	$1.2 \cdot 10^{6}$	$1.2 \cdot 10^{5}$
50	$25.60 \cdot 10^{-3}$	$6.4 \cdot 10^{4}$	$4.5 \cdot 10^{5}$	$1.3 \cdot 10^{4}$
80	$38.46 \cdot 10^{-3}$	$1.4 \cdot 10^{4}$	$8.2 \cdot 10^{4}$	$3.7 \cdot 10^{3}$
High pressure version				
8	$4.93 \cdot 10^{-3}$	$6.0 \cdot 10^{7}$	$1.4 \cdot 10^{8}$	$2.8 \cdot 10^{7}$
15	$7.75 \cdot 10^{-3}$	$8.0 \cdot 10^{6}$	$2.5 \cdot 10^{7}$	$1.4 \cdot 10^{6}$
25	$10.20 \cdot 10^{-3}$	$2.7 \cdot 10^{6}$	$8.9 \cdot 10^{6}$	$6.3 \cdot 10^{5}$

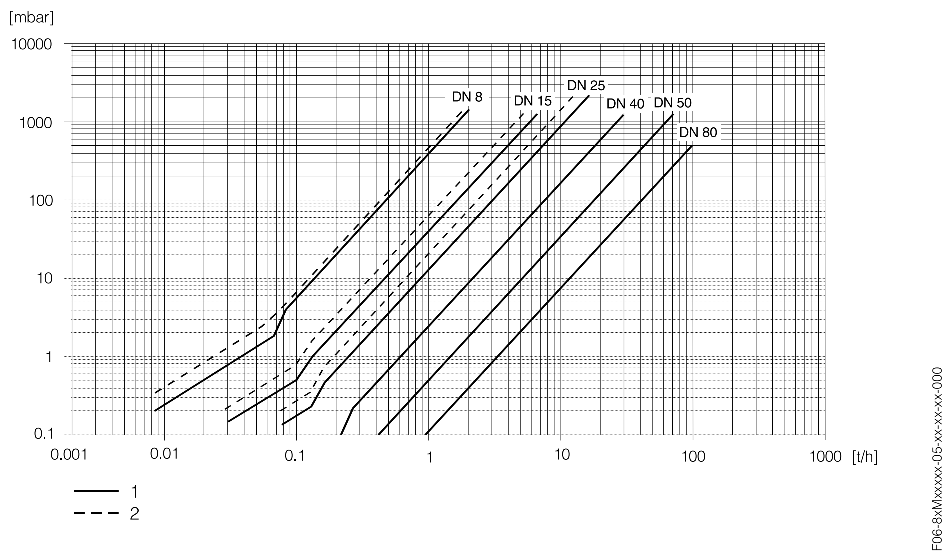


Fig. 31: Pressure loss diagram with water

1 Promass M
2 Promass M (high pressure version)

Pressure loss coefficient for Promass A

DN	d [m]	K	K1	K3
1	$1.10 \cdot 10^{-3}$	$1.2 \cdot 10^{11}$	$1.3 \cdot 10^{11}$	0
2	$1.80 \cdot 10^{-3}$	$1.6 \cdot 10^{10}$	$2.4 \cdot 10^{10}$	0
4	$3.50 \cdot 10^{-3}$	$9.4 \cdot 10^{8}$	$2.3 \cdot 10^{9}$	0
High pressure version				
2	$1.40 \cdot 10^{-3}$	$5.4 \cdot 10^{10}$	$6.6 \cdot 10^{10}$	0
4	$3.00 \cdot 10^{-3}$	$2.0 \cdot 10^{9}$	$4.3 \cdot 10^{9}$	0

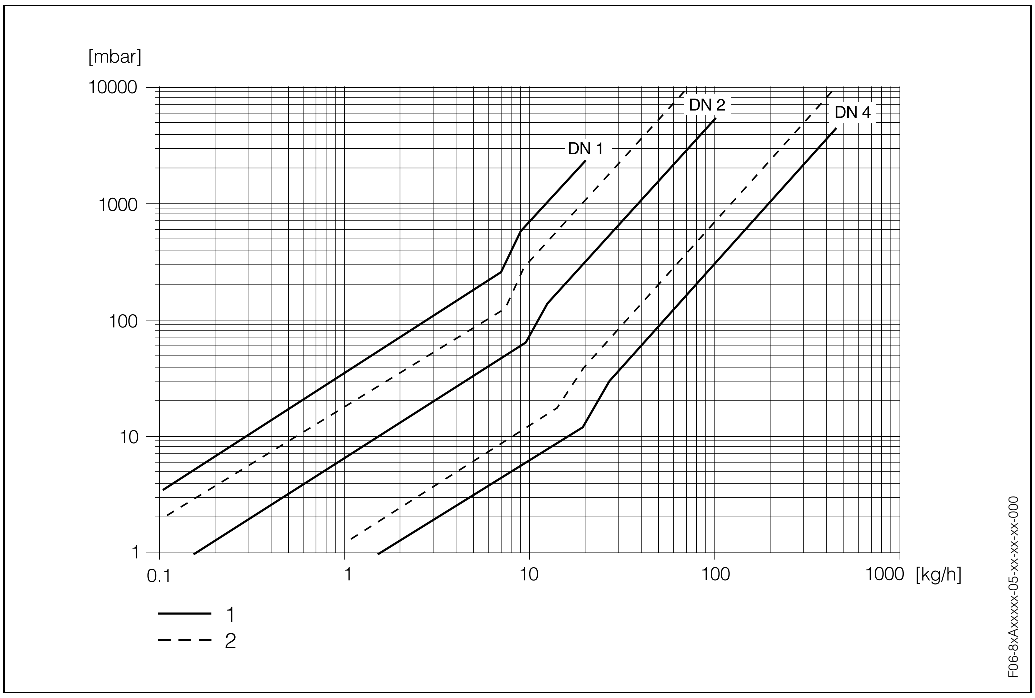


Fig. 32: Pressure loss diagram with water

1 Standard version
2 High pressure version

Pressure loss coefficient for Promass I

DN	d [m]	K	K1	K3
8	$8.55 \cdot 10^{-3}$	$8.1 \cdot 10^{6}$	$3.9 \cdot 10^{7}$	$129.95 \cdot 10^{4}$
15	$11.38 \cdot 10^{-3}$	$2.3 \cdot 10^{6}$	$1.3 \cdot 10^{7}$	$23.33 \cdot 10^{4}$
15 1)	$17.07 \cdot 10^{-3}$	$4.1 \cdot 10^{5}$	$3.3 \cdot 10^{6}$	$0.01 \cdot 10^{4}$
25	$17.07 \cdot 10^{-3}$	$4.1 \cdot 10^{5}$	$3.3 \cdot 10^{6}$	$5.89 \cdot 10^{4}$
25 1)	$25.60 \cdot 10^{-3}$	$7.8 \cdot 10^{4}$	$8.5 \cdot 10^{5}$	$0.11 \cdot 10^{4}$
40	$25.60 \cdot 10^{-3}$	$7.8 \cdot 10^{4}$	$8.5 \cdot 10^{5}$	$1.19 \cdot 10^{4}$
40 1)	$35.62 \cdot 10^{-3}$	$1.3 \cdot 10^{4}$	$2.0 \cdot 10^{5}$	$0.08 \cdot 10^{4}$
50	$35.62 \cdot 10^{-3}$	$1.3 \cdot 10^{4}$	$2.0 \cdot 10^{5}$	$0.25 \cdot 10^{4}$
Pressure loss data includes interface between measuring tube and piping 1) DN 15, 25, 40 “FB” = Full bore versions of Promass I				

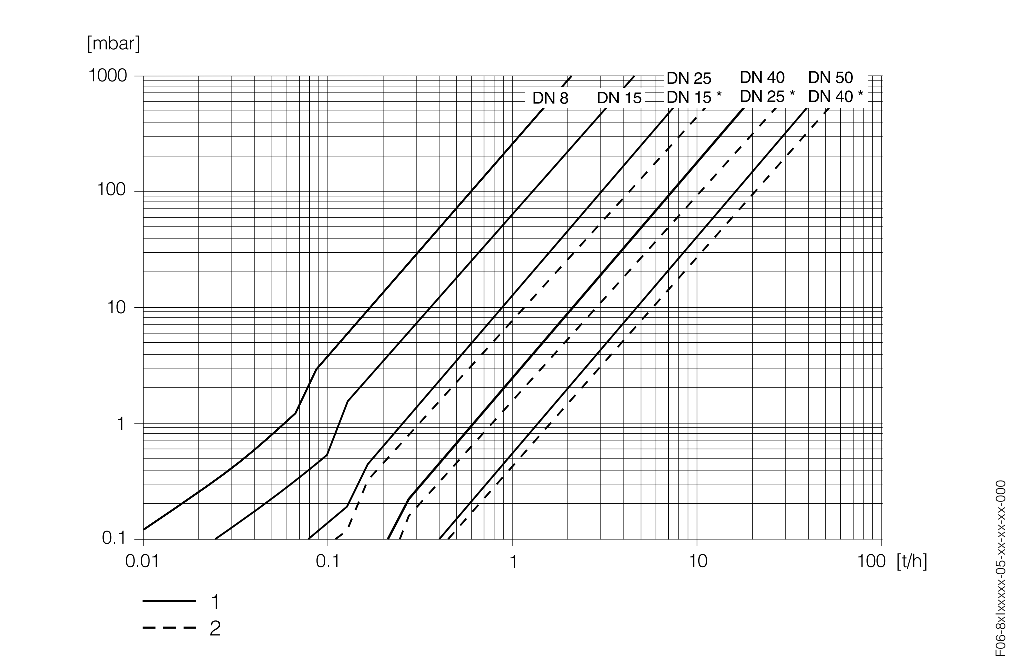


Fig. 33: Pressure loss diagram with water

1 *Standard versions*
2 *Full bore versions (*)*

10.1.10 Mechanical construction

Design / dimensions

see Page 84 ff.

Weight

- Compact version: see table below
- Remote version
  – Sensor: weight of compact version minus 2 kg
  – Wall-mount housing: 5 kg

Promass F / DN	8	15	25	40	50	80	80 2)	100	100 3)
Weight1) in [kg]	11	12	14	19	30	55	61	96	108

1) The weights in the table are those of the compact version.
2) Nominal diameter DN 80 / 3" with DN 100 / 4" flanges
3) Nominal diameter DN 100 / 4" with DN 150 / 6" flanges

Promass M / DN	8	15	25	40	50	80	80 2)
Weight1) in [kg]	11	12	15	24	41	67	71

1) The weights in the table are those of the compact version.
2) Nominal diameter DN 80 / 3" with DN 100 / 4" flanges

Promass A / DN	1	2	4
Weight1) in [kg]	10	11	15

1) The weights in the table are those of the compact version.

Promass I / DN	8	15	15 2)	25	25 2)	40	40 2)	50
Weight1) in [kg]	12	15	20	20	41	41	67	67

1) The weights in the table are those of the compact version.
2) DN 15, 25, 40 “FB” = Full bore versions of Promass I

Materials

Transmitter housing:
- Compact housing: powder coated die-cast aluminium
- Wall-mounted housing: die-cast aluminium

Sensor housing / containment:
- Promass F: acid- and alkali-resistant outer surface
  DN 8...50: stainless steel 1.4301/304
  DN 80...100: stainless steel 1.4301/304 and 1.4308/304L
- Promass M: acid- and alkali-resistant outer surface
  – DN 8...50: steel, chemically nickel-plated
  – DN 80: stainless steel
- Promass A, I: acid- and alkali-resistant outer surface; stainless steel 1.4301/304

Connection housing, sensor (remote version):
- Stainless steel 1.4301/304

Process connections, Promass F:
- Flanges DN 8...100, DIN / ANSI / JIS → stainless steel 1.4404/316L
- Flanges DN 8...80, DIN / ANSI / JIS → Alloy C-22 2.4602/N 06022
- Flange DIN 11864-2 → stainless steel 1.4404/316L
- VCO connection → stainless steel 1.4404/316L
- Hygienic coupling DIN 11851 / SMS 1145 → stainless steel 1.4404/316L
- Threaded unions ISO 2853 / DIN 11864-1 → stainless steel 1.4404/316L
- Tri-Clamp → stainless steel 1.4404/316L

Process connections, Promass M:
- Flanges DIN / ANSI / JIS → stainless steel 1.4404/316L, titanium grade 2
- Flange DIN 11864-2 → stainless steel 1.4404/316L
- PVDF connection to DIN / ANSI / JIS
- VCO connection → stainless steel 1.4404/316L
- Hygienic coupling DIN 11851 / SMS 1145 → stainless steel 1.4404/316L
- Threaded unions ISO 2853 / DIN 11864-1 → stainless steel 1.4404/316L
- Tri-Clamp → stainless steel 1.4404/316L

Process connections, Promass M (high pressure version):
- Connector → stainless steel 1.4404/316L
- Threaded unions → stainless steel 1.4401/316

Process connections, Promass A:
- Mounting set for flanges DIN / ANSI / JIS → stainless steel 1.4539/904L, Alloy C-22 2.4602/N 06022. Loose flanges → stainless steel 1.4404/316L
- VCO coupling → stainless steel 1.4539/904L, Alloy C-22 2.4602/N 06022
- Tri-Clamp (1/2") → stainless steel 1.4539/904L
- Mounting set for SWAGELOK (1/4", 1/8") → stainless steel 1.4401/316
- Mounting set for NPT-F (1/4") → stainless steel 1.4539/904L, Alloy C-22 2.4602/N 06022

Process connections, Promass I:
- Flanges DIN / ANSI / JIS → titanium grade 9
- Flange DIN 11864-2 → titanium grade 2
- VCO connection → titanium grade 2
- Hygienic coupling DIN 11851 / SMS 1145 → titanium grade 2
- Threaded unions ISO 2853 / DIN 11864-1 → titanium grade 2
- Tri-Clamp → titanium grade 2

Measuring tube(s):
- Promass F:
  DN 8...100: stainless steel 1.4539 (904L)
  DN 8...80: Alloy C-22 2.4602/N 06022
- Promass M:
  DN 8...50: titanium grade 9
  DN 80: titanium grade 2
- Promass M (high pressure version): titanium grade 9
- Promass A: stainless steel 1.4539/904L, Alloy C-22 2.4602/N 06022
- Promass I: titanium grade 9

Seals:
- Promass F: welded process connections without internal seals
- Promass M: Viton, EPDM, silicon, Kalrez, FEP-jacketed
- Promass A: Viton, EPDM, silicon, Kalrez
- Promass I: welded process connections without internal seals

Material load diagram	The material load curves (pressure-temperature diagrams) for the process connections are to be found in the following documents: • Technical Information Promass 80/83 F, M (TI 053D/06/en) • Technical Information Promass 80/83 A (TI 054D/06/en) • Technical Information Promass 80/83 I (TI 052D/06/en)
Process connections	*Promass F (welded process connections):* • VCO coupling, flanges (DIN 2501, ANSI B16.5, JIS B2238) • Sanitary connections: Tri-Clamp, threaded unions (DIN 11851, SMS 1145, ISO 2853, DIN 11864-1), flange to DIN 11864-2 *Promass M (threaded process connections):* • VCO coupling, flanges (DIN 2501, ANSI B16.5, JIS B2238) • Sanitary connections: Tri-Clamp, threaded unions (DIN 11851, SMS 1145, ISO 2853, DIN 11864-1), flange to DIN 11864-2 *Promass M (high-pressure version, screw-fitted process connections):* • Thread connections: G 3/8", 1/2" NPT, 3/8" NPT and 1/2" SWAGELOK threaded unions • Connector with 7/8-14UNF internal thread *Promass A* • Welded process connections: 4-VCO-4 coupling, 1/2" Tri-Clamp • Screw fitted process connections: flanges (DIN, ANSI, JIS), 1/4" NPT thread adapter, 1/8" or 1/4"-SWAGELOK threaded unions *Promass I (welded process connections):* • VCO coupling, flanges (DIN 2501, ANSI B16.5, JIS B2238) • Sanitary connections: Tri-Clamp, threaded unions (DIN 11851, SMS 1145, ISO 2853, DIN 11864-1), flange to DIN 11864-2

10.1.11 Human interface

Display elements	• Liquid crystal display: illuminated, two lines with 16 characters per line • Selectable display of different measured values and status variables
Operating elements	• Local operation with three keys (–, +, E) • Quick Setup menus for straightforward commissioning
Remote operation	Operation by means of: • HART protocol • PROFIBUS-PA

10.1.12 Certificates and approvals

Ex Approvals	Information presently available in Ex versions (ATEX, FM, CSA) can be supplied by your E+H Sales Centre on request. All explosion protection data are given in separate documentation that you can order as necessary.
Sanitary compatibility	• 3A authorization (all measuring systems) • EHEDG-tested (Promass A and Promass I only)

CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
Other standards and guidelines	EN 60529: Degrees of protection by housing (IP code) EN 61010: Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures. EN 61326 (IEC 1326): Electromagnetic compatibility (EMC requirements) NAMUR NE 21: Association for Standards for Control and Regulation in the Chemical Industry

10.1.13 Ordering information

The E+H service organisation can provide detailed ordering information and information on the order codes on request.

10.1.14 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transducer and the sensor (see Page 47). The E+H service organisation can provide detailed information on the order codes of your choice.

10.1.15 Documentation

❑ System Information Promass (SI 032D/06/en)
❑ Technical Information Promass 80/83 F, M (TI 053D/06/en)
❑ Technical Information Promass 80/83 A (TI 054D/06/en)
❑ Technical Information Promass 80/83 I (TI 052D/06/en)
❑ Description of Device Functions Promass 80 (BA 058D/06/en)
❑ Operating Instruction Promass 83 (BA059/D06/en)
❑ Description of Device Functions Promass 83 (BA 060D/06/en)
❑ Supplementary documentation on Ex-ratings: ATEX, FM, CSA

10.2 Dimensions: wall-mounted housing

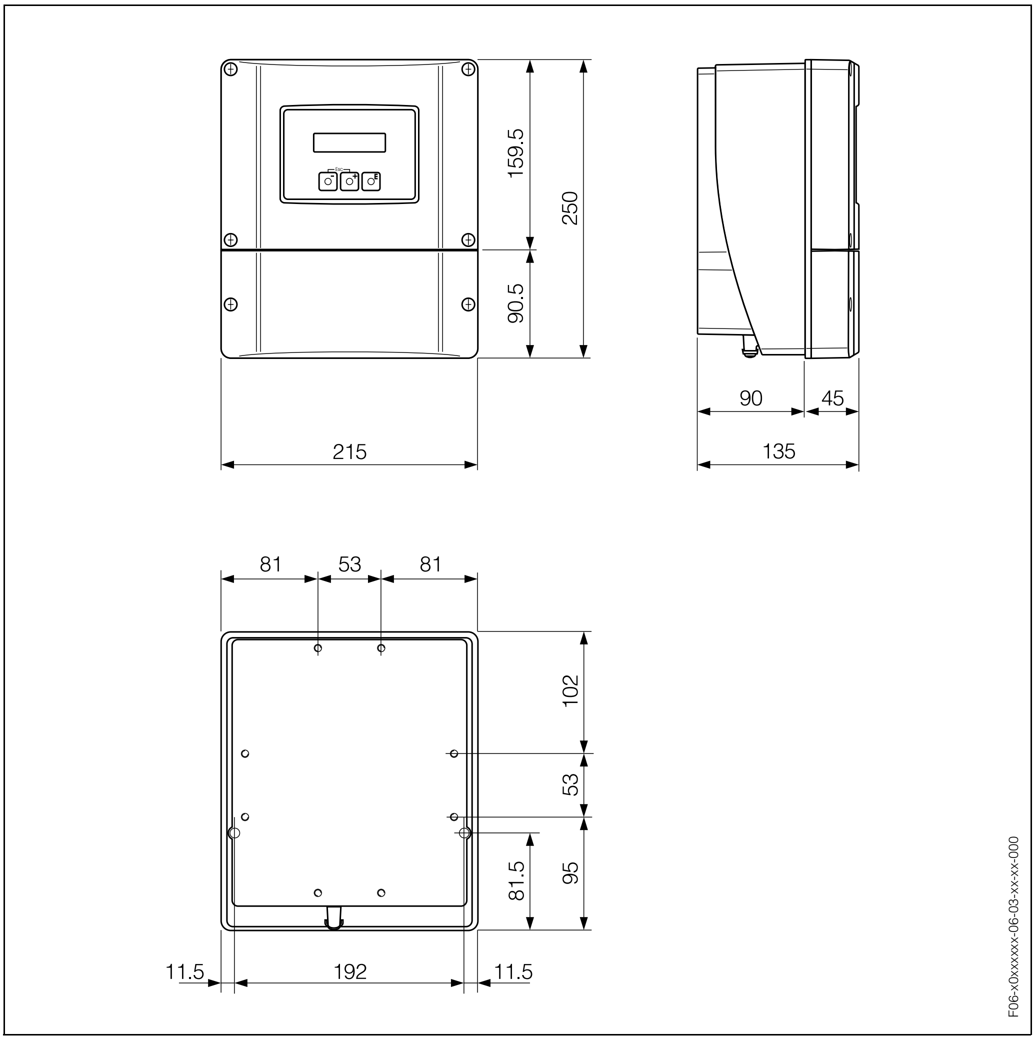


Fig. 34: Dimensions of wall-mounted housing

10.3 Dimensions: remote version

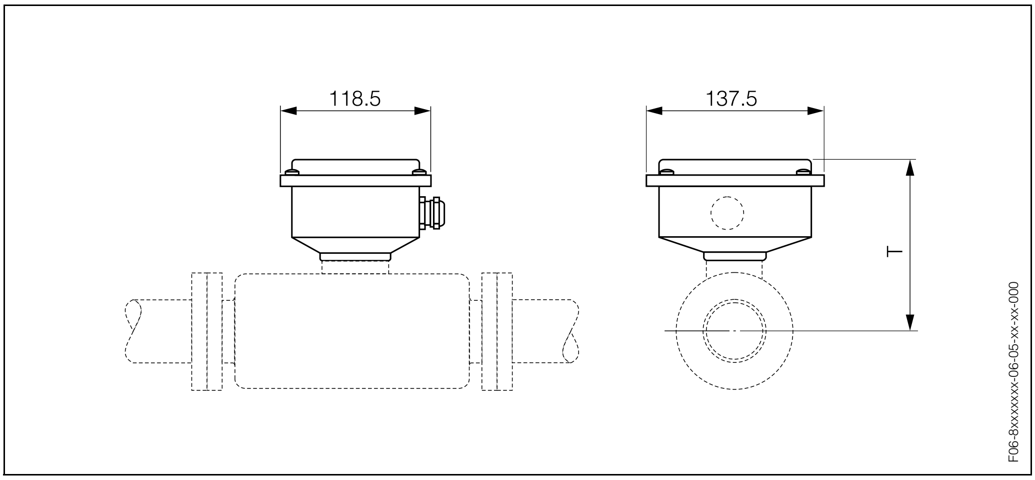


Fig. 35: Dimensions of sensor connection housing (remote version),
T = dimension A in compact version with corresponding nominal diameter minus 153 mm

10.4 Dimensions Promass F

Dimensions Promass F: flange connections (DIN, ANSI, JIS)

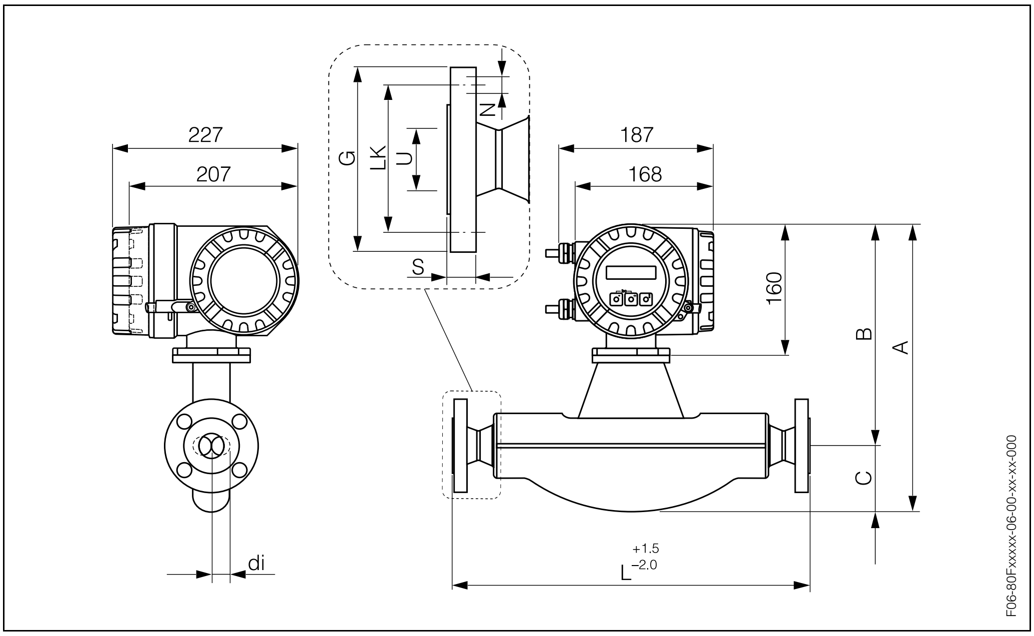


Fig. 36: Dimensions Promass F: flange connections (DIN, ANSI, JIS)

Flange DIN 2501 / DIN 2512N 1) / PN 16: 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
100	571	324	247	220	1128	8 x Ø18	20	180	107.1	51.20
1) Flange with groove to DIN 2512N available										

Flange DIN 2501 / PN 16 (with DN 100 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
80	505	305	200	220	874	8 x Ø18	20	180	107.1	40.50

Flange DIN 2501 / PN 16 (with DN 150 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
100	571	324	247	285	1168	8 x Ø22	22	240	159.3	51.20

Flange DIN 2501 / DIN 2512N 1) / PN 40: 1.4404/316L, Alloy C-22										
DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	95	370	4 x Ø14	16	65	17.3	5.35
15	341	266	75	95	404	4 x Ø14	16	65	17.3	8.30
25	341	266	75	115	440	4 x Ø14	18	85	28.5	12.00
40	376	271	105	150	550	4 x Ø18	18	110	43.1	17.60
50	424	283	141	165	715	4 x Ø18	20	125	54.5	26.00
80	505	305	200	200	840	8 x Ø18	24	160	82.5	40.50
100 2)	571	324	247	235	1128	8 x Ø22	24	190	107.1	51.20
1) Flange with groove to DIN 2512N available 2) Not available in Alloy C-22										

Flange DIN 2501 / PN 40 (with DN 25 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	115	440	4 x Ø14	18	85	28.5	5.35
15	341	266	75	115	440	4 x Ø14	18	85	28.5	8.30

Flange DIN 2501 / PN 40 (with DN 100 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
80	505	305	200	235	874	8 x Ø22	24	190	107.1	40.50

Flange DIN 2501 / PN 40 (with DN 150 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
100	571	324	247	300	1168	8 x Ø26	28	250	159.3	51.20

Flange DIN 2501 / DIN 2512N [1)] / PN 64: 1.4404/316L, Alloy C-22										
DN	A	B	C	G	L	N	S	LK	U	di
50	424	283	141	180	724	4 x Ø22	26	135	54.5	26.00
80	505	305	200	215	875	8 x Ø22	28	170	81.7	40.50
100 [2)]	571	324	247	250	1128	8 x Ø26	30	200	106.3	51.20

1) Flange with groove to DIN 2512N available
2) Not available in Alloy C-22

Flange DIN 2501 / DIN 2512N [1)] / PN 100: 1.4404/316L, Alloy C-22										
DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	105	400	4 x Ø14	20	75	17.3	5.35
15	341	266	75	105	420	4 x Ø14	20	75	17.3	8.30
25	341	266	75	140	470	4 x Ø18	24	100	28.5	12.00
40	376	271	105	170	590	4 x Ø22	26	125	42.5	17.60
50	424	283	141	195	740	4 x Ø26	28	145	53.9	26.00
80	505	305	200	230	885	8 x Ø26	32	180	80.9	40.50
100 [2)]	571	324	247	265	1128	8 x Ø30	36	210	104.3	51.20

1) Flange with groove to DIN 2512N available
2) Not available in Alloy C-22

Flange ANSI B16.5 / Cl 150: 1.4404/316L, Alloy C-22											
DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	341	266	75	88.9	370	4 x Ø15.7	11.2	60.5	15.7	5.35
15	1/2"	341	266	75	88.9	404	4 x Ø15.7	11.2	60.5	15.7	8.30
25	1"	341	266	75	108.0	440	4 x Ø15.7	14.2	79.2	26.7	12.00
40	1 1/2"	376	271	105	127.0	550	4 x Ø15.7	17.5	98.6	40.9	17.60
50	2"	424	283	141	152.4	715	4 x Ø19.1	19.1	120.7	52.6	26.00
80	3"	505	305	200	190.5	840	4 x Ø19.1	23.9	152.4	78.0	40.50
100 1)	4"	571	324	247	228.6	1128	8 x Ø19.1	23.9	190.5	102.4	51.20
1) Not available in Alloy C-22											

Flange ANSI B16.5 / Cl 150 (with 4" flanges): 1.4404/316L											
DN		A	B	C	G	L	N	S	LK	U	di
80	3"	505	305	200	228.6	874	8 x Ø19.1	23.9	190.5	102.4	40.50

Flange ANSI B16.5 / Cl 150 (with 6" flanges): 1.4404/316L											
DN		A	B	C	G	L	N	S	LK	U	di
100	4"	571	324	247	279.4	1168	8 x Ø22.4	25.4	241.3	154.2	51.20

Flange ANSI B16.5 / Cl 300: 1.4404/316L, Alloy C-22											
DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	341	266	75	95.2	370	4 x Ø15.7	14.2	66.5	15.7	5.35
15	1/2"	341	266	75	95.2	404	4 x Ø15.7	14.2	66.5	15.7	8.30
25	1"	341	266	75	123.9	440	4 x Ø19	17.5	88.9	26.7	12.00
40	1 1/2"	376	271	105	155.4	550	4 x Ø22.3	20.6	114.3	40.9	17.60
50	2"	424	283	141	165.1	715	8 x Ø19	22.3	127.0	52.6	26.00
80	3"	505	305	200	209.5	840	8 x Ø22.3	28.4	168.1	78.0	40.50
100 1)	4"	571	324	247	254.0	1128	8 x Ø22.3	31.7	200.1	102.4	51.20
1) Not available in Alloy C-22											

Flange ANSI B16.5 / Cl 300 (with 4" flanges): 1.4404/316L											
DN		A	B	C	G	L	N	S	LK	U	di
80	3"	505	305	200	254.0	894	8 x Ø22.3	31.7	200.1	102.4	40.50

Flange ANSI B16.5 / Cl 600: 1.4404/316L, Alloy C-22											
DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	341	266	75	95.3	400	4 x Ø15.7	20.6	66.5	13.9	5.35
15	1/2"	341	266	75	95.3	420	4 x Ø15.7	20.6	66.5	13.9	8.30
25	1"	341	266	75	124.0	490	4 x Ø19.1	23.9	88.9	24.3	12.00
40	1 1/2"	376	271	105	155.4	600	4 x Ø22.4	28.7	114.3	38.1	17.60
50	2"	424	283	141	165.1	742	8 x Ø19.1	31.8	127.0	49.2	26.00
80	3"	505	305	200	209.6	900	8 x Ø22.4	38.2	168.1	73.7	40.50
100 1)	4"	571	324	247	273.1	1158	8 x Ø25.4	48.4	215.9	97.3	51.20
1) Not available in Alloy C-22											

Flange JIS B2238 / 10K: 1.4404/316L, Alloy C-22										
DN	A	B	C	G	L	N	S	LK	U	di
50	424	283	141	155	715	4 x Ø19	16	120	50	26.00
80	505	305	200	185	832	8 x Ø19	18	150	80	40.50
100 [1)]	571	324	247	210	1128	8 x Ø19	18	175	100	51.20
[1)] Not available in Alloy C-22										

Flange JIS B2238 / 10K (with DN 100 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
80	505	305	200	210	864	8 x Ø19	18	175	100	40.50

Flange JIS B2238 / 10K (with DN 150 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
100	571	324	247	280	1168	8 x Ø23	22	240	150	51.20

Flange JIS B2238 / 20K: 1.4404/316L, Alloy C-22										
DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	95	370	4 x Ø15	14	70	15	5.35
15	341	266	75	95	404	4 x Ø15	14	70	15	8.30
25	341	266	75	125	440	4 x Ø19	16	90	25	12.00
40	376	271	105	140	550	4 x Ø19	18	105	40	17.60
50	424	283	141	155	715	8 x Ø19	18	120	50	26.00
80	505	305	200	200	832	8 x Ø23	22	160	80	40.50
100 [1)]	571	324	241	225	1128	8 x Ø23	24	185	100	51.20
[1)] Not available in Alloy C-22										

Flange JIS B2238 / 40K: 1.4404/316L, Alloy C-22										
DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	115	400	4 x Ø19	20	80	15	5.35
15	341	266	75	115	425	4 x Ø19	20	80	15	8.30
25	341	266	75	130	485	4 x Ø19	22	95	25	12.00
40	376	271	105	160	600	4 x Ø23	24	120	38	17.60
50	424	283	141	165	760	8 x Ø19	26	130	50	26.00
80	505	305	200	210	890	8 x Ø23	32	170	75	40.50
100 [1)]	571	324	241	250	1168	8 x Ø25	36	205	100	51.20
[1)] Not available in Alloy C-22										

Flange JIS B2238 / 63K: 1.4404/316L, Alloy C-22										
DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	120	420	4 x Ø19	23	85	12	5.35
15	341	266	75	120	440	4 x Ø19	23	85	12	8.30
25	341	266	75	140	494	4 x Ø23	27	100	22	12.00
40	376	271	105	175	620	4 x Ø25	32	130	35	17.60
50	424	283	141	185	775	8 x Ø23	34	145	48	26.00
80	505	305	200	230	915	8 x Ø25	40	185	73	40.50
100 [1)]	571	324	247	270	1168	8 x Ø27	44	220	98	51.20
[1)] Not available in Alloy C-22										

Dimensions Promass F: VCO connections

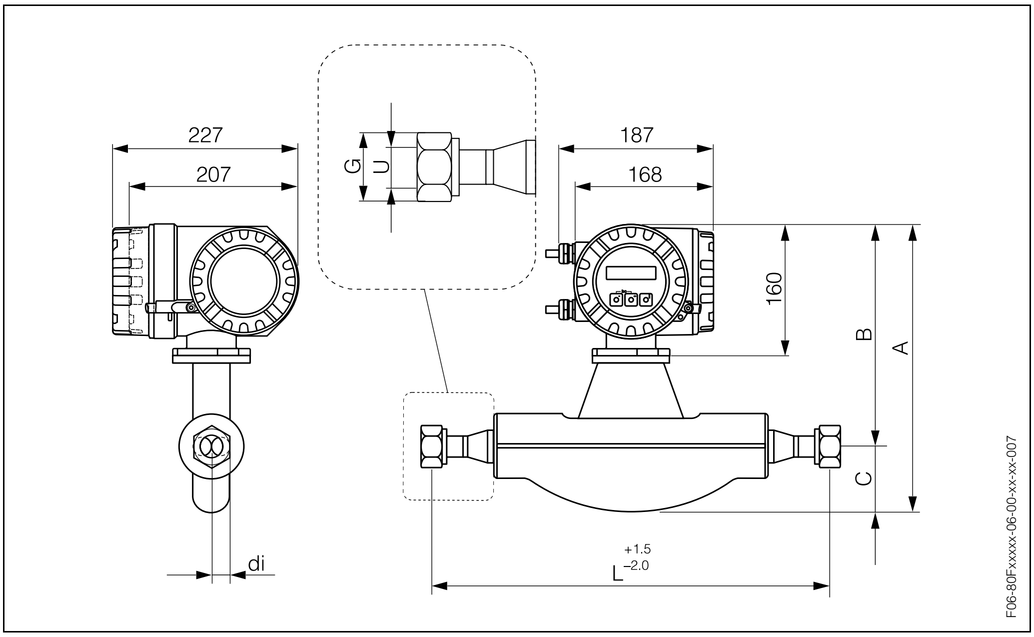


Fig. 37: Dimensions Promass F: VCO connections

8-VCO-4 (1/2"): 1.4404/316L							
DN	A	B	C	G	L	U	di
8	341	266	75	SW 1"	390	10.2	5.35

12-VCO-4 (3/4"): 1.4404/316L							
DN	A	B	C	G	L	U	di
15	341	266	75	SW 1 1/2"	430	15.7	8.30

Dimensions Promass F: Tri-Clamp connections

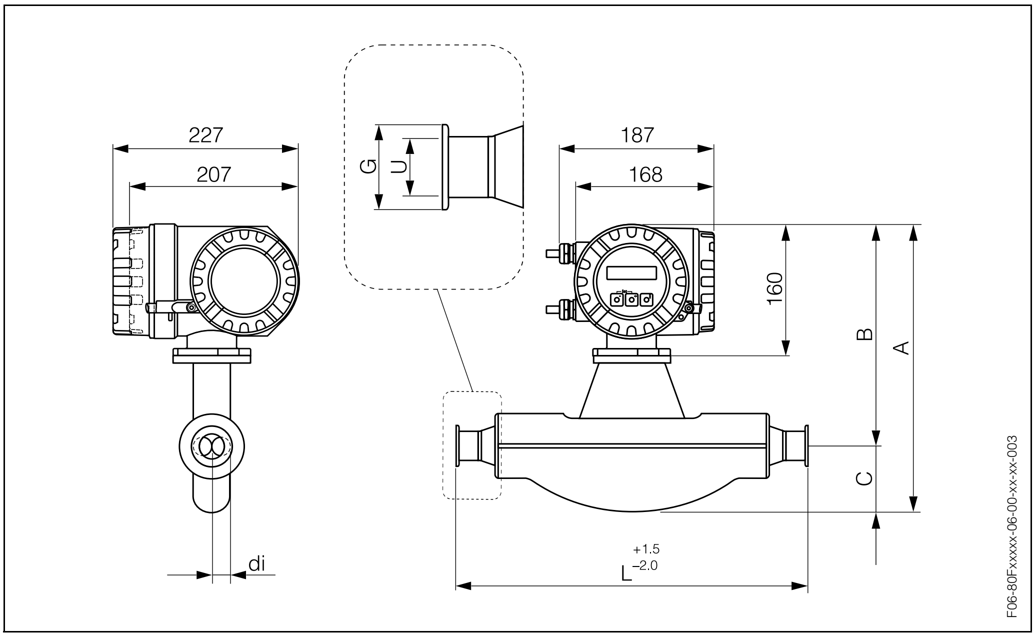


Fig. 38: Dimensions Promass F: Tri-Clamp connections

Tri-Clamp: 1.4404/316L								
DN	Clamp	A	B	C	G	L	U	di
8	1"	341	266	75	50.4	367	22.1	5.35
15	1"	341	266	75	50.4	398	22.1	8.30
25	1"	341	266	75	50.4	434	22.1	12.00
40	1 1/2"	376	271	105	50.4	560	34.8	17.60
50	2"	424	283	141	63.9	720	47.5	26.00
80	3"	505	305	200	90.9	900	72.9	40.50
100	4"	571	324	247	118.9	1128	97.4	51.20
3-A version also available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)								

1/2" Tri-Clamp: 1.4404/316L								
DN	Clamp	A	B	C	G	L	U	di
8	1"	341	266	75	25.0	367	9.5	5.35
15	1"	341	266	75	25.0	398	9.5	8.30
3-A version also available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)								

Dimensions Promass F: DIN 11851 connections (hygienic coupling)

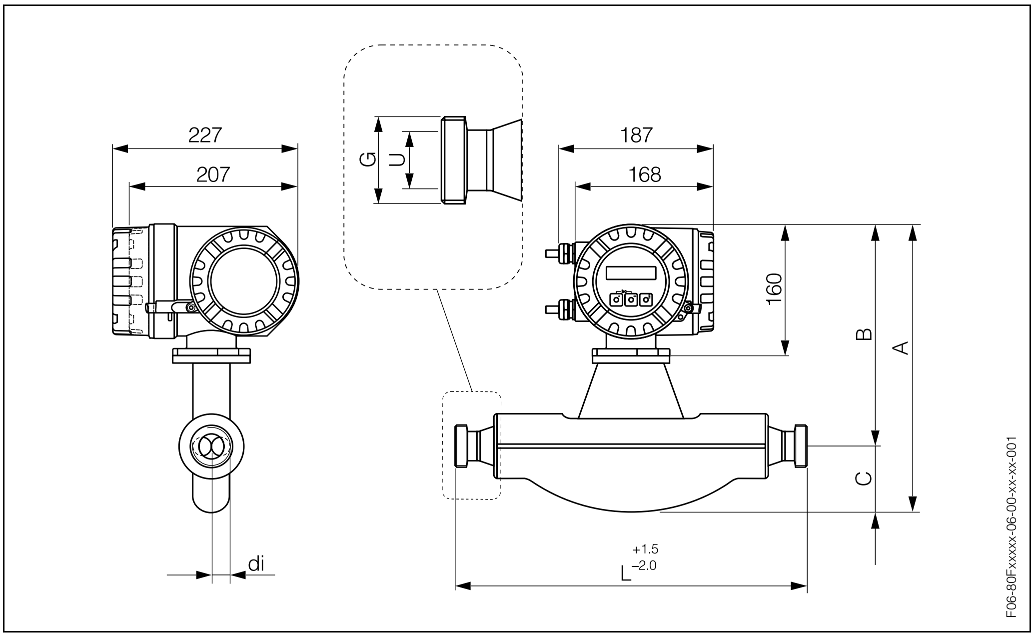


Fig. 39: Dimensions Promass F: DIN 11851 connections (hygienic coupling)

Hygienic coupling DIN 11851: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	341	266	75	Rd 34 x 1/8"	367	16	5.35
15	341	266	75	Rd 34 x 1/8"	398	16	8.30
25	341	266	75	Rd 52 x 1/6"	434	26	12.00
40	376	271	105	Rd 65 x 1/6"	560	38	17.60
50	424	283	141	Rd 78 x 1/6"	720	50	26.00
80	505	305	200	Rd 110 x 1/4"	900	81	40.50
100	571	324	247	Rd 130 x 1/4"	1128	100	51.20
3-A version also available (Ra ≤ 0.8 µm/150 grit)							

Dimensions Promass F: DIN 11864-1 Form A connections (threaded unions)

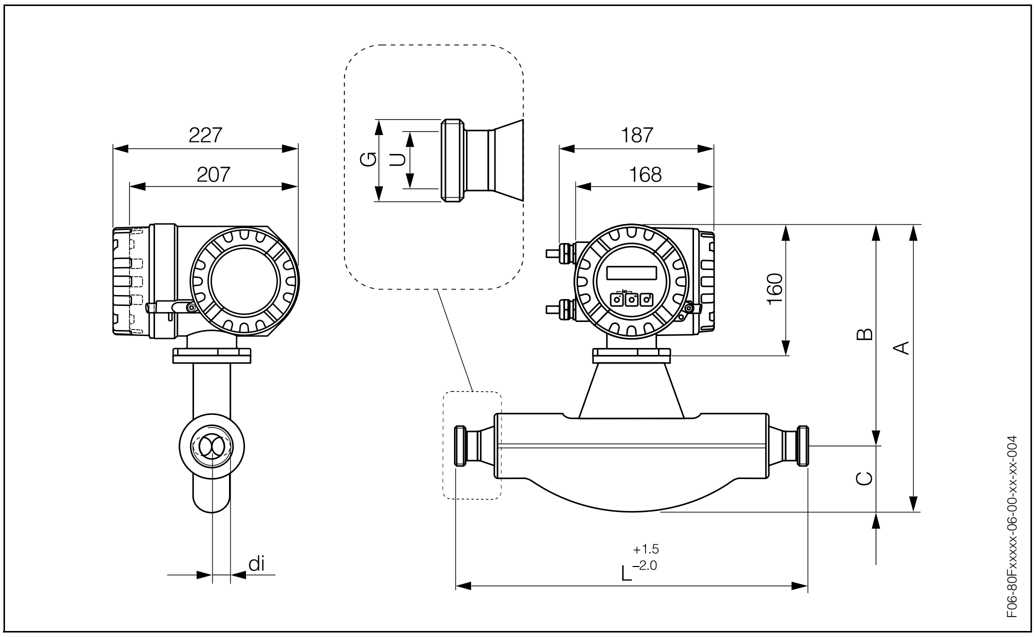


Fig. 40: Dimensions Promass F: DIN 11864-1 Form A connections (threaded unions)

Threaded union DIN 11864-1 Form A: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	341	266	75	Rd 28 x 1/8"	367	10	5.35
15	341	266	75	Rd 34 x 1/8"	398	16	8.30
25	341	266	75	Rd 52 x 1/6"	434	26	12.00
40	376	271	105	Rd 65 x 1/6"	560	38	17.60
50	424	283	141	Rd 78 x 1/6"	720	50	26.00
80	505	305	200	Rd 110 x 1/4"	900	81	40.50
100	571	324	247	Rd 130 x 1/4"	1128	100	51.20
3-A version also available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)							

Dimensions Promass F: flange connections DIN 11864-2 Form A

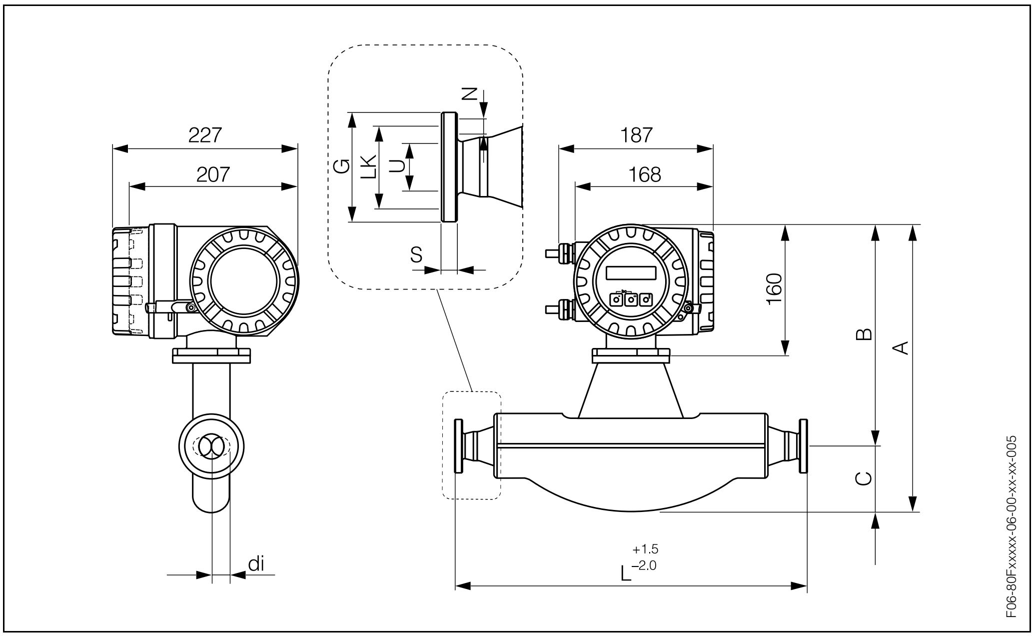


Fig. 41: Dimensions Promass F: flange connections DIN 11864-2 Form A

Flange DIN 11864-2 Form A: 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	54	387	4 x Ø9	10	37	10	5.35
15	341	266	75	59	418	4 x Ø9	10	42	16	8.30
25	341	266	75	70	454	4 x Ø9	10	53	26	12.00
40	376	271	105	82	560	4 x Ø9	10	65	38	17.60
50	424	283	141	94	720	4 x Ø9	10	77	50	26.00
80	505	305	200	133	900	8 x Ø11	12	112	81	40.50
100	571	324	247	159	1128	8 x Ø11	14	137	100	51.20
3-A version also available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)										

Dimensions Promass F: ISO 2853 connections (threaded unions)

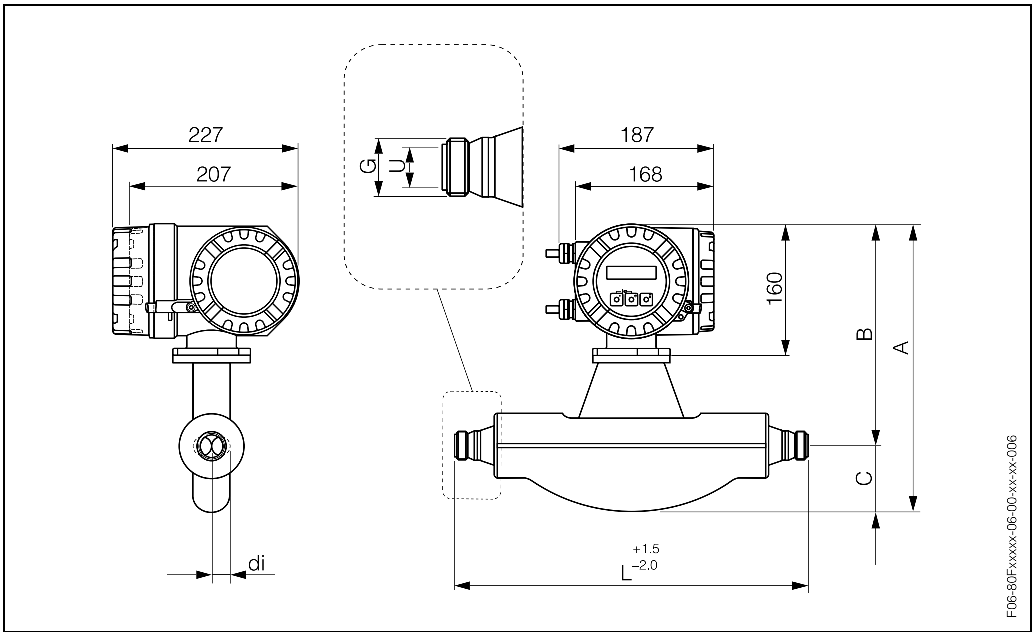


Fig. 42: Dimensions Promass F: ISO 2853 connections (threaded unions)

Threaded union ISO 2853: 1.4404/316L							
DN	A	B	C	G 1)	L	U	di
8	341	266	75	37.13	367	22.6	5.35
15	341	266	75	37.13	398	22.6	8.30
25	341	266	75	37.13	434	22.6	12.00
40	376	271	105	52.68	560	35.6	17.60
50	424	283	141	64.16	720	48.6	26.00
80	505	305	200	91.19	900	72.9	40.50
100	571	324	247	118.21	1128	97.6	51.20
1) Max. thread diameter to ISO 2853 Annex A 3-A version also available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)							

Dimensions Promass F: SMS 1145 connections (hygienic coupling)

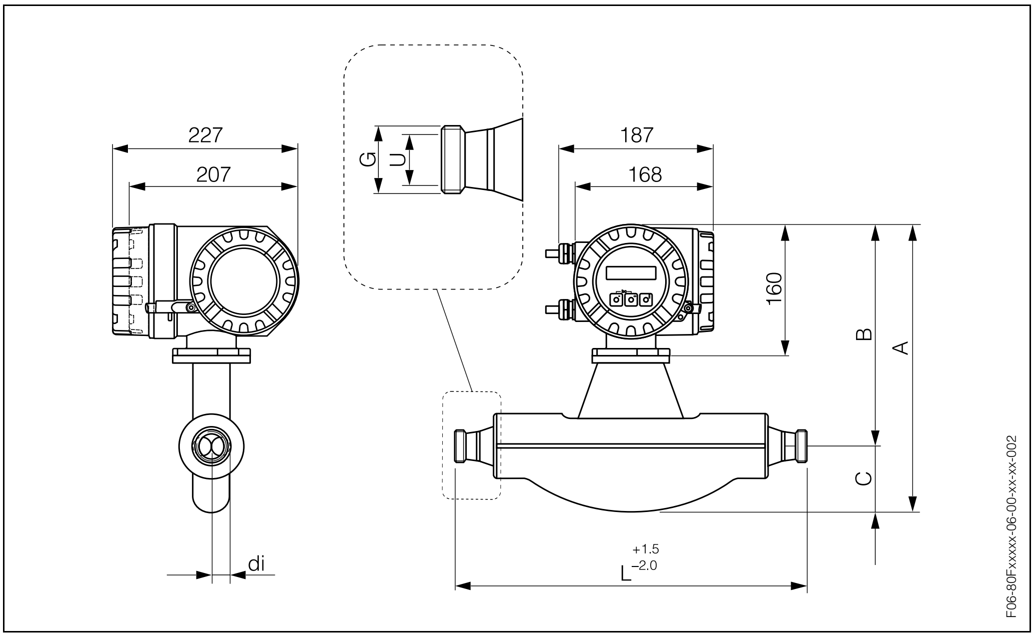


Fig. 43: Dimensions Promass F: SMS 1145 connections (hygienic coupling)

Hygienic coupling SMS 1145: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	341	266	75	Rd 40 x 1/6"	367	22.5	5.35
15	341	266	75	Rd 40 x 1/6"	398	22.5	8.30
25	341	266	75	Rd 40 x 1/6"	434	22.5	12.00
40	376	271	105	Rd 60 x 1/6"	560	35.5	17.60
50	424	283	141	Rd 70 x 1/6"	720	48.5	26.00
80	505	305	200	Rd 98 x 1/6"	900	72.0	40.50
100	571	324	247	Rd 132 x 1/6"	1128	97.5	51.20
3-A version also available (Ra ≤ 0.8 µm/150 grit)							

Dimensions Promass F:
purge connections / secondary containment monitoring

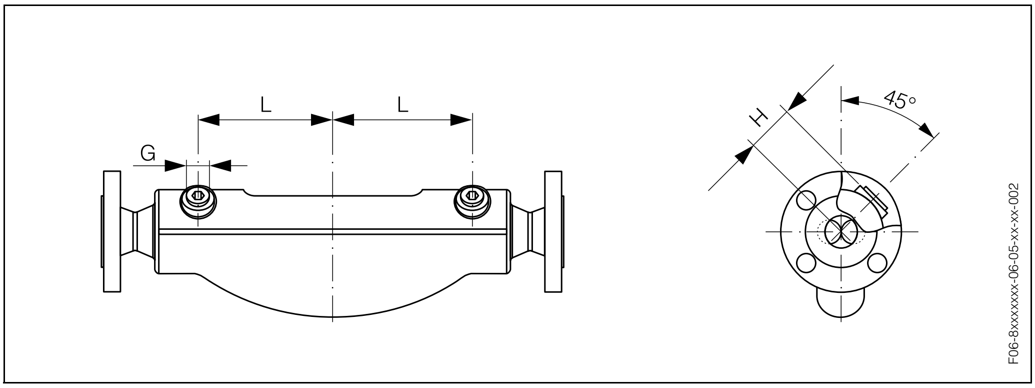


Fig. 44: Dimensions Promass F: purge connections / secondary containment monitoring

DN	L	H	G
8	108	47	1/2" NPT
15	110	47	1/2" NPT
25	130	47	1/2" NPT
40	155	52	1/2" NPT
50	226	64	1/2" NPT
80	280	86	1/2" NPT
100	342	100	1/2" NPT

10.5 Dimensions Promass M

Dimensions Promass M: flange connections (DIN, ANSI, JIS)

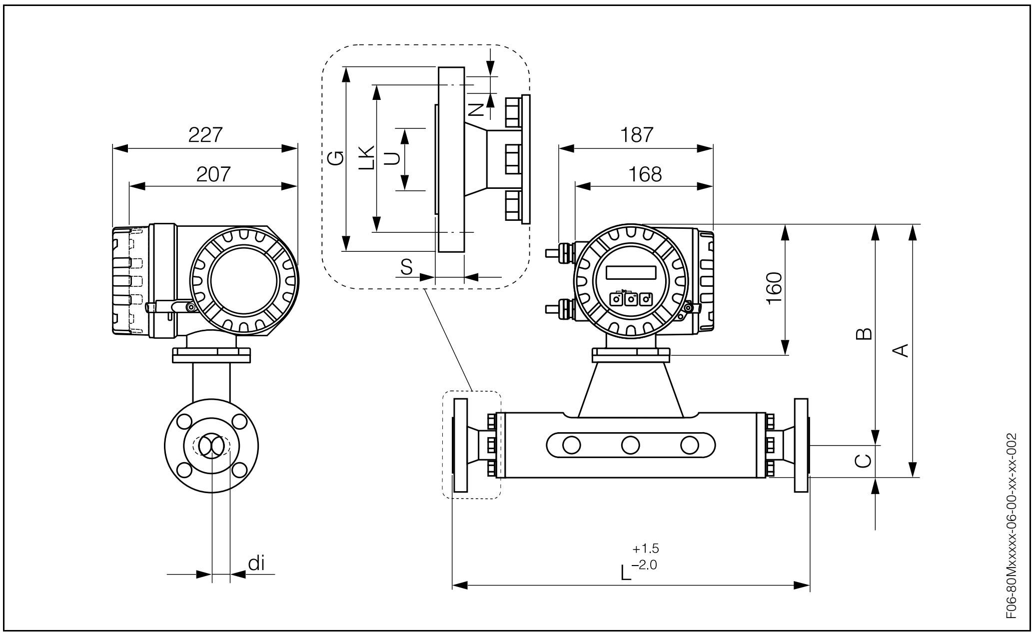


Fig. 45: Dimensions Promass M: flange connections (DIN, ANSI, JIS)

Flange DIN 2501 / PN 16: PVDF										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	370	4 x Ø14	16	65	16.1	5.53
15	305	268	37	95	404	4 x Ø14	16	65	16.1	8.55
25	312	272	40	115	440	4 x Ø14	18	85	28.5	11.38
40	332	283	49	150	550	4 x Ø18	18	110	43.1	17.07
50	351	293	58	165	715	4 x Ø18	20	125	54.5	25.60

Flange DIN 2501 / PN 16 (with DN 100 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
80	385	309	76	220	874	8 x Ø18	20	180	107.1	38.46

Flange DIN 2501 / DIN 2512N [1] / PN 40: 1.4404/316L, titanium										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	370	4 x Ø14	16	65	17.3	5.53
15	305	268	37	95	404	4 x Ø14	16	65	17.3	8.55
25	312	272	40	115	440	4 x Ø14	18	85	28.5	11.38
40	332	283	49	150	550	4 x Ø18	18	110	43.1	17.07
50	351	293	58	165	715	4 x Ø18	20	125	54.5	25.60
80	385	309	76	200	840	8 x Ø18	24	160	82.5	38.46
[1] Flange with groove to DIN 2512N available										

Flange DIN 2501 / PN 40 (with DN 25 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	115	440	4 x Ø14	18	85	28.5	5.53
15	305	268	37	115	440	4 x Ø14	18	85	28.5	8.55

Flange DIN 2501 / PN 40 (with DN 100 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
80	385	309	76	235	1128	8 x Ø22	24	190	107.1	38.46

Flange DIN 2501 / DIN 2512N [1] / PN 64: 1.4404/316L, titanium										
DN	A	B	C	G	L	N	S	LK	U	di
50	351	293	58	180	724	4 x Ø22	26	135	54.5	25.60
80	385	309	76	215	875	8 x Ø22	28	170	81.7	38.46
[1] Flange with groove to DIN 2512N available										

Flange DIN 2501 / DIN 2512N [1] / PN 100: 1.4404/316L, titanium										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	400	4 x Ø14	20	65	17.3	5.53
15	305	268	37	95	420	4 x Ø14	20	65	17.3	8.55
25	312	272	40	115	470	4 x Ø14	24	85	28.5	11.38
40	332	283	49	150	590	4 x Ø18	26	110	43.1	17.07
50	351	293	58	165	740	4 x Ø18	28	125	54.5	25.60
80	385	309	76	230	885	8 x Ø26	32	180	80.9	38.46
[1] Flange with groove to DIN 2512N available										

Flange ANSI B16.5 / Cl 150: 1.4404/316L, titanium											
DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	301	266	35	88.9	370	4 x Ø15.7	11.2	60.5	15.7	5.53
15	1/2"	305	268	37	88.9	404	4 x Ø15.7	11.2	60.5	15.7	8.55
25	1"	312	272	40	108.0	440	4 x Ø15.7	14.2	79.2	26.7	11.38
40	1 1/2"	332	283	49	127.0	550	4 x Ø15.7	17.5	98.6	40.9	17.07
50	2"	351	293	58	152.4	715	4 x Ø19.1	19.1	120.7	52.6	25.60
80	3"	385	309	76	190.5	840	4 x Ø19.1	23.9	152.4	78.0	38.46

Flange ANSI B16.5 / Cl 150: PVDF											
DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	301	266	35	88.9	370	4 x Ø15.7	16	60.5	15.7	5.53
15	1/2"	305	268	37	88.9	404	4 x Ø15.7	16	60.5	15.7	8.55
25	1"	312	272	40	108.0	440	4 x Ø15.7	18	79.2	26.7	11.38
40	1 1/2"	332	283	49	127.0	550	4 x Ø15.7	21	98.6	40.9	17.07
50	2"	351	293	58	152.4	715	4 x Ø19.1	28	120.7	52.6	25.60

Flange ANSI B16.5 / Cl 150 (with DN 4" flanges): 1.4404/316L											
DN		A	B	C	G	L	N	S	LK	U	di
80	3"	385	309	76	228.6	874	8 x Ø19.1	23.9	190.5	102.4	38.46

Flange ANSI B16.5 / Cl 300: 1.4404/316L, titanium											
DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	301	266	35	95.2	370	4 x Ø15.7	14.2	66.5	15.7	5.53
15	1/2"	305	268	37	95.2	404	4 x Ø15.7	14.2	66.5	15.7	8.55
25	1"	312	272	40	123.9	440	4 x Ø19.0	17.5	88.9	26.7	11.38
40	1 1/2"	332	283	49	155.4	550	4 x Ø22.3	20.6	114.3	40.9	17.07
50	2"	351	293	58	165.1	715	8 x Ø19.0	22.3	127.0	52.6	25.60
80	3"	385	309	76	209.5	840	8 x Ø22.3	28.4	168.1	78.0	38.46

Flange ANSI B16.5 / Cl 300 (with 4" flanges): 1.4404/316L											
DN		A	B	C	G	L	N	S	LK	U	di
80	3"	385	309	76	254.0	894	8 x Ø22.3	31.7	200.1	102.4	38.46

Flange ANSI B16.5 / Cl 600: 1.4404/316L, titanium											
DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	301	266	35	95.3	400	4 x Ø15.7	20.6	66.5	13.8	5.53
15	1/2"	305	268	37	95.3	420	4 x Ø15.7	20.6	66.5	13.8	8.55
25	1"	312	272	40	124.0	490	4 x Ø19.1	23.6	88.9	24.4	11.38
40	1 1/2"	332	283	49	155.4	600	4 x Ø22.4	28.7	114.3	38.1	17.07
50	2"	351	293	58	165.1	742	8 x Ø19.1	31.8	127.0	49.3	25.60
80	3"	385	309	76	209.6	900	8 x Ø22.4	38.2	168.1	73.7	38.46

Flange JIS B2238 / 10K: 1.4404/316L, titanium										
DN	A	B	C	G	L	N	S	LK	U	di
50	351	293	49.25	155	715	4 x Ø19	16	120	50	25.60
80	385	309	58	185	832	8 x Ø19	18	150	80	38.46

Flange JIS B2238 / 10K: PVDF										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	370	4 x Ø15	16	70	15	5.53
15	305	268	37	95	404	4 x Ø15	16	70	15	8.55
25	312	272	40	125	440	4 x Ø19	18	90	25	11.38
40	332	283	49	140	550	4 x Ø19	21	105	40	17.07
50	351	293	58	155	715	4 x Ø19	22	120	50	25.60

Flange JIS B2238 / 10K (with DN 100 flanges): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
80	385	309	76	210	864	8 x Ø19	18	175	100	38.46

Flange JIS B2238 / 20K: 1.4404/316L, titanium										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	370	4 x Ø15	14	70	15	5.53
15	305	268	37	95	404	4 x Ø15	14	70	15	8.55
25	312	272	40	125	440	4 x Ø19	16	90	25	11.38
40	332	283	49	140	550	4 x Ø19	18	105	40	17.07
50	351	293	58	155	715	8 x Ø19	18	120	50	25.60
80	385	309	76	200	832	8 x Ø23	22	160	80	38.46

Flange JIS B2238 / 40K: 1.4404/316L, titanium										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	115	400	4 x Ø19	20	80	15	5.53
15	305	268	37	115	425	4 x Ø19	20	80	15	8.55
25	312	272	40	130	485	4 x Ø19	22	95	25	11.38
40	332	283	49	160	600	4 x Ø23	24	120	38	17.07
50	351	293	58	165	760	8 x Ø19	26	130	50	25.60
80	385	309	76	210	890	8 x Ø23	32	170	75	38.46

Flange JIS B2238 / 63K: 1.4404/316L, titanium										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	120	420	4 x Ø19	23	85	12	5.53
15	305	268	37	120	440	4 x Ø19	23	85	12	8.55
25	312	272	40	140	494	4 x Ø23	27	100	22	11.38
40	332	283	49	175	620	4 x Ø25	32	130	35	17.07
50	351	293	58	185	775	8 x Ø23	34	145	48	25.60
80	385	309	76	230	915	8 x Ø25	40	185	73	38.46

Dimensions Promass M: VCO connections

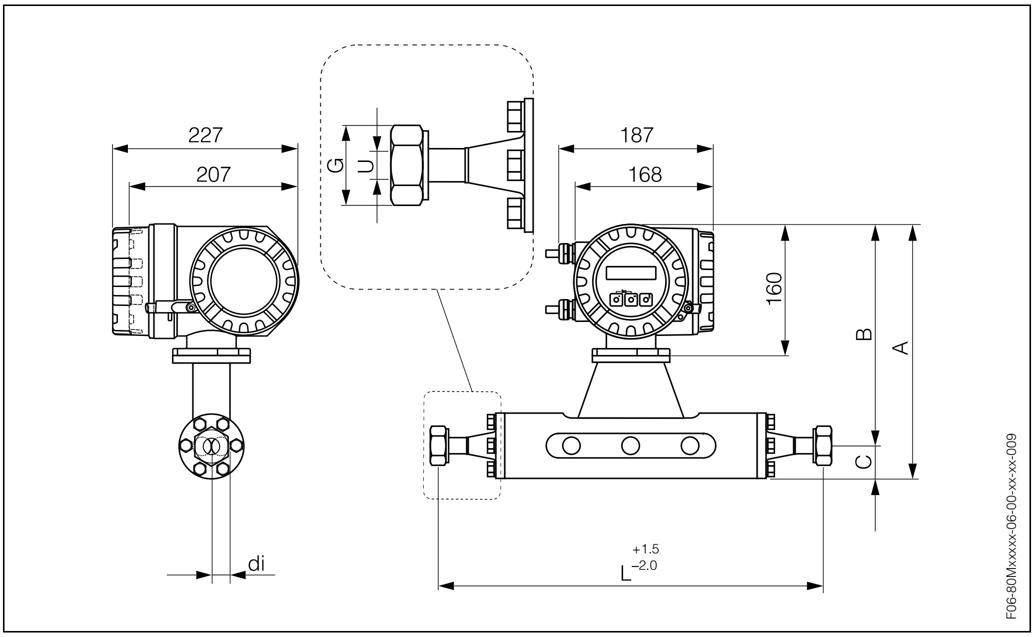


Fig. 46: Dimensions Promass M: VCO connections

8-VCO-4 (1/2"): 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	SW 1"	390	10.2	5.53

12-VCO-4 (3/4"): 1.4404/316L							
DN	A	B	C	G	L	U	di
15	305	268	37	SW 1 1/2"	430	15.7	8.55

Dimensions Promass M: Tri-Clamp connections

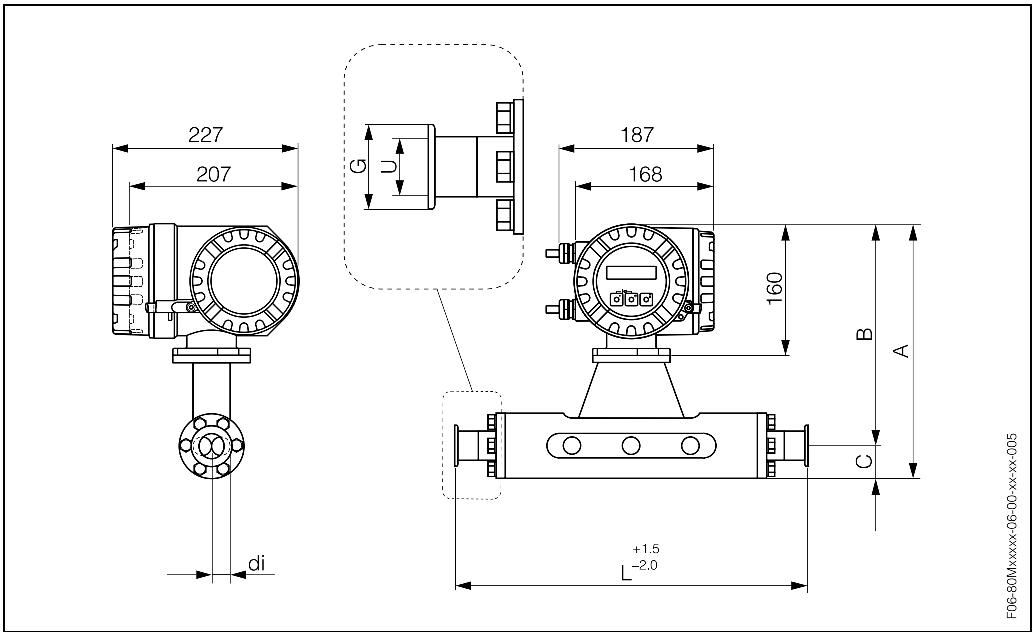


Fig. 47: Dimensions Promass M: Tri-Clamp connections

Tri-Clamp: 1.4404/316L								
DN	Clamp	A	B	C	G	L	U	di
8	1"	301	266	35	50.4	367	22.1	5.53
15	1"	305	268	37	50.4	398	22.1	8.55
25	1"	312	272	40	50.4	434	22.1	11.38
40	1 1/2"	332	283	49	50.4	560	34.8	17.07
50	2"	351	293	58	63.9	720	47.5	25.60
80	3"	385	309	76	90.9	801	72.9	38.46
3-A version also available (Ra ≤ 0.8 µm/150 grit)								

1/2" Tri-Clamp: 1.4404/316L								
DN	Clamp	A	B	C	G	L	U	di
8	1"	301	266	35	25.0	367	9.5	5.53
15	1"	305	268	37	25.0	398	9.5	8.55
3-A version also available (Ra ≤ 0.8 µm/150 grit)								

Dimensions Promass M: DIN 11851 connections (hygienic coupling)

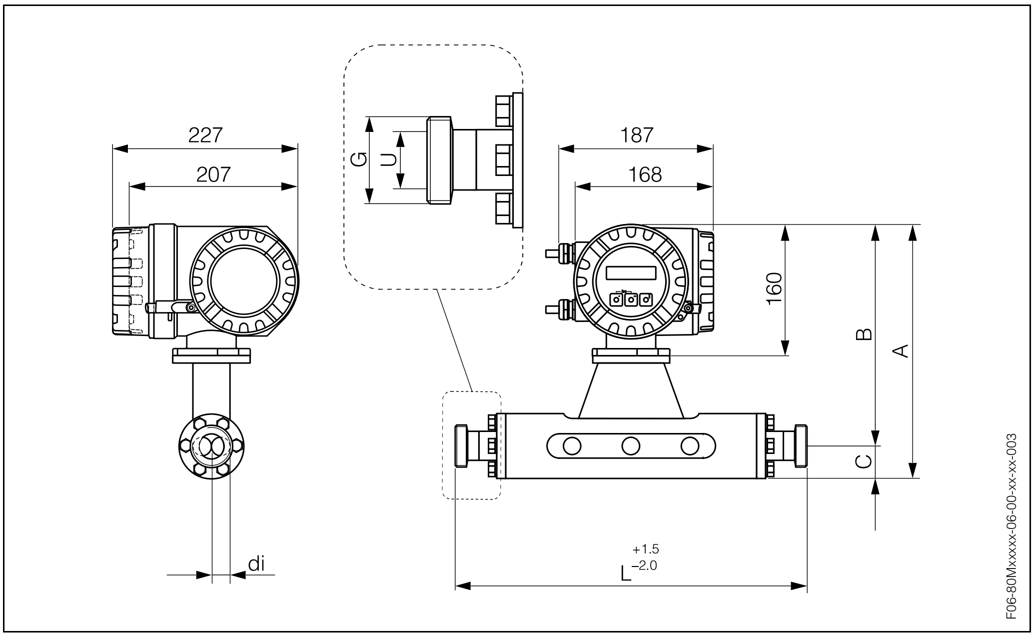


Fig. 48: Dimensions Promass M: DIN 11851 connections (hygienic coupling)

Hygienic coupling DIN 11851: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	Rd 34 x 1/8"	367	16	5.53
15	305	268	37	Rd 34 x 1/8"	398	16	8.55
25	312	272	40	Rd 52 x 1/6"	434	26	11.38
40	332	283	49	Rd 65 x 1/6"	560	38	17.07
50	351	293	58	Rd 78 x 1/6"	720	50	25.60
80	385	309	76	Rd 110 x 1/4"	815	81	38.46
3-A version also available (Ra ≤ 0.8 µm/150 grit)							

Dimensions Promass M: DIN 11864-1 Form A connections (threaded unions)

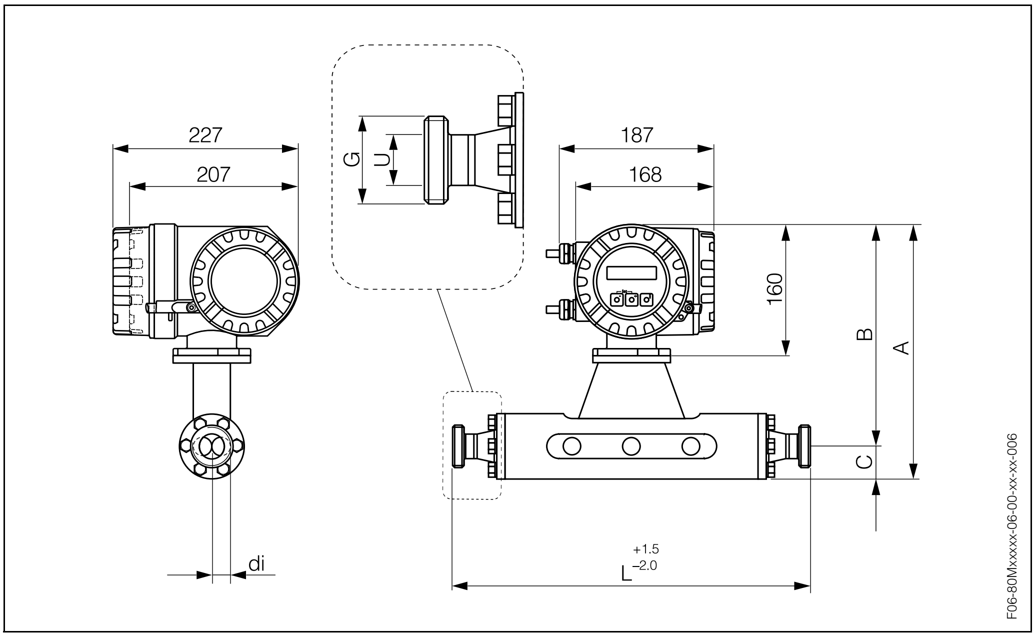


Fig. 49: Dimensions Promass M: DIN 11864-1 Form A connections (threaded unions)

Threaded union DIN 11864-1 Form A: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	Rd 28x 1/8"	367	10	5.53
15	305	268	37	Rd 34 x 1/8"	398	16	8.55
25	312	272	40	Rd 52 x 1/6"	434	26	11.38
40	332	283	49	Rd 65 x 1/6"	560	38	17.07
50	351	293	58	Rd 78 x 1/6"	720	50	25.60
80	385	309	76	Rd 110 x 1/4"	815	81	38.46
3-A version also available (Ra ≤ 0.8 µm/150 grit)							

Dimensions Promass M: flange connections DIN 11864-2 Form A

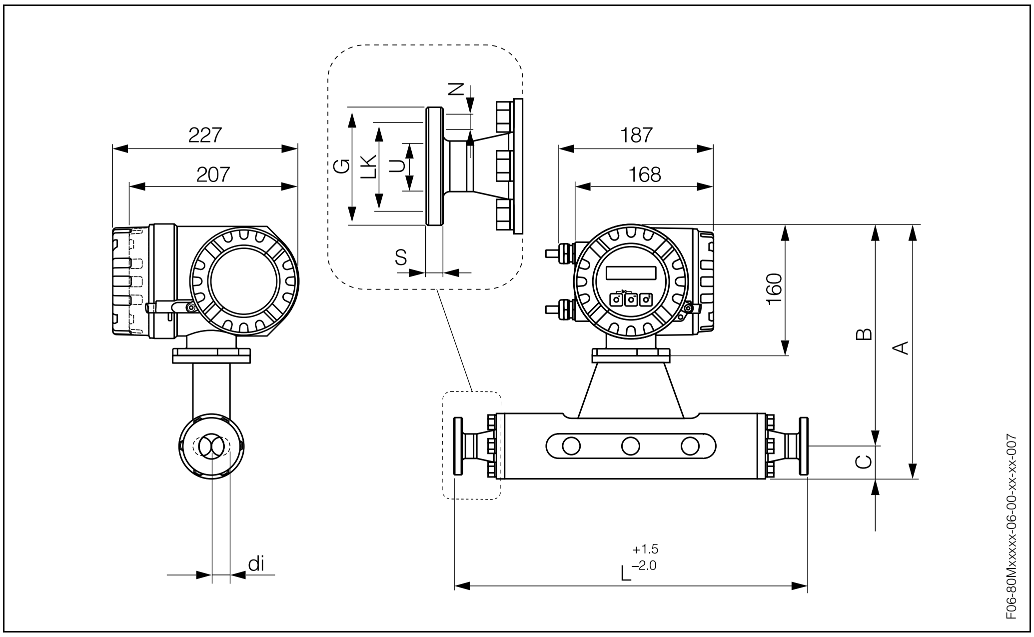


Fig. 50: Dimensions Promass M: flange connections DIN 11864-2 Form A

Flange DIN 11864-2 Form A: 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	54	367	4 x Ø9	10	37	10	5.53
15	305	268	37	59	398	4 x Ø9	10	42	16	8.55
25	312	272	40	70	434	4 x Ø9	10	53	26	11.38
40	332	283	49	82	560	4 x Ø9	10	65	38	17.07
50	351	293	58	94	720	4 x Ø9	10	77	50	25.60
80	385	309	76	133	815	8 x Ø11	12	112	81	38.46
3-A version also available (Ra ≤ 0.8 µm/150 grit)										

Dimensions Promass M: ISO 2853 connections (threaded unions)

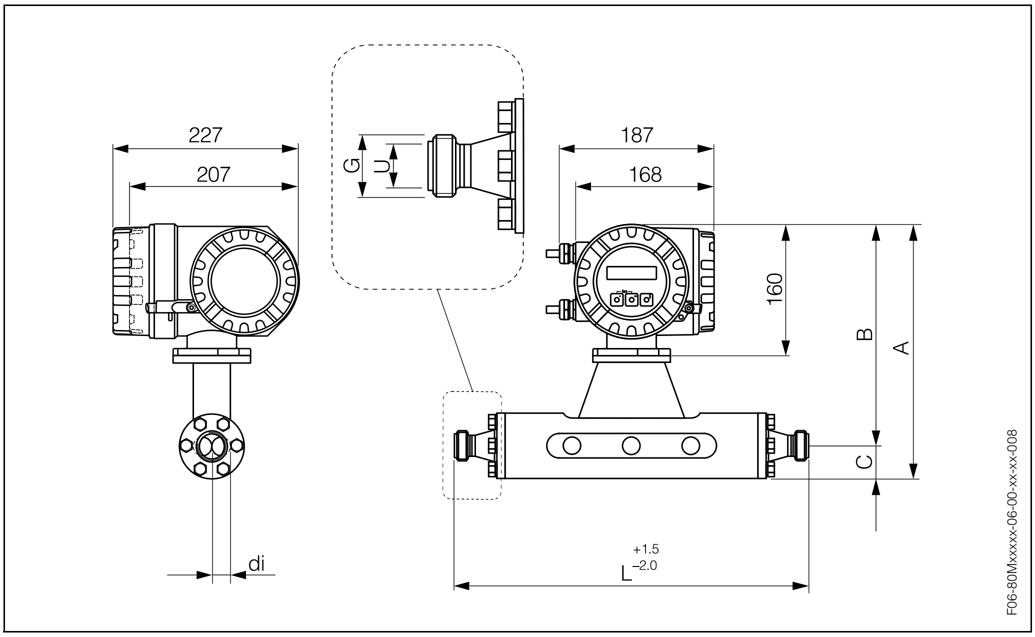


Fig. 51: Dimensions Promass M: ISO 2853 connections (threaded unions)

Threaded union ISO 2853: 1.4404/316L							
DN	A	B	C	G [1]	L	U	di
8	301	266	35	37.13	367	22.6	5.53
15	305	268	37	37.13	398	22.6	8.55
25	312	272	40	37.13	434	22.6	11.38
40	332	283	49	52.68	560	35.6	17.07
50	351	293	58	64.16	720	48.6	25.60
80	385	309	76	91.19	815	72.9	38.46
[1] Max. thread diameter to ISO 2853 Annex A 3-A version also available (Ra ≤ 0.8 µm/150 grit)							

Dimensions Promass M: SMS 1145 connections (hygienic coupling)

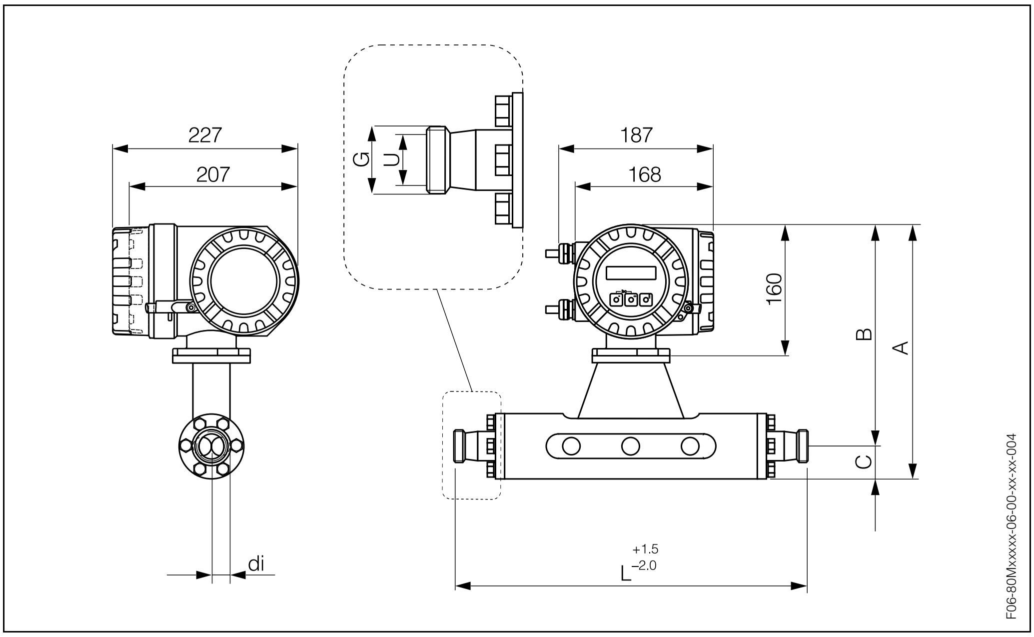


Fig. 52: Dimensions Promass M: SMS 1145 connections (hygienic coupling)

Hygienic coupling SMS 1145: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	Rd 40 x 1/6"	367	22.5	5.53
15	305	268	37	Rd 40 x 1/6"	398	22.5	8.55
25	312	272	40	Rd 40 x 1/6"	434	22.5	11.38
40	332	283	49	Rd 40 x 1/6"	560	35.5	17.07
50	351	293	58	Rd 70 x 1/6"	720	48.5	25.60
80	385	309	76	Rd 98 x 1/6"	792	72.0	38.46
3-A version also available (Ra ≤ 0.8 µm/150 grit)							

Dimensions Promass M (high-pressure): 1/2" NPT, 3/8" NPT and G 3/8" connections

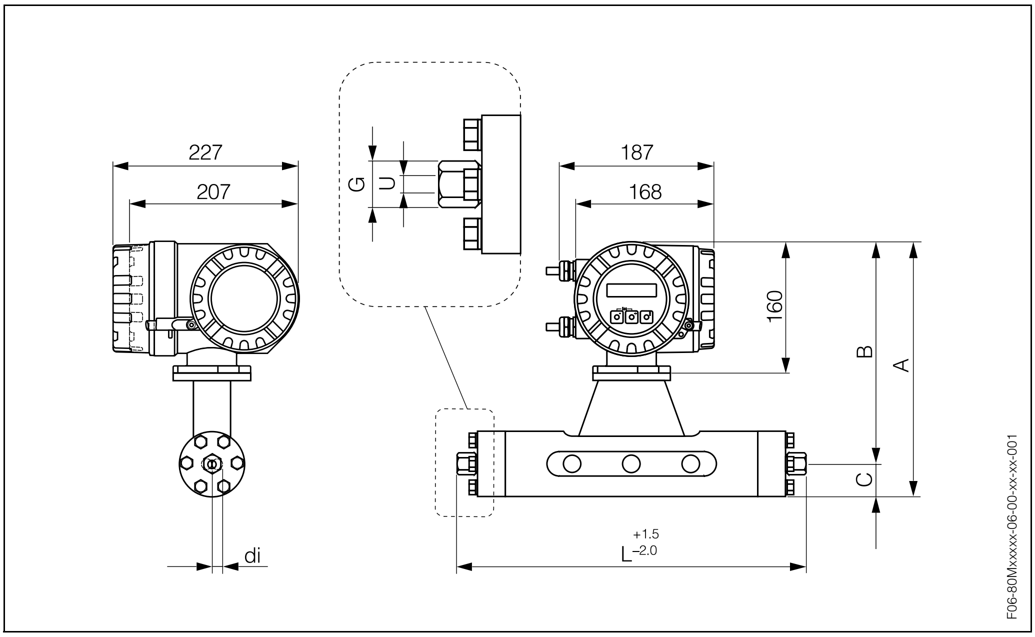


Fig. 53: Dimensions Promass M (high pressure): 1/2" NPT, 3/8" NPT and G 3/8" connections

1/2" NPT: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	SW 1 1/16"	370	10.2	5.53
15	305	268	37	SW 1 1/16"	400	10.2	8.55
25	312	272	40	SW 1 1/16"	444	10.2	11.38

3/8" NPT: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	SW 1 5/16"	355.8	10.2	5.53
15	305	268	37	SW 1 5/16"	385.8	10.2	8.55
25	312	272	40	SW 1 5/16"	429.8	10.2	11.38

G 3/8": 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	SW 24	355.8	10.2	5.53
15	305	268	37	SW 24	385.8	10.2	8.55
25	312	272	40	SW 24	429.8	10.2	11.38

Dimensions Promass M (high pressure): 1/2" SWAGELOK connection

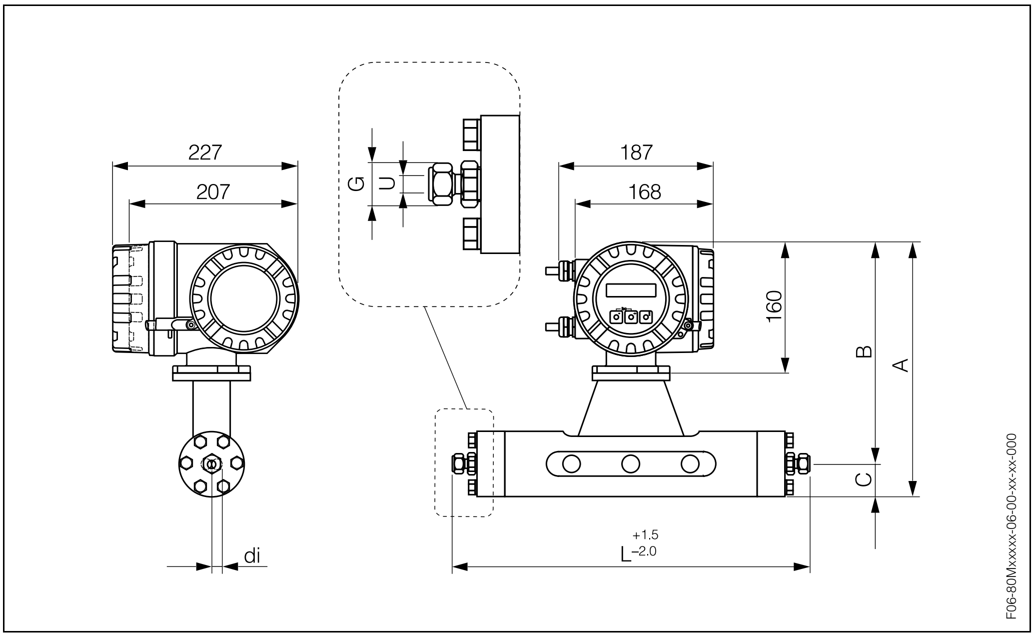


Fig. 54: Dimensions Promass M (high pressure): 1/2" SWAGELOK connection

1/2" SWAGELOK: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	7/8"	366.4	10.2	5.53
15	305	268	37	7/8"	396.4	10.2	8.55
25	312	272	40	7/8"	440.4	10.2	11.38

Dimensions Promass M (high-pressure): Connector with 7/8-14UNF internal thread

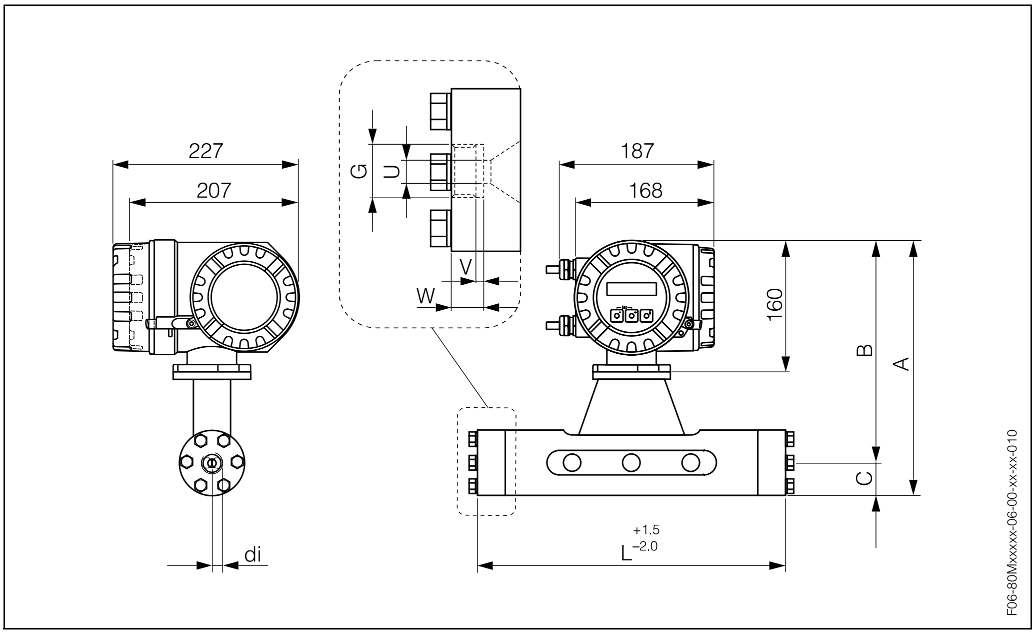


Fig. 55: Dimensions Promass M (high pressure): Connector with 7/8-14UNF internal thread

Internal thread 7/8-14UNF: 1.4404/316L									
DN	A	B	C	G	L	U	V	W	di
8	301	266	35	7/8-14UNF	304	10.2	3	14	5.53
15	305	268	37	7/8-14UNF	334	10.2	3	14	8.55
25	312	272	40	7/8-14UNF	378	10.2	3	14	11.38

Dimensions Promass M: without process connections

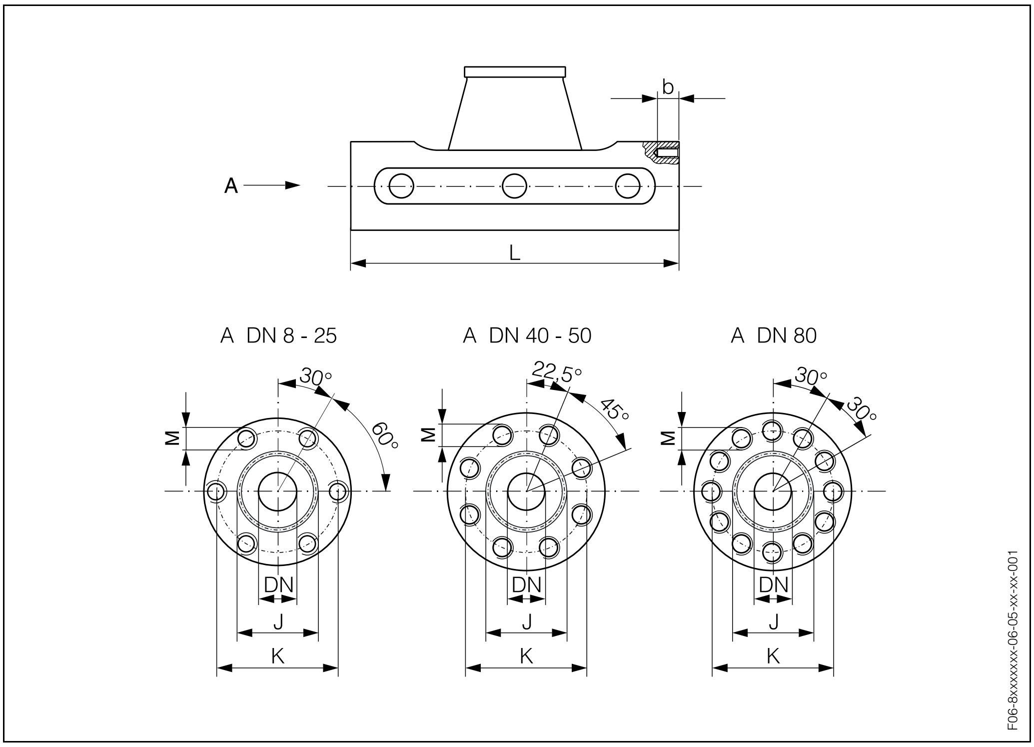


Fig. 56: Dimensions Promass M: without process connections

DN	L	J	K	M	$b_{max.}$	$b_{min.}$
8	256	27	54	6 x M 8	12	10
8 1)	256	27	54	6 x M 8	12	10
15	286	35	56	6 x M 8	12	10
15 1)	286	35	56	6 x M 8	12	10
25	310	40	62	6 x M 8	12	10
25 1)	310	40	62	6 x M 8	12	10
40	410	53	80	8 x M 10	15	13
50	544	73	94	8 x M 10	15	13
80	644	102	128	12 x M 12	18	15
1) High pressure version; permissible thread: A4 - 80; lubricant: Molykote P37						

	Tightening torque	Lubricated thread	O-ring	
DN	Nm	yes/no	Thickness	Inside Ø
8	30.0	no	2.62	21.89
8 1)	19.3	yes	2.62	21.89
15	30.0	no	2.62	29.82
15 1)	19.3	yes	2.62	29.82
25	30.0	no	2.62	34.60
25 1)	19.3	yes	2.62	34.60
40	60.0	no	2.62	47.30
50	60.0	yes	2.62	67.95
80	100.0	yes	3.53	94.84
1) High pressure version; permissible thread: A4 - 80; lubricant: Molykote P37				

Dimensions Promass M: purge connections / secondary containment monitoring

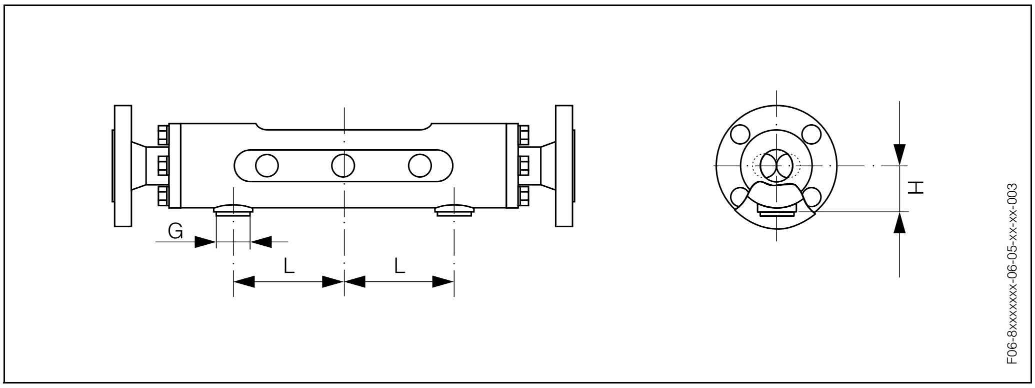


Fig. 57: Dimensions Promass M: purge connections / secondary containment monitoring

DN	L	H	G
8	85	44.0	1/2" NPT
15	100	46.5	1/2" NPT
25	110	50.0	1/2" NPT
40	155	59.0	1/2" NPT
50	210	67.5	1/2" NPT
80	210	81.5	1/2" NPT

10.6 Dimensions: Promass A

Dimensions Promass A: 4-VCO-4 connection (welded)

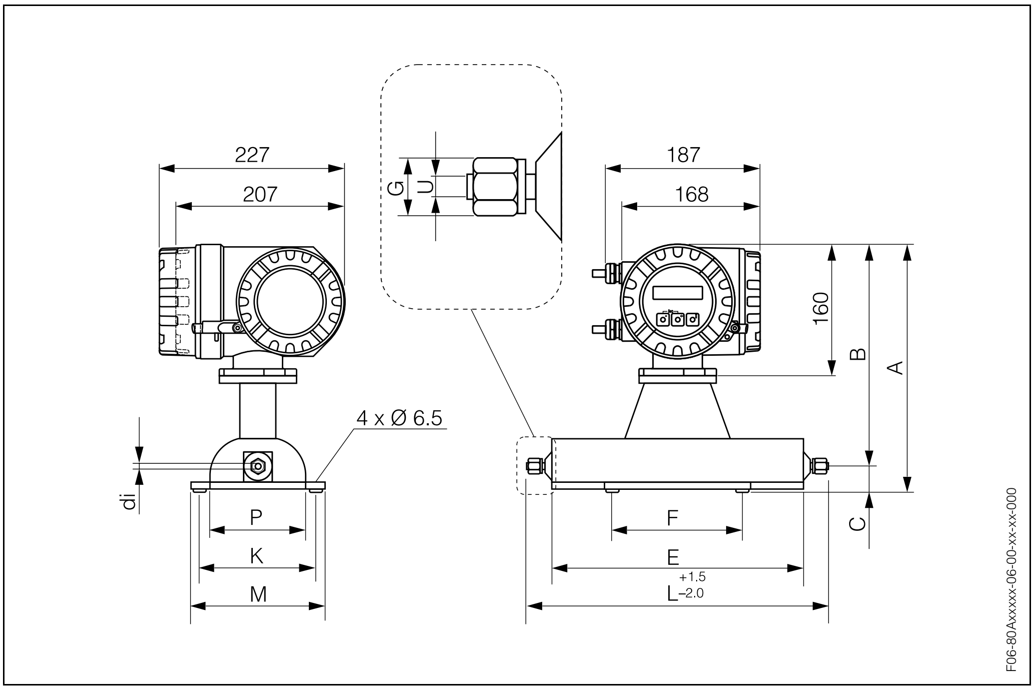


Fig. 58: Dimensions Promass A: 4-VCO-4 connection (welded)

4-VCO-4 connection: 1.4539/904L, Alloy C-22											
DN	A	B	C	E	F	G	K	L	M	P	U / di
1 [1)]	305	273	32	228	160	SW 11/16"	145	290	165	120	1.1
2 [1)]	305	273	32	310	160	SW 11/16"	145	372	165	120	1.8
2 [2)]	305	273	32	310	160	SW 11/16"	145	372	165	120	1.4
4 [1)]	315	283	32	435	220	SW 11/16"	175	497	195	150	3.5
4 [2)]	315	283	32	435	220	SW 11/16"	175	497	195	150	3.0

1) 3-A version also available (Ra ≤ 0.4 µm/240 grit). For 1.4539/904L only
2) High pressure version

Dimensions Promass A: 1/2" Tri-Clamp connection (welded)

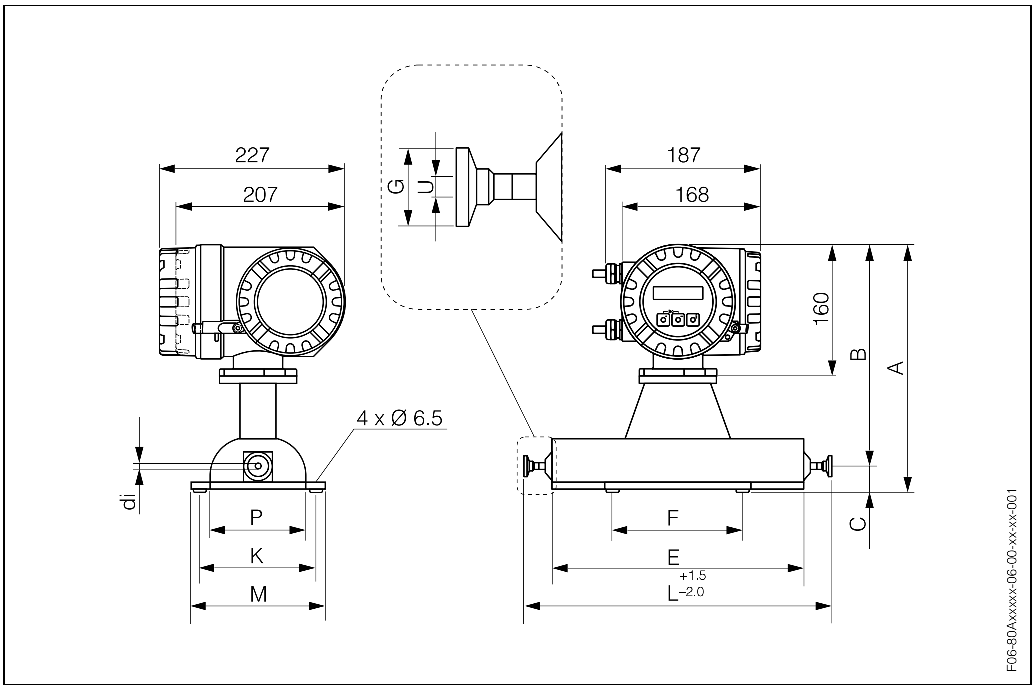


Fig. 59: Dimensions Promass A: 1/2" Tri-Clamp connection (welded)

1/2" Tri-Clamp connection / 3-A version [1]: 1.4539/904L												
DN	A	B	C	E	F	G	K	L	M	P	U	di
1	305	273	32	228	160	25	145	296	165	120	9.5	1.1
2	305	273	32	310	160	25	145	378	165	120	9.5	1.8
4	315	283	32	435	220	25	175	503	195	150	9.5	3.5
[1] 3-A version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)												

Dimensions Promass A: 4-VCO-4 connection with mounting set DN 15 flange (DIN, JIS) or 1/2" flange (ANSI)

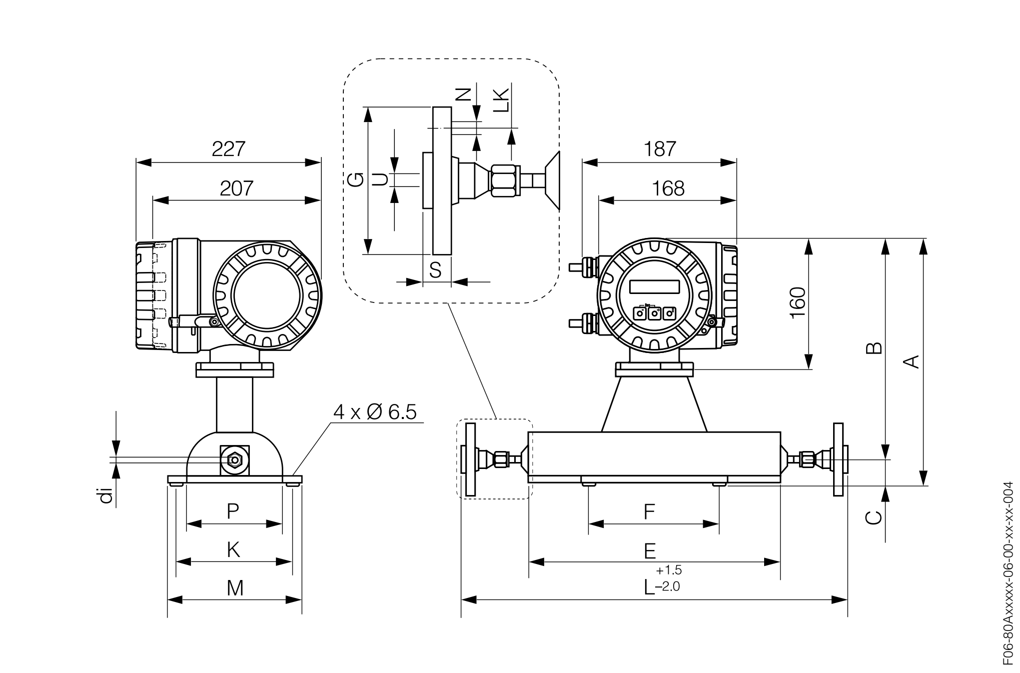


Fig. 60: Dimensions Promass A: 4-VCO-4 connection with mounting set DN 15 flange (DIN, JIS) or 1/2" flange (ANSI)

Mounting set DN 15 flange (DIN) PN 40: 1.4539/904L, Alloy C-22															
DN	A	B	C	E	F	G	K	L	M	N	P	S	LK	U	di
1	305	273	32	228	160	95	145	393	165	4 x Ø14	120	28	65	17.3	1.1
2	305	273	32	310	160	95	145	475	165	4 x Ø14	120	28	65	17.3	1.8
4	315	283	32	435	220	95	175	600	195	4 x Ø14	150	28	65	17.3	3.5
Loose flanges (not fluid-wetted) made of stainless steel 1.4404/316L															

Mounting set DN 15 flange (JIS) 10K: 1.4539/904L, Alloy C-22															
DN	A	B	C	E	F	G	K	L	M	N	P	S	LK	U	di
1	305	273	32	228	160	95	145	393	165	4 x Ø15	120	20	70	15.0	1.1
2	305	273	32	310	160	95	145	475	165	4 x Ø15	120	20	70	15.0	1.8
4	315	283	32	435	220	95	175	600	195	4 x Ø15	150	20	70	15.0	3.5
Loose flanges (not fluid-wetted) made of stainless steel 1.4404/316L															

Mounting set DN 15 flange (JIS) 20K: 1.4539/904L, Alloy C-22															
DN	A	B	C	E	F	G	K	L	M	N	P	S	LK	U	di
1	305	273	32	228	160	95	145	393	165	4 x Ø15	120	14	70	15.0	1.1
2	305	273	32	310	160	95	145	475	165	4 x Ø15	120	14	70	15.0	1.8
4	315	283	32	435	220	95	175	600	195	4 x Ø15	150	14	70	15.0	3.5

Mounting set 1/2" flange (ANSI) Cl 150: 1.4539/904L, Alloy C-22																
DN		A	B	C	E	F	G	K	L	M	N	P	S	LK	U	di
1	1/24"	305	273	32	228	160	88.9	145	393	165	4 x Ø15.7	120	17.7	60.5	15.7	1.1
2	1/12"	305	273	32	310	160	88.9	145	475	165	4 x Ø15.7	120	17.7	60.5	15.7	1.8
4	1/8"	315	283	32	435	220	88.9	175	600	195	4 x Ø15.7	150	17.7	60.5	15.7	3.5
Loose flanges (not fluid-wetted) made of stainless steel 1.4404/316L																

Mounting set 1/2" flange (ANSI) Cl 300: 1.4539/904L, Alloy C-22																
DN		A	B	C	E	F	G	K	L	M	N	P	S	LK	U	di
1	1/24"	305	273	32	228	160	95.2	145	393	165	4 x Ø15.7	120	20.7	66.5	15.7	1.1
2	1/12"	305	273	32	310	160	95.2	145	475	165	4 x Ø15.7	120	20.7	66.5	15.7	1.8
4	1/8"	315	283	32	435	220	95.2	175	600	195	4 x Ø15.7	150	20.7	66.5	15.7	3.5
Loose flanges (not fluid-wetted) made of stainless steel 1.4404/316L																

Dimensions Promass A: 4-VCO-4 connection with mounting set 1/4" NPT-F

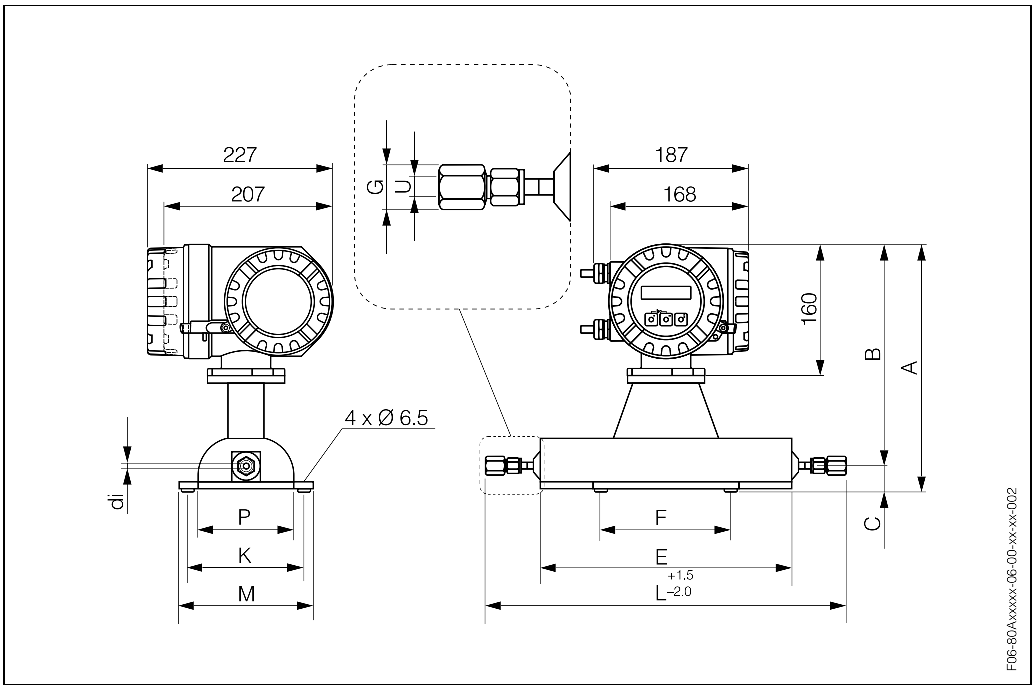


Fig. 61: Dimensions Promass A: 4-VCO-4 connection with mounting set 1/4" NPT-F

Mounting set 1/4" NPT-F connection: 1.4539/904L, Alloy C-22											
DN	A	B	C	E	F	G	K	L	M	P	U	di
1	305	273	32	228	160	SW 3/4"	145	361	165	120	1/4"-NPT	1.1
2	305	273	32	310	160	SW 3/4"	145	443	165	120	1/4"-NPT	1.8
2 [1)]	305	273	32	310	160	SW 3/4"	145	443	165	120	1/4"-NPT	1.4
4	315	283	32	435	220	SW 3/4"	175	568	195	150	1/4"-NPT	3.5
4 [1)]	315	283	32	435	220	SW 3/4"	175	568	195	150	1/4"-NPT	3.0
[1)] High pressure version available in 1.4539/904L only												

Dimensions Promass A: 4-VCO-4 connection with mounting set 1/8" or 1/4" SWAGELOK

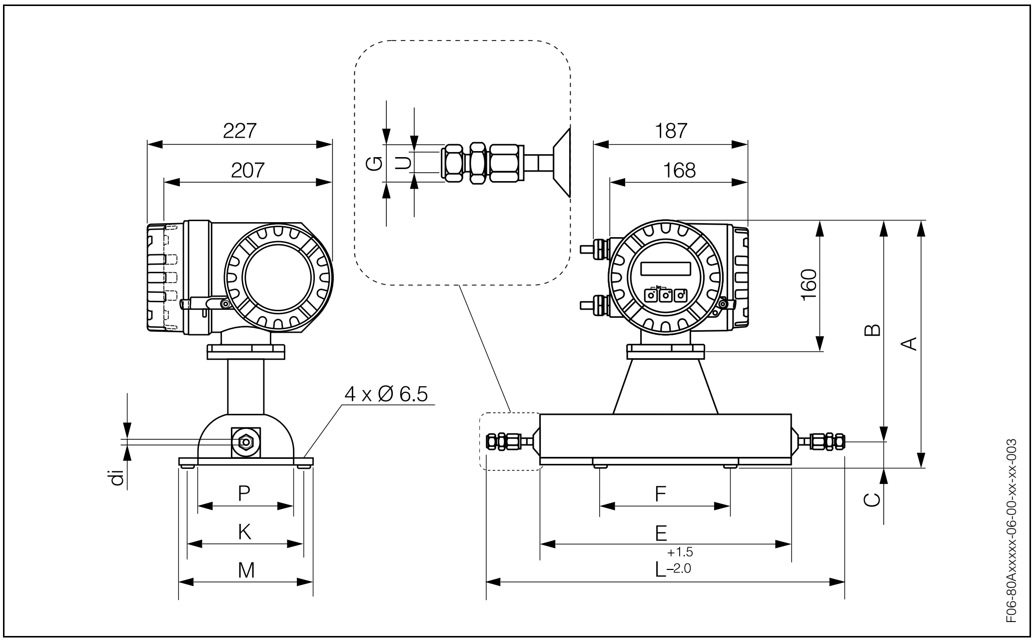


Fig. 62: Dimensions Promass A: 4-VCO-4 connection with mounting set 1/8" or 1/4" SWAGELOK

Mounting set SWAGELOK connection: 1.4401/316												
DN	A	B	C	E	F	G	K	L	M	P	U	di
1	305	273	32	228	160	SW 7/16"	145	359.6	165	120	1/8"	1.1
1	305	273	32	228	160	SW 9/16"	145	359.6	165	120	1/4"	1.1
2	305	273	32	310	160	SW 7/16"	145	441.6	165	120	1/8"	1.8
2	305	273	32	310	160	SW 9/16"	145	441.6	165	120	1/4"	1.8
2 [1)]	305	273	32	310	160	SW 7/16"	145	441.6	165	120	1/8"	1.4
2 [1)]	305	273	32	310	160	SW 9/16"	145	441.6	165	120	1/4"	1.4
4	315	283	32	435	220	SW 9/16"	175	571.6	195	150	1/4"	3.5
4 [1)]	315	283	32	435	220	SW 9/16"	175	571.6	195	150	1/4"	3.0
[1)] High pressure version												

Dimensions Promass A: purge connections / secondary containment monitoring

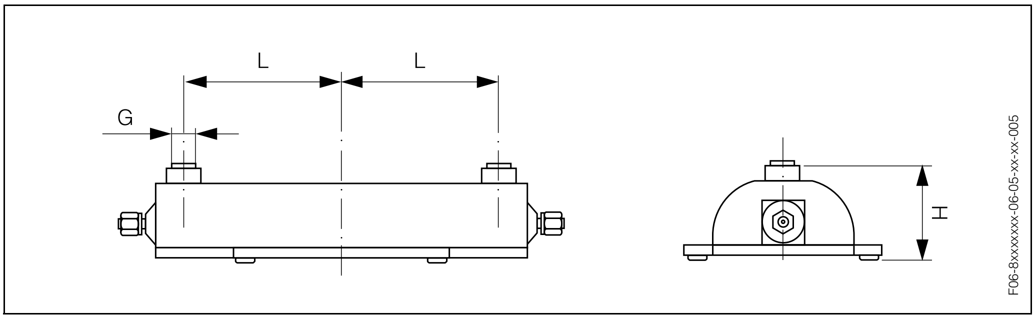


Fig. 63: Dimensions Promass A: purge connections / secondary containment monitoring

DN	L	H	G
1	92.0	87.0	1/2" NPT
2	130.0	87.0	1/2" NPT
4	192.5	97.1	1/2" NPT

10.7 Dimensions: Promass I

Dimensions Promass I: flange connections (DIN, ANSI, JIS)

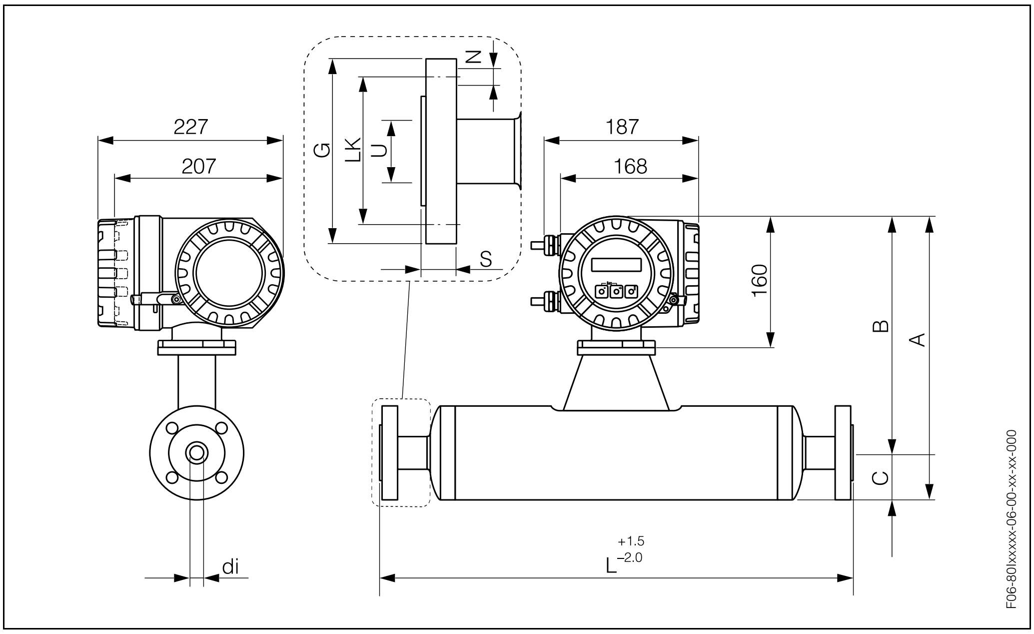


Fig. 64: Dimensions Promass I: flange connections (DIN, ANSI, JIS)

Flange DIN 2501 / PN 40: titanium grade 9										
DN	A	B	C	G	L	N	S	LK	U	di
8 [1)]	350	291	59	95	402	4 x Ø14	20	65	17.30	8.55
15	350	291	59	95	438	4 x Ø14	20	65	17.30	11.38
15 [2)]	350	291	59	95	572	4 x Ø14	19	65	17.07	17.07
25	350	291	59	115	578	4 x Ø14	23	85	28.50	17.07
25 [2)]	377	305	72	115	700	4 x Ø14	22	85	25.60	25.60
40	377	305	72	150	708	4 x Ø18	26	110	43.10	25.60
40 [2)]	406	320	86	150	819	4 x Ø18	24	110	35.62	35.62
50	406	320	86	165	827	4 x Ø18	28	125	54.50	35.62

[1)] DN 8 with DN 15 flanges as standard
[2)] DN 15, 25, 40 "FB" = Full bore versions of Promass I

Flange DIN 2501 / PN 64: titanium grade 9										
DN	A	B	C	G	L	N	S	LK	U	di
50	406	320	86	180	832	4 x Ø22	34	135	54.5	35.62

Flange DIN 2501 / PN 100: titanium grade 9										
DN	A	B	C	G	L	N	S	LK	U	di
8 1)	350	291	59	105	402	4 x Ø14	25	75	17.30	8.55
15	350	291	59	105	438	4 x Ø14	25	75	17.30	11.38
15 2)	350	291	59	105	578	4 x Ø14	26	75	17.07	17.07
25	350	291	59	140	578	4 x Ø18	29	100	28.50	17.07
25 2)	377	305	72	140	706	4 x Ø18	31	100	25.60	25.60
40	377	305	72	170	708	4 x Ø22	32	125	42.50	25.60
40 2)	406	320	86	170	825	4 x Ø22	33	125	35.62	35.62
50	406	320	86	195	832	4 x Ø26	36	145	53.90	35.62

1) DN 8 with DN 15 flanges as standard
2) DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange ANSI B16.5 / Cl 150: titanium grade 9											
DN		A	B	C	G	L	N	S	LK	U	di
8 1)	3/8"	350	291	59	88.9	402	4 x Ø15.7	20	60.5	15.70	8.55
15	1/2"	350	291	59	88.9	438	4 x Ø15.7	20	60.5	15.70	11.38
15 2)	1/2"	350	291	59	88.9	572	4 x Ø15.7	19	60.5	17.07	17.07
25	1"	350	291	59	108.0	578	4 x Ø15.7	23	79.2	26.70	17.07
25 2)	1"	377	305	72	108.0	700	4 x Ø15.7	22	79.2	25.60	25.60
40	1 1/2"	377	305	72	127.0	708	4 x Ø15.7	26	98.6	40.90	25.60
40 2)	1 1/2"	406	320	86	127.0	819	4 x Ø15.7	24	98.6	35.62	35.62
50	2"	406	320	86	152.4	827	4 x Ø19.1	28	120.7	52.60	35.62

1) DN 8 with DN 15 flanges as standard
2) DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange ANSI B16.5 / Cl 300: titanium grade 9											
DN		A	B	C	G	L	N	S	LK	U	di
8 1)	3/8"	350	291	59	95.3	402	4 x Ø15.7	20	66.5	15.70	8.55
15	1/2"	350	291	59	95.3	438	4 x Ø15.7	20	66.5	15.70	11.38
15 2)	1/2"	350	291	59	95.3	572	4 x Ø15.7	19	66.5	17.07	17.07
25	1"	350	291	59	124.0	578	4 x Ø19.1	23	88.9	26.70	17.07
25 2)	1"	377	305	72	124.0	700	4 x Ø19.1	22	88.9	25.60	25.60
40	1 1/2"	377	305	72	155.4	708	4 x Ø22.4	26	114.3	40.90	25.60
40 2)	1 1/2"	406	320	86	155.4	819	4 x Ø22.4	24	114.3	35.62	35.62
50	2"	406	320	86	165.1	827	8 x Ø19.1	28	127.0	52.60	35.62

1) DN 8 with DN 15 flanges as standard
2) DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange ANSI B16.5 / Cl 600: titanium grade 9											
DN		A	B	C	G	L	N	S	LK	U	di
8 1)	3/8"	350	291	59	95.3	402	4 x Ø15.7	20	66.5	13.80	8.55
15	1/2"	350	291	59	95.3	438	4 x Ø15.7	20	66.5	13.80	11.38
15 2)	1/2"	350	291	59	95.3	578	4 x Ø15.7	22	66.5	17.07	17.07
25	1"	350	291	59	124.0	578	4 x Ø19.1	23	88.9	24.40	17.07
25 2)	1"	377	305	72	124.0	706	4 x Ø19.1	25	88.9	25.60	25.60
40	1 1/2"	377	305	72	155.4	708	4 x Ø22.4	28	114.3	38.10	25.60
40 2)	1 1/2"	406	320	86	155.4	825	4 x Ø22.4	29	114.3	35.62	35.62
50	2"	406	320	86	165.1	832	8 x Ø19.1	33	127.0	49.30	35.62

1) DN 8 with DN 15 flanges as standard
2) DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange JIS B2238 / 10K: titanium grade 9										
DN	A	B	C	G	L	N	S	LK	U	di
50	406	320	86	155	827	4 x Ø19	28	120	50	35.62

Flange JIS B2238 / 20K: titanium grade 9										
DN	A	B	C	G	L	N	S	LK	U	di
8 [1)]	350	291	59	95	402	4 x Ø15	20	70	15.00	8.55
15	350	291	59	95	438	4 x Ø15	20	70	15.00	11.38
15 [2)]	350	291	59	95	572	4 x Ø15	19	70	17.07	17.07
25	350	291	59	125	578	4 x Ø19	23	90	25.00	17.07
25 [2)]	377	305	72	125	700	4 x Ø19	22	90	25.60	25.60
40	377	305	72	140	708	4 x Ø19	26	105	40.00	25.60
40 [2)]	406	320	86	140	819	4 x Ø19	24	105	35.62	35.62
50	406	320	86	155	827	8 x Ø19	28	120	50.00	35.62

[1)] DN 8 with DN 15 flanges as standard
[2)] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange JIS B2238 / 40K: titanium grade 9										
DN	A	B	C	G	L	N	S	LK	U	di
8 [1)]	350	291	59	115	402	4 x Ø19	25	80	15.00	8.55
15	350	291	59	115	438	4 x Ø19	25	80	15.00	11.38
15 [2)]	350	291	59	115	578	4 x Ø19	26	80	17.07	17.07
25	350	291	59	130	578	4 x Ø19	27	95	25.00	17.07
25 [2)]	377	305	72	130	706	4 x Ø19	29	95	25.60	25.60
40	377	305	72	160	708	4 x Ø23	30	120	38.00	25.60
40 [2)]	406	320	86	160	825	4 x Ø23	31	120	35.62	35.62
50	406	320	86	165	827	8 x Ø19	32	130	50.00	35.62

[1)] DN 8 with DN 15 flanges as standard
[2)] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange JIS B2238 / 63K: titanium grade 9										
DN	A	B	C	G	L	N	S	LK	U	di
8 [1)]	350	291	59	120	402	4 x Ø19	28	85	12.00	8.55
15	350	291	59	120	438	4 x Ø19	28	85	12.80	11.38
15 [2)]	350	291	59	120	578	4 x Ø19	29	85	17.07	17.07
25	350	291	59	140	578	4 x Ø23	30	100	22.00	17.07
25 [2)]	377	305	72	140	706	4 x Ø23	32	100	25.60	25.60
40	377	305	72	175	708	4 x Ø25	36	130	35.00	25.60
40 [2)]	406	320	86	175	825	4 x Ø25	37	130	35.62	35.62
50	406	320	86	185	832	8 x Ø23	40	145	48.00	35.62

[1)] DN 8 with DN 15 flanges as standard
[2)] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Dimensions Promass I: VCO connections

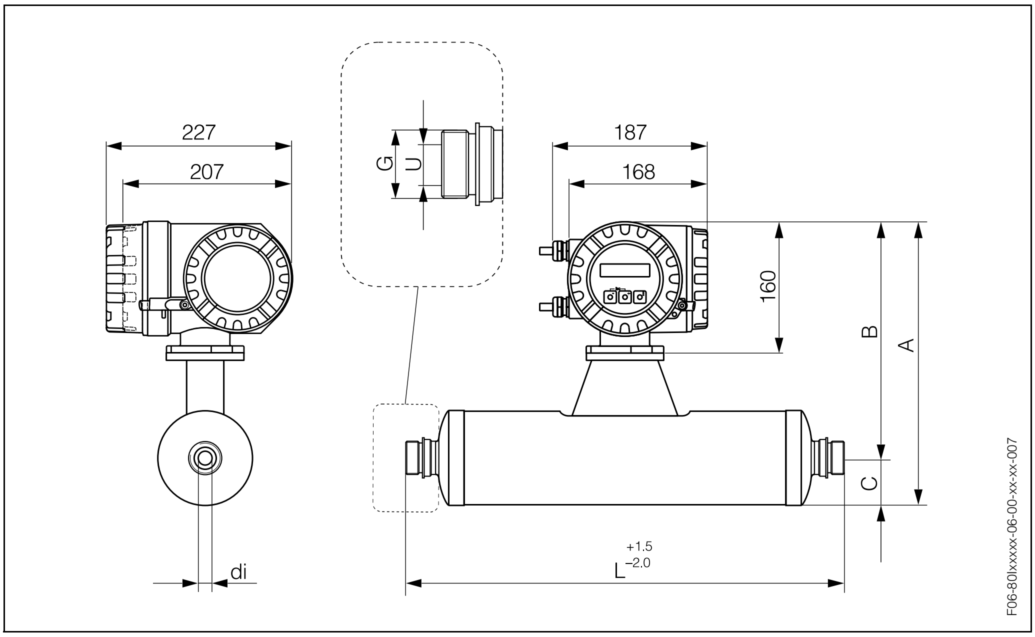


Fig. 65: Dimensions Promass I: VCO connections

12-VCO-4 (3/4"): titanium grade 2							
DN	A	B	C	G	L	U	di
8	350	291	59	1 1/4-18 UNEF	429	15.7	8.55
15	350	291	59	1 1/4-18 UNEF	465	15.7	11.38

Dimensions Promass I: Tri-Clamp connections

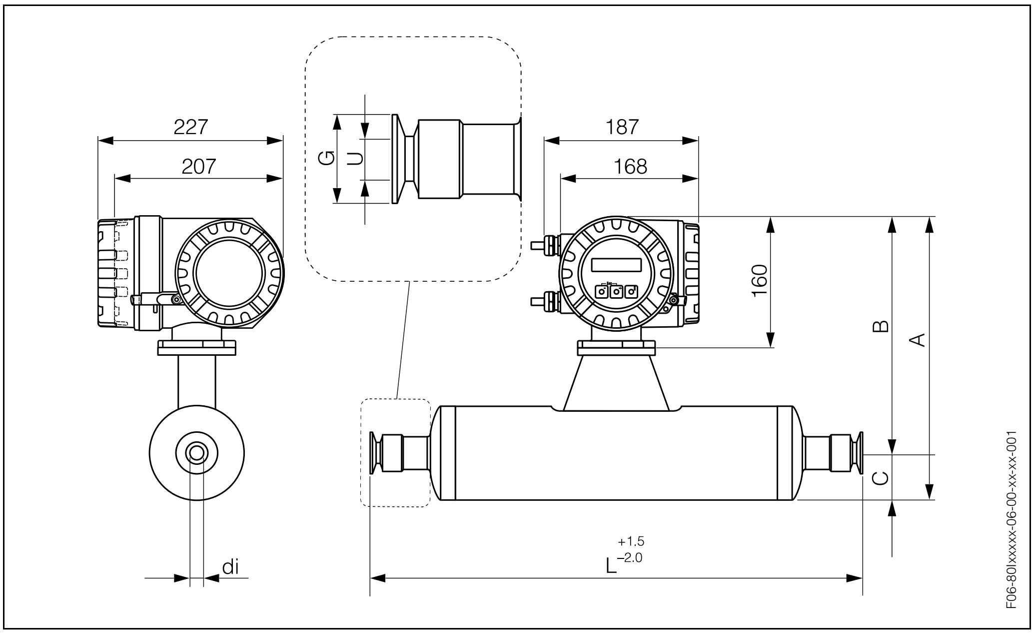


Fig. 66: Dimensions Promass I: Tri-Clamp connections

Tri-Clamp / 3-A version[1]: titanium grade 2								
DN	Clamp	A	B	C	G	L	U	di
8	1"	350	291	59	50.4	427	22.1	8.55
15	1"	350	291	59	50.4	463	22.1	11.38
15 [2]	see 3/4" Tri-Clamp connection							
25	1"	350	291	59	50.4	603	22.1	17.07
25 [2]	1"	377	305	72	50.4	730	22.1	25.60
40	1 1/2"	377	305	72	50.4	731	34.8	25.60
40 [2]	1 1/2"	406	320	86	50.4	849	34.8	35.62
50	2"	406	320	86	63.9	850	47.5	35.62
[1] 3-A version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit) [2] DN 15, 25, 40 “FB” = Full bore versions of Promass I								

1/2" Tri-Clamp / 3-A version[1]: titanium grade 2								
DN	Clamp	A	B	C	G	L	U	di
8	1/2"	350	291	59	25.0	426	9.5	8.55
15	1/2"	350	291	59	25.0	462	9.5	11.38
[1] 3-A version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)								

3/4" Tri-Clamp / 3-A version[1]: titanium grade 2								
DN	Clamp	A	B	C	G	L	U	di
8	3/4"	350	291	59	25.0	426	16.0	8.55
15	3/4"	350	291	59	25.0	462	16.0	11.38
15 [2]	3/4"	350	291	59	25.0	602	16.0	17.07
[1] 3-A version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit) [2] DN 15 “FB” = Full bore versions of Promass I								

Dimensions Promass I: DIN 11851 connections (hygienic coupling)

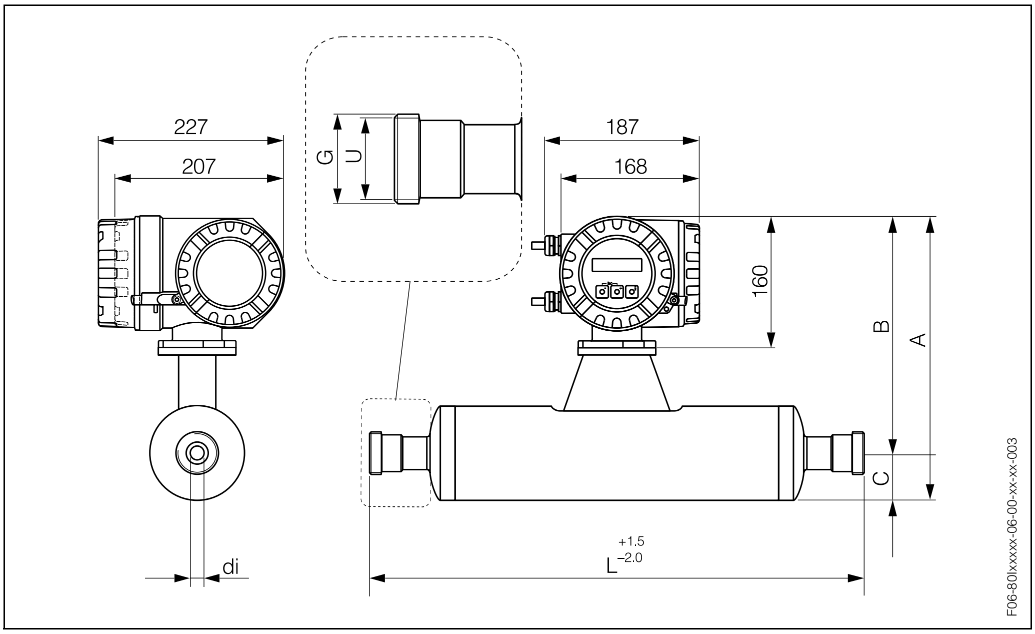


Fig. 67: Dimensions Promass I: DIN 11851 connections (hygienic coupling)

Hygienic coupling DIN 11851 / 3-A version [1]: titanium grade 2							
DN	A	B	C	G	L	U	di
8	350	291	59	Rd 34 x 1/8"	427	16	8.55
15	350	291	59	Rd 34 x 1/8"	463	16	11.38
15 [2]	350	291	59	Rd 34 x 1/8"	602	16	17.07
25	350	291	59	Rd 52 x 1/6"	603	26	17.07
25 [2]	377	305	72	Rd 52 x 1/6"	736	26	25.60
40	377	305	72	Rd 65 x 1/6"	731	38	25.60
40 [2]	406	320	86	Rd 65 x 1/6"	855	38	35.62
50	406	320	86	Rd 78 x 1/6"	856	50	35.62
[1] 3-A version (Ra ≤ 0.8 µm/150 grit) [2] DN 15, 25, 40 “FB” = Full bore versions of Promass I							

Hygienic coupling DIN 11851 Rd 28 x 1/8" / 3-A version [1]: titanium grade 2							
DN	A	B	C	G	L	U	di
8	350	291	59	Rd 28 x 1/8"	426	10	8.55
15	350	291	59	Rd 28 x 1/8"	462	10	11.38
[1] 3-A version (Ra ≤ 0.8 µm/150 grit)							

Dimensions Promass I: DIN 11864-1 Form A connections (threaded unions)

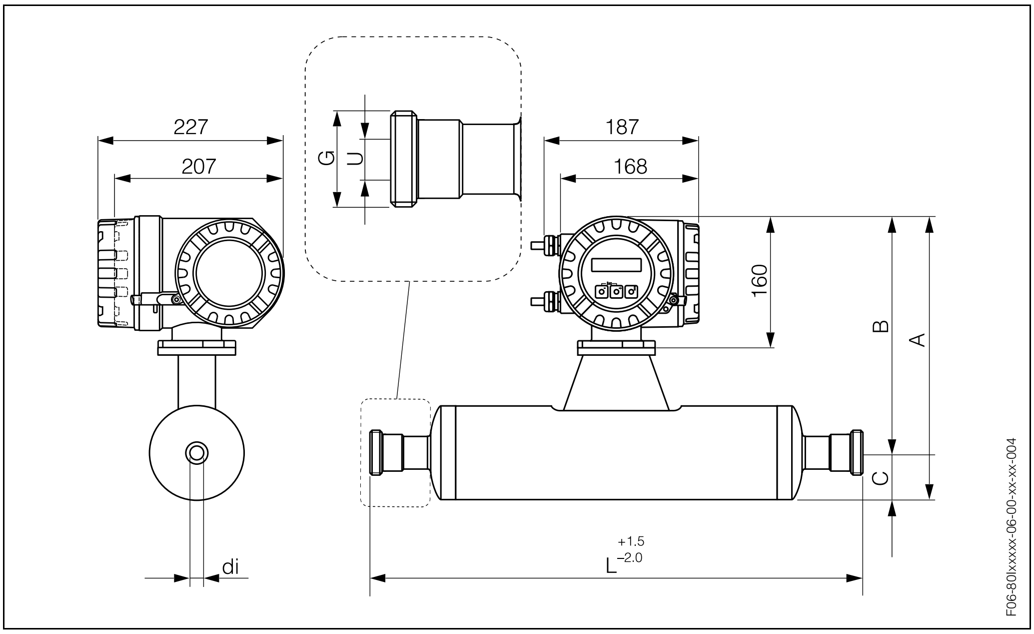


Fig. 68: Dimensions Promass I: DIN 11864-1 Form A connections (threaded unions)

Threaded union DIN 11864-1 Form A / 3-A version [1]: titanium grade 2							
DN	A	B	C	G	L	U	di
8 [2]	350	291	59	Rd 28 x 1/8"	428	10	8.55
15	350	291	59	Rd 34 x 1/8"	463	16	11.38
15 [3]	350	291	59	Rd 34 x 1/8"	602	16	17.07
25	350	291	59	Rd 52 x 1/6"	603	26	17.07
25 [3]	377	305	72	Rd 52 x 1/6"	734	26	25.60
40	377	305	72	Rd 65 x 1/6"	731	38	25.60
40 [3]	406	320	86	Rd 65 x 1/6"	855	38	35.62
50	406	320	86	Rd 78 x 1/6"	856	50	35.62

[1] 3-A version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)
[2] DN 8 with DN 10 threaded adapters
[3] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Dimensions Promass I: flange connection DIN 11864-2 Form A

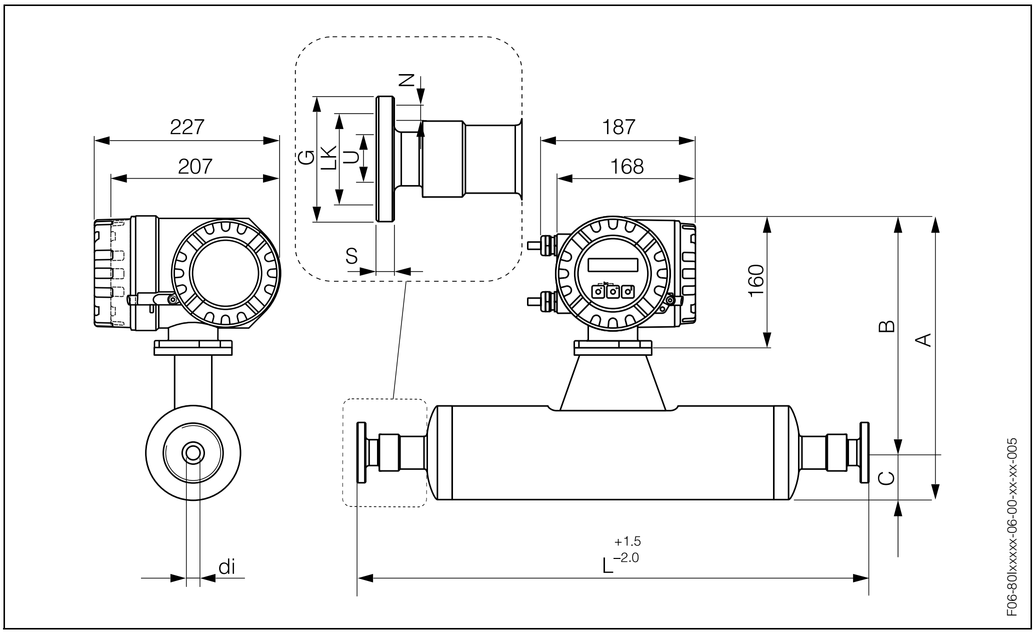


Fig. 69: Dimensions Promass I: flange connection DIN 11864-2 Form A

Flange DIN 11864-2 Form A / 3-A version 1): titanium grade 2										
DN	A	B	C	G	L	N	S	LK	U	di
8 2)	350	291	59	54	449	4 x Ø9	10	37	10	8.55
15	350	291	59	59	485	4 x Ø9	10	42	16	11.38
25	350	291	59	70	625	4 x Ø9	10	53	26	17.07
40	377	305	72	82	753	4 x Ø9	10	65	38	25.60
50	406	320	86	94	874	4 x Ø9	10	77	50	35.62

1) 3-A version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)
2) DN 8 with DN 10 flanges

Dimensions Promass I: ISO 2853 connections (threaded unions)

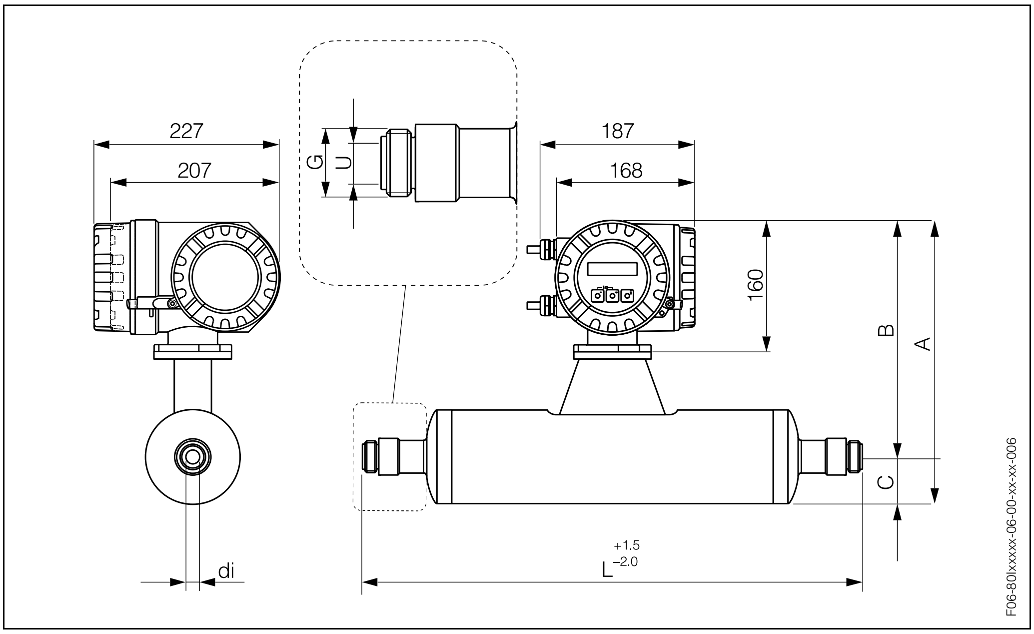


Fig. 70: Dimensions Promass I: ISO 2853 connections (threaded unions)

Threaded union ISO 2853 / 3-A version 1): titanium grade 2							
DN	A	B	C	G	L	U	di
8 2)	350	291	59	37.13	435	22.6	8.55
15	350	291	59	37.13	471	22.6	11.38
15 3)	350	291	59	37.13	610	22.6	17.07
25 3)	377	305	72	37.13	744	22.6	25.60
40	377	305	72	50.65	737	35.6	25.60
40 3)	406	320	86	50.65	859	35.6	35.62
50	406	320	86	64.16	856	48.6	35.62

1) 3-A version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)
2) DN 8 with DN 15 threaded adapters as standard
3) DN 15, 25, 40 “FB” = Full bore versions of Promass I

Dimensions Promass I: SMS 1145 connections (hygienic coupling)

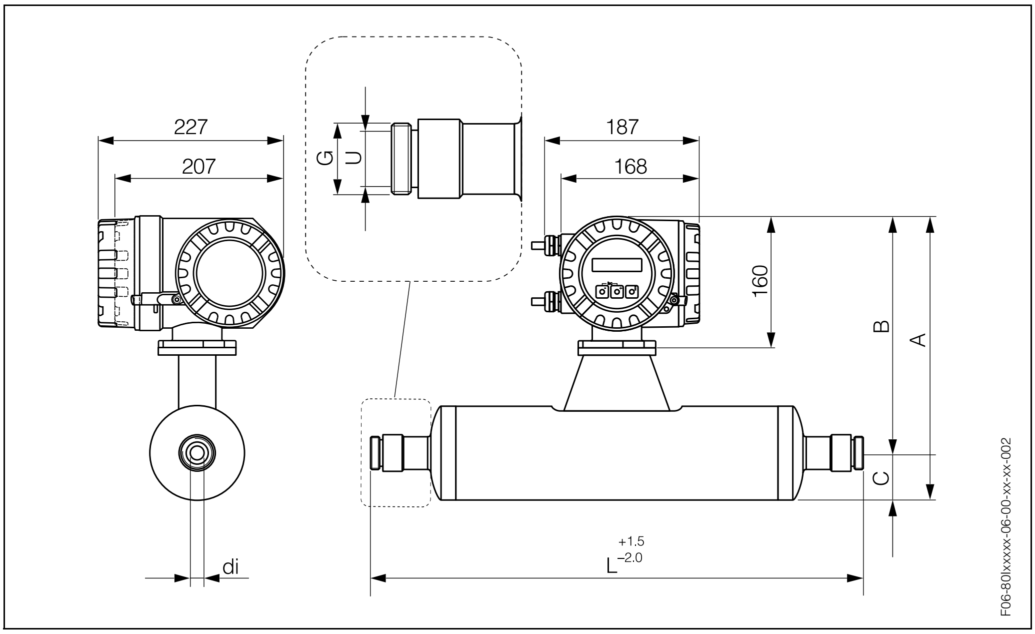


Fig. 71: Dimensions, Promass I: SMS 1145 connections (hygienic coupling)

Hygienic coupling SMS 1145 / 3-A version 1)**:** titanium grade 2							
DN	A	B	C	G	L	U	di
8	350	291	59	Rd 40 x 1/6"	427	22.5	8.55
15	350	291	59	Rd 40 x 1/6"	463	22.5	11.38
25	350	291	59	Rd 40 x 1/6"	603	22.5	17.07
25 2)	377	305	72	Rd 40 x 1/6"	736	22.5	25.60
40	377	305	72	Rd 60 x 1/6"	738	35.5	25.60
40 2)	406	320	86	Rd 60 x 1/6"	857	35.5	35.62
50	406	320	86	Rd 70 x 1/6"	858	48.5	35.62

1) 3-A version (Ra ≤ 0.8 µm/150 grit)
2) DN 15, 25, 40 "FB" = Full bore versions of Promass I

Dimensions Promass I: purge connections / secondary containment monitoring

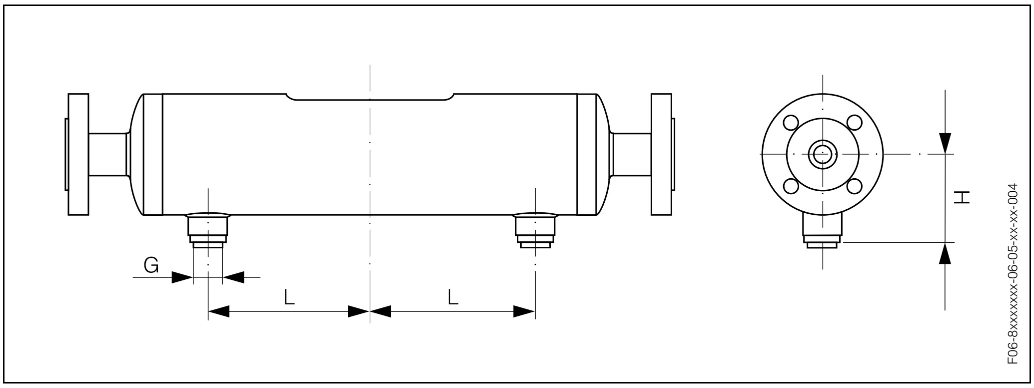


Fig. 72: Dimensions Promass I: purge connections / secondary containment monitoring

DN	L	H	G
8 [2)]	61	78.15	1/2" NPT
15	79	78.15	1/2" NPT
15 [1)]	79	78.15	1/2" NPT
25	148	78.15	1/2" NPT
25 [1)]	148	78.15	1/2" NPT
40	196	90.85	1/2" NPT
40 [1)]	196	90.85	1/2" NPT
50	254	105.25	1/2" NPT

1) DN 15, 25, 40 “FB” = Full bore versions of Promass I
2) DN 8 with DN 15 flanges as standard

Index

Gefahrgutblatt für Reparaturen an E+H-Geräten
Safety regulation form for repairs of E+H instruments
Bulletin de marchandises dangereuses pour réparations des instruments E+H

Lieber Kunde, bitte helfen Sie uns mit Ihren Informationen, damit wir Ihre Reparatur schnell, exakt und risikofrei durchführen können.
Dear customer, please help us with your information to handle your repair fast, exact and free of any risks for the technicians.
Cher client, aidez-nous avec vos informations, afin que nous puissions exécuter vos réparations rapidement, exactement et sans risques.

Firma / company / entreprise: ____________________

Abt. / dept. / service: ____________________

Anschrift / address / adresse: ____________________

Name / name / nom: ____________________

Tel. / phone: ____________________

Fax: ____________________

Sensortyp / type of sensor / modèle de détecteur: ____________________

Auswertegerät / type of instrument / type d´appareil: ____________________

Seriennummer / serial no. / numéro de série: ____________________

Seriennummer / serial no. / numéro de série: ____________________

Prozessdaten / process data / données des opérations

Medium: ____________________

Chemische Formel:
Chemical formula:
Formule chimique: ____________________

Gereinigt mit / cleaned with / nettoyé avec

Medium: ____________________

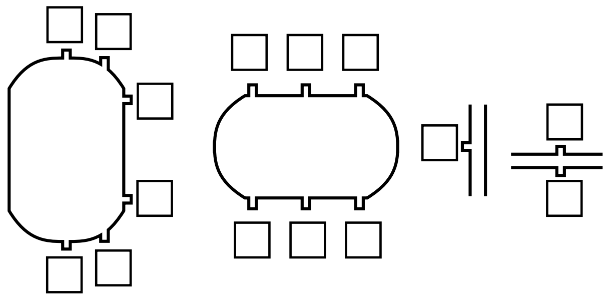
SAFE ☐
Ungefährlich
Safe to handle
Sans danger

Aggregatzustand / state of aggregation / état d´agrégation

flüssig/liquid liquide ☐ fest/solid solide ☐

gasförmig/gaseous gazéiforme ☐ pulverig/powdery poudreux ☐

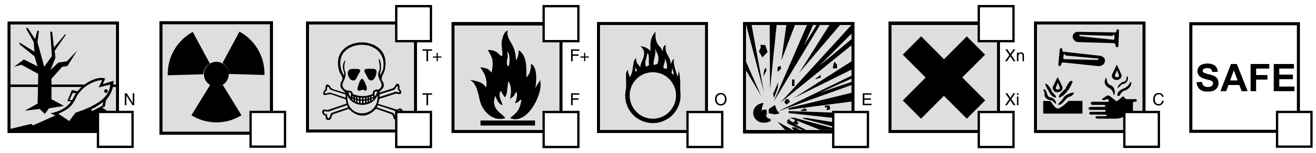
Einbauort / mounting place / lieu de montage



Ex-Anlage / Ex-Zone / Ex-plan

Ja Yes Oui ☐ Nein No Non ☐ Zone Class ____________________

Sicherheitshinweise / safety regulations / normes de sécurité



Umweltgefährlich Dangerous for the envir. Dangereux pour l'envir.	Radioaktiv Radioactive Radioactif	Giftig Toxic Toxique	Entzündlich Flammable Inflammable	Brandfördernd Oxidizing Comburant	Expl.gefährlich Explosive Explosif	Schädlich / Reizend Harmful / Irritant Nocif / Irritant	Ätzend Corrosive Corrosif	Ungefährlich Safe to handle Sans danger

➤ Hiermit bestätigen wir, dass die zurückgeschickten Geräte frei sind von jeglichen Gefahr- oder Giftstoffen (Säuren, Laugen, Lösungsmitteln, usw.). Radioaktiv kontaminierte Geräte müssen vor Einsendung entsprechend den Strahlenschutzvorschriften dekontaminiert werden. Falls spezielle Handhabungsvorschriften nötig sind, legen Sie diese bitte bei.
➤ We herewith confirm that the returned instruments are free of any dangerous or toxic materials (acids, caustics, solvents, etc.). Radioactive contaminated instruments must be decontaminated according to nuclear safety regulations prior to shipment. If special handling regulations are required, please attach.
➤ Par la présente, nous certifions que les instruments en retour sont exempts de tous risques de contamination ou de matières toxiques. Avant expédition les instruments contaminés par de la radio-activité doivent être décontaminés en référence aux prescriptions des règles de securité en vigueur contre les radiations nucléaires. Au cas où des règles de manipulations spécifiques sont nécessaires, veuillez les joindre s. v. p.

Datum / date:
Firmenstempel / stamp / cachet: ____________________

Unterschrift:
Signature: ____________________

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Parameter Einstellung
Réglage des paramètres
Parameter Setting

1058293

Endress+Hauser Flowtec

Endress+Hauser Flowtec AG	PROMASS 80 I
Hersteller · Fabricant · Manufacturer	Umformer/Aufnehmer · Transm./Capteur · Transm./Sensor
I-43838632-10	DN15 / 1/2"
Auftrag-Nr. · Nº d'ordre · Order Nº	Nennweite · Diamètre nominal · Nominal diameter
80I15-AFPAAAAAA5AA	-
Bestell-Code · Nº comm. · Order Code	Tag-Nr. · Nº de Tag · Tag Nº
47073202000	
Fabrikations-Nr. · Nº de série · Serial Nº	

<u>Stromausgang 1 · Sortie Courant 1 · Current Output 1</u>

Wert 0/4mA · Valeur 0/4mA · Value for 0/4mA	0 kg/hr
Wert 20mA · Valeur 20mA · Value for 20mA	1300 kg/hr
Strombereich · Gamme Courant · Current Span	4-20mA HART

<u>Impulsausgang 1 · Sortie Impulsion 1 · Impulse Output 1</u>

Impulswertigkeit · Valeur d'Impulsion · Pulse Value	0.1 kg
Ausgangsignal · Signal de Sortie · Output Signal	passive/positive

Obige Parameter wurden gemäss Ihrer Bestellung eingestellt. Die Einstellung der hier nicht erwähnten Parameter entnehmen Sie bitte der Betriebsanleitung.
L'appareil a été configuré conformément à votre commande. Vous trouverez dans le manuel de mise en service les valeurs des paramètres qui n'ont pas été specifiés sur le document.
The above parameters are set according to your order. Please refer to the Operating Manual for any parameters not mentioned.

19.07.2002
Datum · Date · Date

Endress+Hauser Flowtec AG
Kägenstrasse 7 / Rue de l'Europe 35
CH-4153 Reinach / F-68700 Cernay

Parameter Einstellung
Réglage des paramètres
Parameter Setting

1058293

Endress+Hauser Flowtec

Endress+Hauser Flowtec AG	PROMASS 80 I
Hersteller · Fabricant · Manufacturer	Umformer/Aufnehmer · Transm./Capteur · Transm./Sensor
I-43838632-10	DN15 / 1/2"
Auftrag-Nr. · Nº d'ordre · Order Nº	Nennweite · Diamètre nominal · Nominal diameter
80I15-AFPAAAAAA5AA	-
Bestell-Code · Nº comm. · Order Code	Tag-Nr. · Nº de Tag · Tag Nº
47073202000	
Fabrikations-Nr. · Nº de série · Serial Nº	

Stromausgang 1 · Sortie Courant 1 · Current Output 1

Wert 0/4mA · Valeur 0/4mA · Value for 0/4mA	0 kg/hr
Wert 20mA · Valeur 20mA · Value for 20mA	1300 kg/hr
Strombereich · Gamme Courant · Current Span	4-20mA HART

Impulsausgang 1 · Sortie Impulsion 1 · Impulse Output 1

Impulswertigkeit · Valeur d'Impulsion · Pulse Value	0.1 kg
Ausgangsignal · Signal de Sortie · Output Signal	passive/positive

Obige Parameter wurden gemäss Ihrer Bestellung eingestellt. Die Einstellung der hier nicht erwähnten Parameter entnehmen Sie bitte der Betriebsanleitung.
L'appareil a été configuré conformément à votre commande. Vous trouverez dans le manuel de mise en service les valeurs des paramètres qui n'ont pas été specifiés sur le document.
The above parameters are set according to your order. Please refer to the Operating Manual for any parameters not mentioned.

19.07.2002
Datum · Date · Date

Endress+Hauser Flowtec AG
Kägenstrasse 7 / Rue de l'Europe 35
CH-4153 Reinach / F-68700 Cernay

Kalibrierprotokoll
Protocole d'étalonnage
Calibration Protocol

10123135-1058293

Endress+Hauser Flowtec

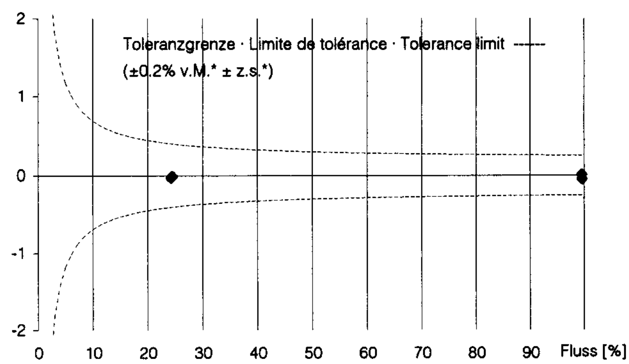
Endress+Hauser Flowtec AG	DN15 / 1/2"
Hersteller · Fabricant · Manufacturer	Nennweite · Diamètre nominal · Nominal diameter
I-43838632-10 / 80I15-AFPAAAAAA5AA	1300.0 kg/hr (≙ 100%)
Auftr.-Nr./Best.-Code · Nº d'ordre/Nº comm. · Order Nº/Order Code	Kalib. Endwert · Valeur finale d'étal. · Cal. full scale
PROMASS 80 I	Calibration Interface
Umformer/Aufnehmer · Transmetteur/Capteur · Transmitter/Sensor	Kalib. Ausgang · Signal de sortie cal. · Cal. output
47073202000	1.6357
Fabrikations-Nr. · Nº de série · Serial Nº	Kalib.-Faktor · Facteur d'étal. · Cal. factor
FCP-6.3	76
Kalibrier-Anlage · Banc d'étalonnage · Calibration rig	Nullpunkt · Point zéro · Zero point
-	32.1 °C
Tag-Nr. · Nº de Tag · Tag Nº	Wassertemperatur · Temp. de l'eau · Water temp.

Fluss Débit Flow [%]	Fluss Débit Flow [kg/hr]	Zeit Durée Duration [sec]	m soll m doit m target [kg]	m mess. m mesure m meas. [kg]	Δ v.M.* Δ d.m.* Δ o.r.* [%]	Ausg.** Sortie** Outp.** [mA]
24.3	316.1	30.2	2.6474	2.6467	-0.03	7.89
24.5	318.8	30.2	2.6779	2.6776	-0.01	7.92
99.6	1294.8	30.7	11.028	11.028	0.00	19.94
99.7	1296.1	30.3	10.895	10.889	-0.05	19.94
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

*v.M. · d.m. · o.r.: vom Messwert · de la mesure · of rate

**Berechneter Wert · Valeur calculée · Calculated value (4 - 20 mA)

Messabweichung % v.M.
Déviation de mesure % d.m.
Measured error % o.r.



*z.s.: Nullpunktstabilität · Stabilité du zéro · Zero stability

Die Rückführbarkeit aller bei der Kalibrierung verwendeten Prüfmittel auf das nationale Normal ist sichergestellt.
Nous garantissons que les instruments de mesure utilisés sur nos bancs d'étalonnage sont raccordés aux étalons nationaux.
Traceability to the national standard for all test instruments used for the calibration is guaranteed.

19.07.2002
Kalib.datum · Date d'étal. · Date of cal.

J. Sivagnanam
Kalibrierer · Opérateur · Operator

Endress+Hauser Flowtec AG
Kägenstrasse 7 / Rue de l'Europe 35
CH-4153 Reinach / F-68700 Cernay

Zertifiziert nach · Certifié selon · Certified acc. to
ISO 9001, Reg.-Nº 10390-03

Kalibrierprotokoll
Protocole d'étalonnage
Calibration Protocol

10123139-1058292

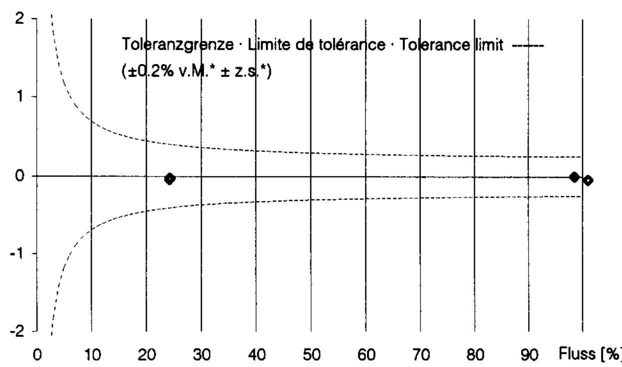
Endress+Hauser Flowtec

Endress+Hauser Flowtec AG	DN15 / 1/2"
Hersteller · Fabricant · Manufacturer	Nennweite · Diamètre nominal · Nominal diameter
I-43838632-10 / 80I15-AFPAAAAAA5AA	1300.0 kg/hr (≙ 100%)
Auftr.-Nr./Best.-Code · Nº d'ordre/Nº comm. · Order Nº/Order Code	Kalib. Endwert · Valeur finale d'étal. · Cal. full scale
PROMASS 80 I	Calibration Interface
Umformer/Aufnehmer · Transmetteur/Capteur · Transmitter/Sensor	Kalib. Ausgang · Signal de sortie cal. · Cal. output
47073102000	1.6528
Fabrikations-Nr. · Nº de série · Serial Nº	Kalib.-Faktor · Facteur d'étal. · Cal. factor
FCP-6.3	114
Kalibrier-Anlage · Banc d'étalonnage · Calibration rig	Nullpunkt · Point zéro · Zero point
-	32.2 °C
Tag-Nr. · Nº de Tag · Tag Nº	Wassertemperatur · Temp. de l'eau · Water temp.

Fluss Débit Flow [%]	Fluss Débit Flow [kg/hr]	Zeit Durée Duration [sec]	m soll m doit m target [kg]	m mess. m mesure m meas. [kg]	Δ v.M.* Δ d.m.* Δ o.r.* [%]	Ausg.** Sortie** Outp.** [mA]
24.3	315.9	30.5	2.6728	2.6718	-0.04	7.88
24.4	316.7	30.7	2.6968	2.6961	-0.02	7.89
98.6	1281.5	30.4	10.809	10.809	0.00	19.77
101.1	1314.0	30.1	10.978	10.973	-0.05	20.17
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

*v.M. · d.m. · o.r.: vom Messwert · de la mesure · of rate
**Berechneter Wert · Valeur calculée · Calculated value (4 - 20 mA)

Messabweichung % v.M.
Déviation de mesure % d.m.
Measured error % o.r.



*z.s.: Nullpunktstabilität · Stabilité du zéro · Zero stability

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