



Flamco



Flexcon[®] M-K



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1. Liability

All data and information contained herein are correct at time of publication. This information is the result of our current findings and experience to the best of our knowledge. We reserve the right to make technical changes subject to the future development of the Flamco product referred to in this publication. Hence no rights may be derived from technical data, descriptions and illustrations. Technical pictures, drawings and graphs do not necessarily correspond to the actual assemblies or parts as delivered. Drawings and pictures are not to scale and contain symbols for simplification.

2. Warranty

Warranty specifications can be found in our General Terms and Conditions and do not form part of this manual.

3. Copyright

This manual must be used confidentially. It may be circulated among authorized personnel only. It must not be given to third parties. All documentation is protected by copyright. Distribution or other forms of reproduction of documents, even extracts, exploitation or notification of the contents hereof is not permitted, where not otherwise specified. Infringements are liable to prosecution and payment of compensation. We reserve the right to exercise all intellectual property rights.

4. General safety instructions

Disregard or lack of attention to the information and measures in this manual may pose a hazard to people, animals, the environment and tangible assets. Failure to observe the safety regulations and the neglect of other safety measures may lead to the lapse of liability for damages in the event of damage or loss.

Definitions

- **Operator:** Natural person or legal entity, who owns the product and uses it or to whom use of the product is entrusted on the basis of a contractual agreement.
- **Principal:** Legally and commercially liable client in the commission of building projects.
- **Responsible person:** The representative appointed to act by the main contractor or operator.
- **Qualified person (QP):** Any person whose professional training, experience and recent professional activity gives them the requisite professional knowledge. This implies that such people have knowledge derived from relevant national and internal safety regulations.

Warning symbols in this manual

Danger - electric current

Disregarding these warnings may:

- endanger health,
- cause death, fire or other damage,
- lead to the overloading of individual components and to damage,
- otherwise impair the unit's function.



Caution - warning for mistakes and wrong basic assumptions

Consider the implications of errors and incorrect set-up conditions carefully!
Disregarding these warnings may lead to:

- serious personal injury,
- overloading of individual components and damage,
- impair the unit's function.



Purpose and use of this manual

The following pages list the information, specifications, measures and technical data that allow the relevant personnel to use this product safely and for the intended purpose. Responsible persons or those engaged by them carrying out the required services must read this manual attentively and understand it. Such services include: storage, transportation, installation, electrical installation, commissioning and re-starting, operation, maintenance, inspection, repair and dismantling.

Where the product is to be used in plants/facilities which do not comply with harmonized European regulations and relevant technical rules and guidelines of professional associations for this field of application, the present document is purely for informative and reference purposes. As this unit may be subject to unlimited inspection at all times, this manual must be kept in the immediate vicinity of the installed unit, at least within the confines of the operations room.

Qualifications required, assumptions

All personnel must have relevant qualifications to carry out the required services, and be physically and psychologically capable.

The area of responsibility, competence and supervision of personnel is the duty of the Operator.

Required service	Professional group	Relevant qualifications
Storage, Transportation	Logistics, transport, warehousing	Transport and warehousing specialist
Installation, dismantling, repair, maintenance	Installation and building services (HVAC)	HVAC specialist.
Re-commissioning after installation of extra components or modification		Person trained with knowledge from the present manual.
Testing		
Commissioning after configuration (generic), re-commissioning after power cut, (work on the terminal and SPC control unit)		
Electrical installation	Electrical engineering	Specialist in electrical engineering/ installation
First and routine inspection of electrical equipment		Qualified person (QP) with certification in Electrical Engineering
Inspection prior to commissioning and routine inspection of pressure equipment	Installation and building services from a professional technical inspection authority.	Qualified person (QP)

Competence development of personnel

Operating instructions are issued by Flamco representatives or others assigned by them during delivery negotiations or on demand. Training for the required services, installation, dismantling, commissioning, operation, inspection, maintenance and repair are part of the training / further education for service engineers of the Flamco branch offices or named service contractors. Such training covers information about on-site requirements rather than performance.

On-site services include transportation, the preparation of an operations room with the requisite foundation engineering to accommodate the system, and the requisite hydraulic and electrical connections, the electrical installation for the power source of the expansion automat and installation of the signal leads for the IT equipment.

Appropriate use

Sealed water-based heating and cooling systems in which temperature-induced changes in the volume of the system water (the heat transferring agent) can be absorbed and the required operating pressure is governed by a separate expansion automat.

The water-based heating systems are submitted to EN 12828. For temperatures above 105 °C or system capacities over 1 MW additional rules and regulations may apply. The contractor / operator will need to consult with a notified body on additional safety measures. Use in similar systems (e.g. heat transfer systems for process industry or technologically conditioned heat) may require special measures. The complementary documents must be studied.



Receiving goods

The items delivered must be compared against the items listed on the shipping note and inspected for conformity. Unpacking, installation and commissioning may be started only once the product has been checked and seen to conform with the intended use as stated in the order process and contract. In particular, exceeding the permissible operating or design parameters may lead to malfunctioning, component damage and personal injury. If not in line with conformity or if the delivery is incorrect in another way, the product must not be used.

Transportation, storage, unpacking

The equipment is delivered in packing units in conformity with contract specifications or specifications required for certain transportation methods and climate zones. They meet the requirements of the Flamco STAG GmbH packaging guidelines as a bare minimum. In conformity with these guidelines, vessels are shipped horizontally and compressor or pump units upright, each packed on disposable pallets. Accessories or additional equipment can be supplied separately (e.g. compressor unit K-04) or may be shipped together with the vessel. These pallets are suitable for horizontal transportation with suitable fork-lift trucks. The forks must be set to the widest possible outer dimensions in order to prevent the load from tipping over. When moving the article in question, the forks must be in the lowest possible position, with the article at right angles to the forks. If the packages are suitable for lifting gear, they will be marked at the appropriate lifting points. Important note: Transport the packed goods as close as possible to the envisaged set-up location and make sure there is a horizontal, solid surface on which the goods can stand.



Caution: Please take precautions to make sure the vessel, once it has been removed from the pallet and the packaging, does not bottom out, tip over or rock. Suitable lifting lugs are provided for lifting and moving suspended empty vessels prior to installation. Such devices (lifting lugs) must be used in tandem; avoid side-pulling.

Once they have been removed from the pallet and the packaging, separately shipped compressors (K04) must be transferred by pulling them over suitable levelled surfaces. Use methods that prevent uncontrolled falling, sliding or tipping over.

The goods may also be warehoused in their packaging. Once it has been removed from its packaging, the equipment must be put in position, observing standard safety procedures. Do not stack the equipment. Use only permitted lifting gear and safe tools, and wear the required personal protective equipment.

Operations room

Definition: room which meets the applicable European regulations, European and harmonized standards and relevant technical rules and guidelines of the professional associations for this field of application. For the use of the expansion automat as prescribed in this manual these rooms generally contain equipment for thermal generation and distribution, water heating/cooling and top-up, power source and distribution, such as measuring, control engineering, control technology and IT.

Access for unqualified and untrained persons must be restricted or forbidden.

The set-up location of the expansion automat must ensure that the operation, service, maintenance, inspection, repair, installation and dismantling can be carried out unhindered and without danger. The floor of the set-up location for the pressurization unit equipment must be such that stability is guaranteed and maintained. Bear in mind that the maximum possible forces can be exerted from the net mass including the water volume. If stability cannot be guaranteed, there is a danger that the vessel will tip over or move and, as a consequence in addition to functional defects may lead to personal injury. The ambient atmosphere must be free of conductive gases, high concentrations of dust and vapours. There is the risk of explosion if any combustible gases are present.

When the safety valve is opening to prevent overpressure in the vessel and when bladder leakage leads to overflowing at the atmospheric pressure equalization port, system water will be drained off. Depending on the process, the water temperature can rise to 70 °C and, in the case of improper operation exceed 70 °C. This brings a danger of personal injury by burns and/or scalding. Ensure that such water can be drained without danger and that there is a safe drainage option or water collector available to prevent damage from water in the system (consider the impact additives may have on the groundwater!).

Flooded equipment must not be operated. If electrical equipment short circuits, persons or other beings in the water will be electrocuted. Furthermore, there is a danger of malfunction and partial or irreparable damage to individual components due to water saturation and corrosion.

Noise reduction

Installations should be constructed with noise-reduction measures in mind. Especially vibrations of the assembly (pipework) can be dampened by using insulation between contact surfaces.

EMERGENCY-STOP / EMERGENCY-OFF

The EMERGENCY-STOP facility required in line with directive 2006/42/EC is made available by the main power switch on the control unit. This switch separates the electrical conductors and neutral conductors. When additional security measures with EMERGENCY-OFF facility are required according to the operation of the heat generator, these are to be installed on-site.

Personal protective equipment (PPE)

PPE must be used when carrying out potentially dangerous work and other activities (e.g. welding), in order to prevent or minimize the risk of personal injury if other measures cannot be taken. These must comply with the requirements specified by the main contractor or operator of the operations room or the site in question. If no requirements are specified, to operate the automat no PPE is required. Minimum requirements are well-fitting clothing and sturdy, closed and skidproof footwear.

Other services require the protective clothing and equipment necessary for the activity in question (e.g. transport and assembly: well-fitting work clothing, foot protectors [safety shoes with toe caps], head protection [safety helmet], hand protection [protective gloves]; Maintenance, repair and overhaul: well-fitting work clothing, foot protectors, hand protectors, eye/face protector [safety goggles]).

Exceeding permitted pressure / temperature levels

Equipment used in combination with the expansion automat must guarantee that the permitted operating temperature and the permitted medium temperature (heat transfer medium) cannot be exceeded. Excess pressure and temperature may lead to component overload, irreparable damage to components, loss of function and, as a result, to severe personal injury and damage to property. Regular checks/inspections of these safeguards must be carried out.

System water

Water which is non-flammable, does not contain solids or long-fibre components and does not present a danger to operations due to its contents, and will not affect or damage the water bearing components (e.g.: pressurized components, the bladder, vessel connection) of the expansion automat.

System water containing components are pipelines, hoses connected to the vessel and system connections including valves and fittings, and their casings, sensors or the vessel itself including the vessel bladder. Operation with improper media can lead to impaired function, damage to components and, as a consequence, to serious personal injury and damage.

Safeguards

The equipment supplied is equipped with the required safety devices. To test their effectiveness or restore the set-up conditions, the equipment must first be taken out of service. Taking the system out of service implies that power should be cut and hydraulic connections blocked, to prevent accidental or unintentional re-connection.

Mechanical hazards:

Compressor casings and fanwheel casings prevent severe personal damage by turning parts. Before commissioning, check these are fit for purpose and fixed in place. The safety valve that is placed at the compressed air compartment of the vessel ensures that the compressor's maximum volumetric compressed air-flow is discharged when the pressurizing equipment malfunctions. It is not intended to protect against excessive pressure within the heating or cooling installation.

Electrical hazards:

The international protection rating (IP) of electrically-operated components prevents personal injury by electrocution, which can be deadly. The protection rating when equipped with K04 compressors is usually IP54 (5: access with wire impossible, dust protected, 4: protected against splashing water). The protection class for compressors K01- K03 is IP23 (2: protected against touch by finger, foreign body protection from $\varnothing 12.5$; 3: protection against water dripping up to 60° from vertical). The control unit cover, the cover of the compressor, the threaded cable glands and the valve connector plugs must be inspected for effectiveness prior to commissioning. The installed pressure and volume sensors are operated with protective extra-low voltage.

Avoid welding work on additional equipment which is electrically connected to the compressor and control unit. Stray welding current or an improper earth connection could lead to the danger of fire and damage to parts of the automat (e.g. the control unit).



External forces

Avoid any additional forces (e.g.: forces caused by heat expansion, flow oscillations or dead weights on the system connection). These can lead to damage / leakage in water-bearing pipework, loss of stability of the appliance and furthermore to failure connected to substantial material and personal damage.

Inspections prior to commissioning, routine checks

They guarantee operational safety and its observance in line with applicable European regulations, European and harmonized standards and relevant technical rules and guidelines of the professional associations for this field of application. The required inspections must be arranged by the owner or operator; an inspection and maintenance log book for scheduling and traceability of measures taken must be kept.

Inspections to ensure operation

(under the German implementation of Council Directive 89/665/EEC).

Pressure device, Vessel					
Category [Appendix II The Directive 2014/68/EC, Diagram 2]	Vessel Nominal Volume (l.)	Inspection prior to commissioning [§14] Inspector	Routine Inspection [§15 (5)]		
			Timeframe, maximum period [a] / inspector		
			External	Internal*	Strength*
III	400 / 6 bar 5000-10000/ 3 bar	Qualified Person (QP)	Not applicable [§15 (6)]	5 / QP	10 / QP
IV	600-3500/ 6 and 10 bar	Qualified Person (QP)	Not applicable [§15 (6)]	5 / QP	10 / QP
* [§15 (10)] In the case of internal inspections the visual inspection may be replaced by similar procedures and in the case of strength tests the static pressure test may be replaced by similar, non-destructive procedures if said tests would not otherwise be possible due to system design or not significant due to the system mode of operation.					

Electrical equipment inspections, routine inspection

Regardless of the prescriptions of the property insurer / operator it is recommended to inspect demonstrably the electrical equipment of the Flexcon M-K together with the heating or refrigerating installation at least every 18 months (see also DIN EN 60204-1 (2007)).

Maintenance and repair

These services may only be carried out when the system is shut down, or if the expansion automat is not required. The pressurization equipment must be taken out of service and guarded against unintentional re-starting until the maintenance work is finished. Note that the safety circuits and data transmissions made whilst shutting down could trigger the safety chain or lead to false information. Existing instructions for the heating or cooling unit as a whole must be observed. To stop hydraulic components, block the relevant sections and drain them using the safe system water drains through the available drain connections, and relieve the pressure.



Caution: The maximum system water temperature in conducting components (vessel, casings, hoses, pipelines, peripheral equipment) may reach 70°C and, in the case of improper operation, may exceed that. This presents a danger of burns and/or scalding. Temperatures of compressed air containing parts, especially the pressurisation connecting assembly, the compressed air hoses for pressurisation and the function related uncovered parts of the compressor are depending on the duty cycle of the compressor and the working pressure and may exceed 40 °C.

The maximum pressure of system water in conducting components may equal the maximum set pressure for the system safety valve (max. 3, 6 or 10 bar). Use of eye/face protectors is required if the eyes or face could be injured by flying parts or spraying fluids.

To stop electrical equipment (control unit, compressors, valves, peripheral equipment), cut power to the control unit. The power supply must remain off for the period of the work. It is forbidden to alter or use non-original components or replacement parts without authorization. Such acts may result in serious personal injury and endanger operational safety. They will also render any claim for damages against product liability void.

It is recommended to contact the Flamco Technical Sales and Service department to carry out these kind of services (+31 33 2975850 or in the UK: +44 1744 744 744).

Obvious misuse

- Operation at incorrect voltage and/or frequency.
- Use in inappropriate system designs.
- Use of unpermitted installation materials.

Other hazards

- Overload of construction parts by the the occurrence of unexpected extreme values.
- Operational continuity at risk in the case of changed, non-permissible ambient conditions.
- Operational continuity at risk in the case of safety-control parts being taken out of service or malfunctioning.
- Compressed air jets with compressed air compartment couplings of the pressurized vessel.
- Fire hazard: ensure professional fire protection on-site.

5. Product description

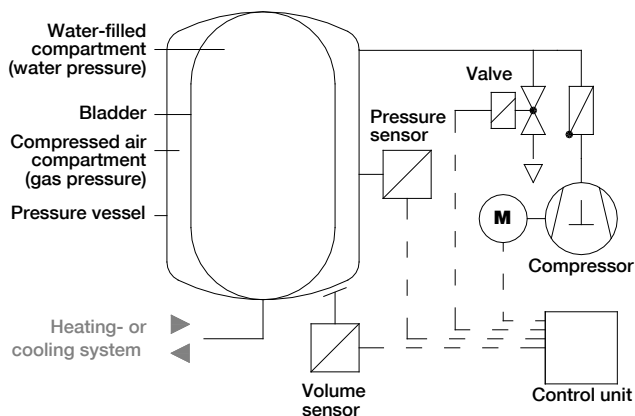
The contents of this manual consist of the specifications for a standard execution. Where appropriate, this includes information on options or other configurations.

If optional extras are supplied, further documentation will be supplied in addition to this manual.

Additional Documentation	
SPC module, volume / pressure analogue	Doc. no. MC00049/11-2010/eng
SPC module, SD-card	Doc. no. MC00050/11-2010/eng
SPC module, RS485, Data protocol	Doc. no. MC00051/11-2010/eng
Wiring diagram SPCx-lw	Doc. no. MC00055/11-2010/eng
SPC module Bus- Koppler LONworks	Doc. no. MC00057/11-2010/eng
Minimum pressure limiter	Doc. no. MC00059/11-2010/eng
Easycontact	Doc. no. MC00060/11-2010/eng


Operating principle


The varying pressure levels due to temperature changes in heating or cooling systems are continuously monitored by the pressure sensor in the compressed air compartment of the vessel. Comparison of these actual pressure levels with a programmable nominal value leads to the triggering of the valve (release of pressure by means of compressed air discharge) in the event of the value being exceeded (temperature rise), and triggering of the compressor (increase of pressure by means of filling the compressed air compartment with compressed air) in the event of the pressure dropping below the nominal level (temperature drop). The volume of water drained or fed in is made available or taken up by the vessel. Continuous comparison of the programmable nominal values with the varying volumes registered by the vessel volume sensor prevents under- or over-filling, whilst allowing volume increase by triggering external top-up devices.




Markings

Name plate - Vessel:

		Flexcon MK/U A 1000	
Capacity (Vol.) (Nom.) (Capacity)		1000 Ltr	
Nominal volume (Nom.) (Volume)		1000 Ltr	
Temperature (Temp.) (Temperatur)		100 °C	
Pressure (Druck) (Druck)		10 bar	
Year of manufacture (Jahr der Herstellung) (Jaar van vervaardiging)		2010	
Serial No. (Serien-Nr.) (Numéro de série)		0000	
Flamco B.V. - Burschelen		www.flamco.com	

		Flamco STAG	
Type: Type: Typ		Flamco STAG GmbH 39307 Genthin GERMANY	
N° de série: Serial-No.: Serien-Nr.		Année de fabrication: Year of manufacture: Herstellungsjahr	
Capacité nominale: Nominal volume: Nominale		litres litres Liter	
Suppression de service admissible: Permissible working overpressure: Zulässiger Betriebsüberdruck		bar	
Suppression d'essai: Test overpressure: Prüfdruck		bar	
Température de service mini. / maxi. admissible: Permissible working temperature min. / max.: Zulässige Betriebstemperatur min. / max.		°C	
		CE 0045	

	SPC - ID no. vessel : A ... Value of nominal volume
	SPC - ID Nr. Behälter : A ... Wert Nenn Volumen
	SPC - ID nr. vat : A ... Waarde van nominale volume
	SPC - récipient no ID : A ... Valeur du volume nominal


Electrical warnings:

Attention, high voltage! Opening by qualified personnel only.
Disconnect the unit from the power supply before opening it.

Achtung, gefährliche Spannung! Nur vom Fachpersonal zu öffnen.
Vor dem Öffnen des Gerätes spannungsfrei schalten.



Warning compressed air pressure:

	Behälter steht unter Druck. Gasdruck bei Auslieferung: 2bar.
	Vessel is under pressure. Gas pressure at delivery: 2bar
	Réservoir sous pression. Gaz à la livraison: 2bar
	Vat onder druk. Gasdruk bij uitlevering: 2bar




Service:


Service Nederland
Tel.: +31(0)33 299 7500
Fax.: +31(0)33 298 6445

Service Germany
Tel.: +49(0)170 630 40 34

Name plate - Pump module:

		Flamco	
Typ: Type: Type		Serien-Nr.: Serial-No.: N° de Série: Volgnummer:	
Flamco STAG GmbH: Berliner Chaussee 29; 39307 Genthin; Germany			
Nennspannung: Nominal voltage: Tension nominale: Nominale spanning:	Zulässige Medientemperatur min. / max.: Permissible media temperature min. / max.: Température de média mini. / maxi. admissible: Toegestane temperatuur media	°C	
Nennstrom: 00,00 A	Zulässiger Betriebsüberdruck: Permissible working overpressure: Surpression de service admissible: Toelaatbare werkdruk	bar	
Nominal current: Courant nominal: Nominale stroom:	Herstellungsjahr: Year of manufacture: Année de fabrication: Jaar van vervaardiging:		
Nennleistung: Nominal power: Puissance assignée: Nominale vermogen:	Zulässige Umgebungstemperatur min. / max.: Permissible ambient temperature min. / max.: Température de ambiante mini. / maxi. admissible: Toelaatbare omgevingstemperatuur min. / max.	°C	
		CE	

Name plate - Control unit:

		Flamco	
Typ: Type: Type		N° de série: Serial-No.: Serien-Nr.:	
Flamco STAG GmbH: Berliner Chaussee 29; 39307 Genthin; Germany			
Année de fabrication: Year of manufacture: Herstellungsjahr	Tension assignée d'emploi: Rated operational voltage: Bemessungsbetriebsspannung	V	
Fréquence: Frequency: Freqenz	Courant de coupure: Out-off current: Vollaststrom	A	
Protection: Degree of protection: Schutzart	Numéro de dessin: Drawing number: Dokumentationsnummer	CE	

Transport seal (volume sensor):



Nach Montage:
Transportsicherung
entfernen.

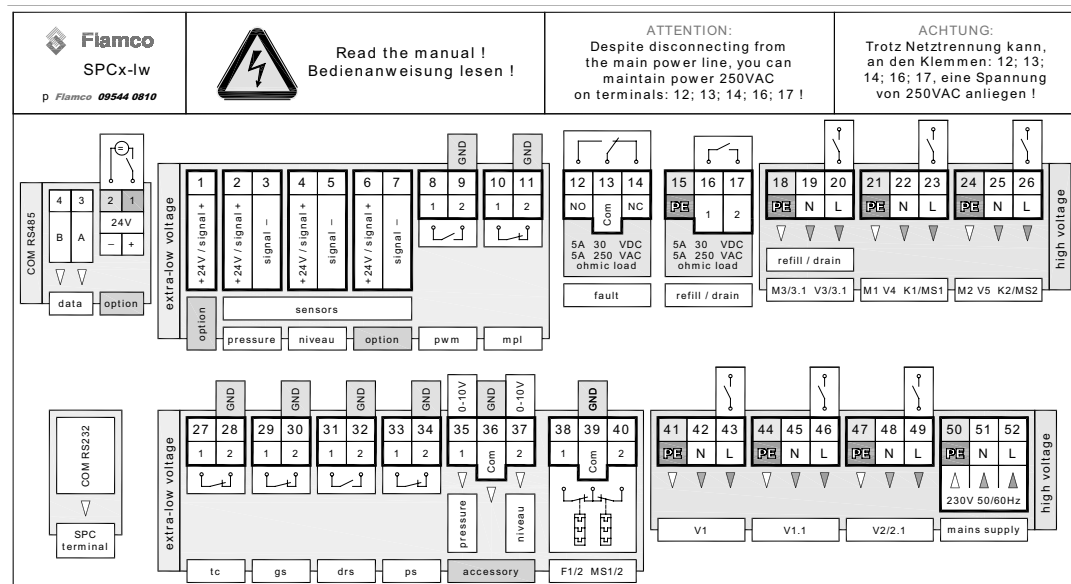
After mounting:
Remove the transport
safety.

Après l'installation:
Retirez la sécurité des
transports.

Na montage:
Verwijder de veiligheid
van het vervoer.



Terminal plan SPCx-lw:



Alphabetic glossary of abbreviations in terminal plan

Note: mentioned switch settings are in current-free, un-switched situation.

accessory	(SPC Extension volume, pressure analog, optional)
COM	COM- interface; serial port
Com	The common port
data	(Data protocol, optional)
drs	(Membrane rupture sensor, optional)
extra low voltage	Protective low voltage
fault	Error message, common failure message. Displayed switch setting is error.
high voltage	Voltage as per markings on the automat
mains supply	Power feed
mpl	(Minimum pressure limiter, optional)
M3/3.1 V3/3.1	Motor 3 (top-up, optional) / 3.1 (drainage, optional); Valve 3 (top-up) / 3.1 (drainage, optional)
M1 V4 K1/MS1	Compressor 1; Valve 4 (pressurization);
M2 V5 K2/MS2	Compressor 2; Valve 5 (pressurization);
niveau	Level, content
ohmic load	Ohmic load, resistance
option	(not applicable)
pressure	Pressure
pwm	(Impulse water meter, optional)
ps	(Pressure switch; Level switch min. level, top-up pump, optional)
refill / drain	Top-up / (drain , optional)
sensors	Sensors
tc	(Temperature switch, optional)
V1; 1.1	Valve 1; 1.1; parallel, Pressurizing valve (Pressure loss)
V2; 2.1	Valve 2; 2.1; Discharge valve (compressor)

Compressor unit ID no.**[1] / [2] - [3] - [4]**

[1] Version	[2] Compressor class, curve range:	[3] Compressor manufacturer	[4] Nom. frequency of the operating voltage [Hz]
MK: Monocompressor	11 (K01; 02)	1	50
MV: Monovalve	31 (K03)	2	60
DK: Dupocompressor	40 (K04)		
DV: Duovalve			

Control unit ID no.**[1] - [2]**

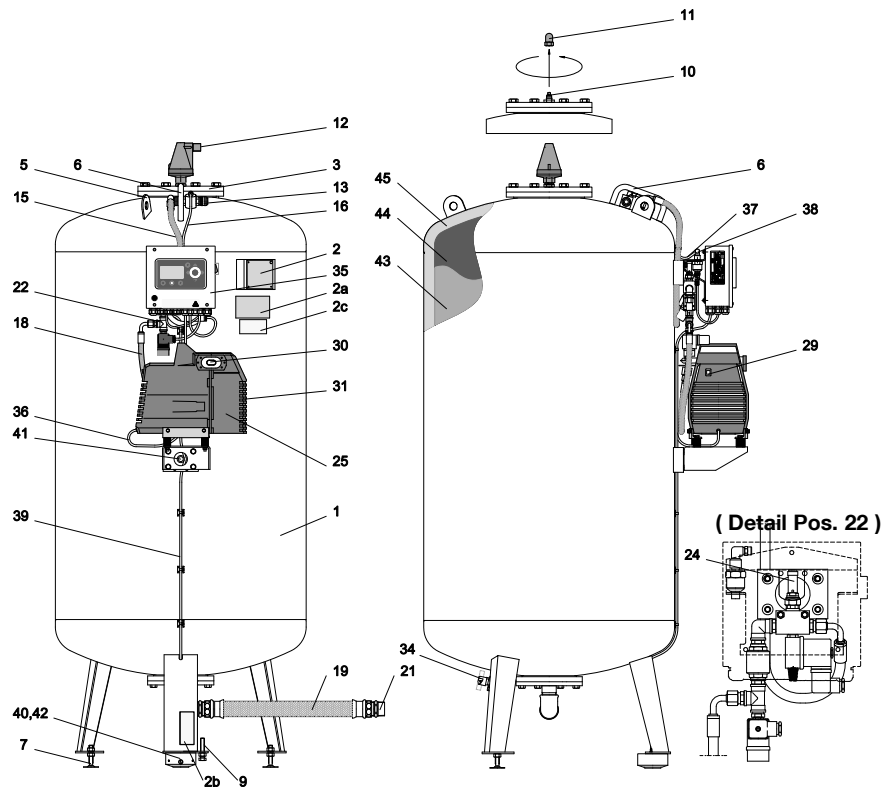
[1] Controller	[2] Casing and execution;
SPCx [x: Hardware version]	
SPCx [x: Hardware version]	lw: low output (Total <=2.2kW)



Overview components

M-K/U / K03

EB



- | | | | |
|----|---|----|---|
| 1 | Basic steel vessel with built-in, exchangeable butyl-rubber bladder for absorption of the expansion water. Exterior corrosion protected, interior untreated (interior coated***) | 23 | Connection assembly pressurisation***, safety valve compressed air compartment compressed air compartment valve 1, pressurisation valve, non-return valve, pressure connection to compressed air compartment, pressure connection to compressor |
| 2 | Vessel name plate | 24 | Safety valve to compressed air compartment |
| 2a | Control unit name plate | 25 | Compressor unit K01 - K03, oil-free |
| 2b | Advice to remove transport seal | 26 | Second compressor unit K01 - K03, oil-free |
| 2c | Pressurisation warning | 27 | Compressor unit K04, oil-free |
| 3 | Inspection opening | 28 | Second compressor unit K04, oil-free |
| 4 | Inspection opening M-K/U 6500-10000 | 29 | Compressor thermal protection, manual reset |
| 5 | Lifting hook, load suspension for transport | 30 | Intake opening compressor |
| 6 | Anti-collision protection (compressed air connections) | 31 | Cooling air inlet compressor |
| 7 | Foot-height adjuster | 32 | Ball valve vessel drain |
| 8 | Foot pressure plate M-K/U 5000-10000 | 33 | Ball valve system connection |
| 9 | Adjusting screw (transport seal volume sensor, removal) | 34 | Ball valve condensate drain |
| 10 | Bleed valve | 35 | Control unit SPCx-lw |
| 11 | Cover nut (anti-collision protection for bleed valve) | 36 | Power cable compressor 1, 2**)k* |
| 12 | Float vent** | 37 | Signal wire pressure sensor (SELV) |
| 13 | quick-release coupling, connector | 38 | Pressure sensor |
| 14 | Pressure hose, flexible, couplings both sides, length 3000 mm** | 39 | Signal wire volume sensor (SELV) |
| 15 | Pressure hose, flexible, to compressed air compartment of vessel | 40 | Volume sensor |
| 16 | Pressure hose, flexible, to pressure sensor | 41 | Bladder rupture sensor** |
| 17 | Pressure hose, flexible, to safety valve, M-K 400-3500 | 42 | Transport seal pressure sensor |
| 18 | Pressure hose, flexible, to compressor 1; 2**)k* | 43 | Water compartment (expansion water) |
| 19 | Pressure hose, flexible, to system connection, M-K/U 400-10000 | 44 | Bladder |
| 20 | System connection M-K, angle 90° 400-3500 l | 45 | Compressed air compartment |
| 21 | System connection M-K/U | | |
| 22 | Connection assembly pressurisation, safety valve compressed air compartment compressed air compartment valve 1 (1.1***), discharge valve 2; 2.1**)k*, non-return valve 1; 2**)k*, pressure connection to compressed air compartment, pressure connection to compressor 1; 2)k* | | |

** accessory, optional extra

*** available as special model

)k* second compressor unit

SELV: Safety Extra-Low Voltage design
(Safety Extra-Low Voltage)

M-K/U: Main vessel

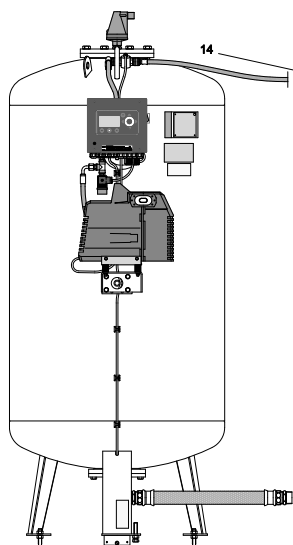
M-K: Auxilliary vessel

EB: single operation

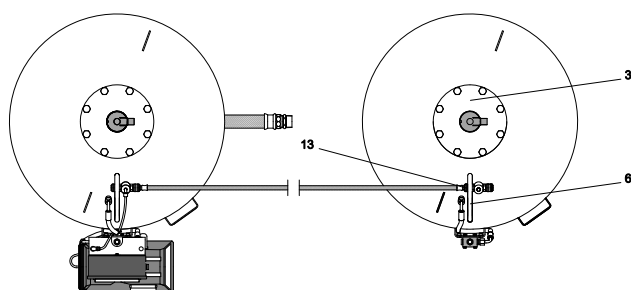
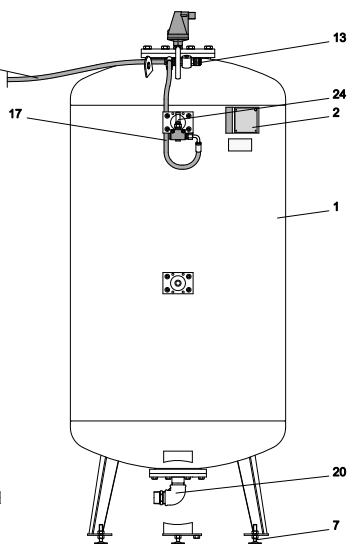
WB: automatic changeover

BL: load dependant operation

M-K/U / K03
EB

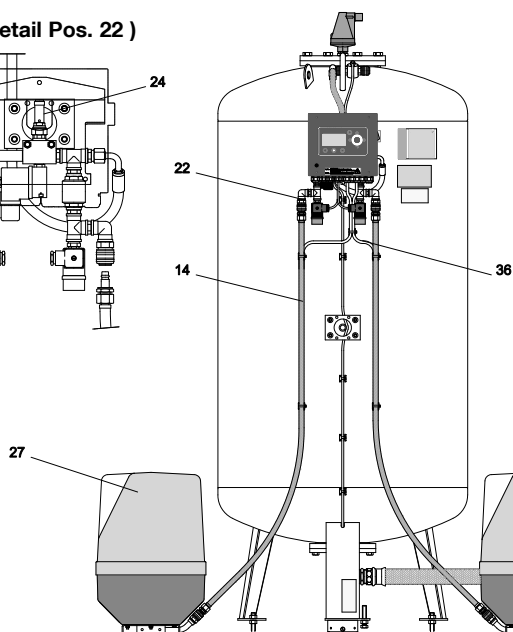
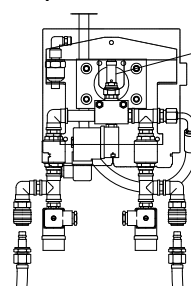


M-K

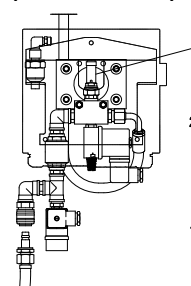


M-K/U / K04 jk*
WB / BL

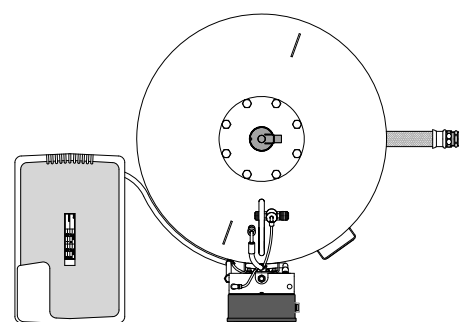
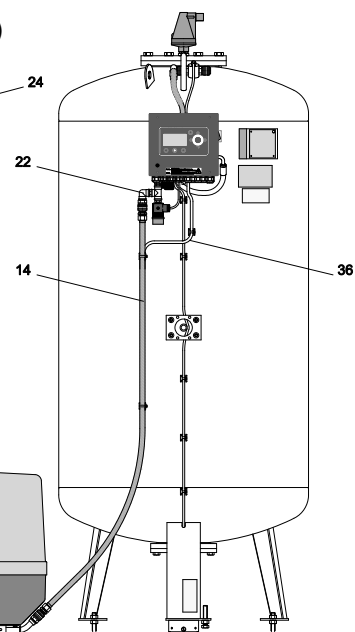
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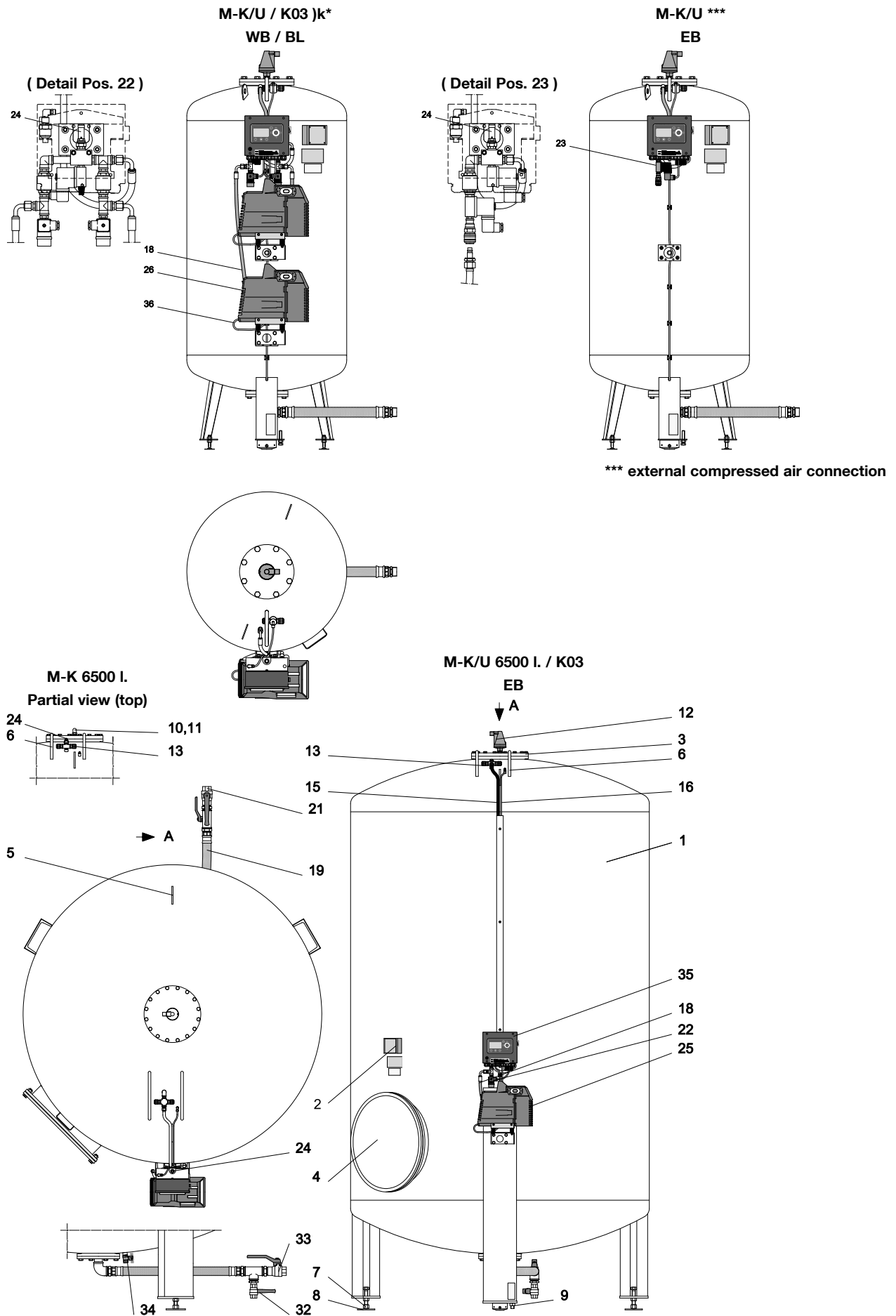
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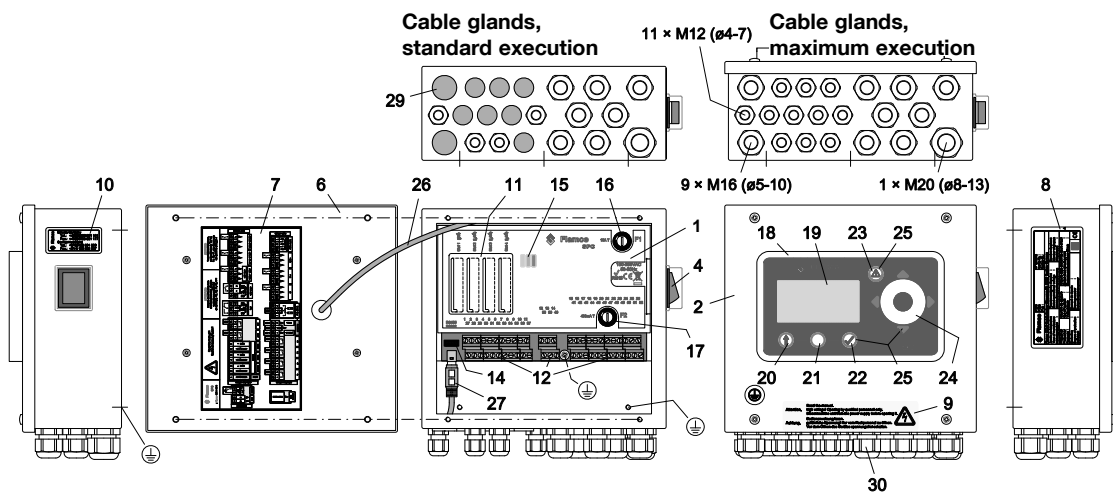
M-K/U / K04
EB



See page 11 for names of positions.



SPCx-lw

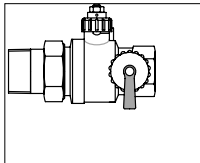


- | | | | |
|----|---|--|---|
| 1 | Control unit SPCx | | |
| 2 | Control unit SPCx-lw | | |
| 4 | Main power switch L, N; On: "Red light" | | |
| 6 | Control unit cover open, inside view | | |
| 7 | Terminal port diagram (see terminal plan) | | |
| 8 | Name plate control unit | | |
| 9 | Electrical warnings | | |
| 10 | Service connection information | | |
| 11 | Port slots, Slot 1 - 4 (SPC Extension, optional)
(Openings for extra modules can be recovered via
breaking point) | | |
| 12 | Screw terminals I/O ports (see SPCx-lw terminal plan) | | |
| 14 | RS485 serial port connector (data protocol, optional) | | |
| 15 | LED warning lights, back lit * | | |
| | LED, yellow on: Automatic mode off; controller is in confi-
guration mode or comissioning menu not completed. | | |
| | LED, green on: The terminal is on; the SPC is connected
to the SPC terminal | | |
| | LED, red on: system error, identical to pos. 23 | | |
| 16 | Microfuse F1; 16A T; equipment protection | | |
| 17 | Microfuse F2; 400 mA T; additional equipment | | |
| | | | protection Valve 1; 1.1; 2; (output port no.: 42; 43 / 45;46
/ 48; 49) |
| 18 | SPC Terminal (display and operating panel) | | |
| 19 | Graphic display with back light
(dimmer in energy-saving mode) | | |
| 20 | Sensor button: "Back" or functions as shown in the dis-
play. | | |
| 21 | Sensor button, unlock key functions
at information in display
or service connection by display marking | | |
| 22 | Sensor button: "Confirmed...Enter" | | |
| 23 | Sensor button: "Error call" | | |
| 24 | Sensor slider, selector | | |
| 25 | Back light on when key function is ready | | |
| 26 | SPC terminal feed wire | | |
| 27 | RS232 port, SPC terminal | | |
| 29 | Cap plugs, threaded cable gland mounting holes | | |
| 30 | Threaded cable glands | | |

* additional indicators (analysis).



6. Installation



Ball valve

Set up

- Remove the transport seal by the capacity sensor once the basic vessel has been erected in the proposed place and no further positional changes are necessary. Try not to strike this sensor and make sure the sensor is on a surface which does not impair the function of the sensor pressure-pad.
- Using the foot-height adjuster, adjust the vessel until it is vertical. Use two vertical magnetic spirit levels.
- Ensure that no external forces can be exerted on the basic vessel (e.g. tools laid on the vessel, things leaning on the sides).
- Do not fix the basic vessel to the ground on which it is erected (do not use any sort of fastening which can adversely affect the vessel, e.g. sinking the feet into concrete or lime, welding on the vessel or its feet, clamps and ties on the body of the structure or appurtenances).
- Place the main vessel and the auxilliary vessel at the same height.

Advice:

- **If the vessels are at different levels:** the volume sensor reading will not be the actual volume in the vessel. As a consequence, error messages, regardless of the actual (sufficient) water level in the vessel, may impair the system's ability to maintain pressure.

System connection

The system connection should be connected to the heating or cooling system.

Appendix 1 shows the installation diagram and example installation.

Please observe the following specifications before filling and commissioning the pressure-expansion automat:

- The connection should preferably be made in the return flow of the heating or cooling system. Please note that a temperature at the system connection $> 70^{\circ}\text{C}$ would exceed the permissible bladder load and possibly lead to damage to components. (Complete insulation of the expansion lines may increase the temperature load on the bladder).
- Ensure that the connection from the main vessel to the system is made only by using the flexible pressure hose that has been supplied with the vessel.
- Make sure that this connection is made solely with the heat/cool generator, and that there are no external hydraulic pressure influences present at the point of entrainment (e.g. hydraulic balancers, distributors).
- Use sealant and pipework relevant to the installation; however, please observe at least the maximum permitted volumetric flow, pressure and temperature values for the expansion line in question.
- Fit isolating equipment in the immediate vicinity of the vesselconnection to the system that cannot be closed unintentionally and preferably includes a fill and drain valve for the water compartments of the vessel. If this equipment is missing, install this additionally.
- When several vessels are placed in a pressure maintenance system, an extra ball valve is required at the expansion line before the connection to the main return line. It is recommended to seal this valve to protect against unintentional closing.
- The nominal diameters of the expansion line (supply or return connection from one or more vessels to the main return line) are to be chosen depending on the installed equipment and the distance to the main return line.

Pay attention to these recommendations based on practical experience:



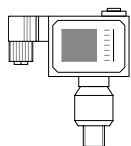
- **Hint:** install expansion lines as short as possible and as flow-efficient as possible.

Single vessel automat	
Length of expansion line	DN of the expansion line, in relation to the vessel connection
> 5 m	Two sizes bigger as vessel connection
> 15 m or > 8 m with 3 pipe bends	Three sizes bigger as vessel connection
> 22 m or > 15m	To be determined from actual values
> 30 m	Avoid at all times!

Install combinations of multiple vessels with the shortest possible distance between each system connection of the vessels (minimum required spaces for service and repair). Construct a collecting main as follows:

Multiple vessels automat	
No. of main and auxiliary vessels	DN of the expansion line, in relation to the vessel connection
up to 3	Four sizes bigger as single vessel connection
4 to 6	Six sizes bigger as single vessel connection

Overview of pipe sizes			
DN	Ø mm	Inch [PN 16]	Vessel volume [Litres]
32	42.4	1 ¼	400 - 1000
40	48.3	1 ½	1200 - 1600
			5000 - 10000
50	60.3	2	2000
65	76.1	2 ½	2800 - 3500
80	88.9	3	
100	114.3	4	
125	139.7		
150	168.3		
200	219.1		
250	273.0		



Min. pressure limiter

The vessels should preferably be positioned symmetrically or the nominal diameter of the connection lines should be increased (Example order: M-K > M-K/U < M-K; M-K > M-K/U - M-K/U < M-K. Ideal: positioning in polygon). For the return line the same guidelines apply as for expansion lines.

- Systems with flow temperatures > 100 °C may require a minimum pressure limiter.



Caution: close the ball valve at system flow.

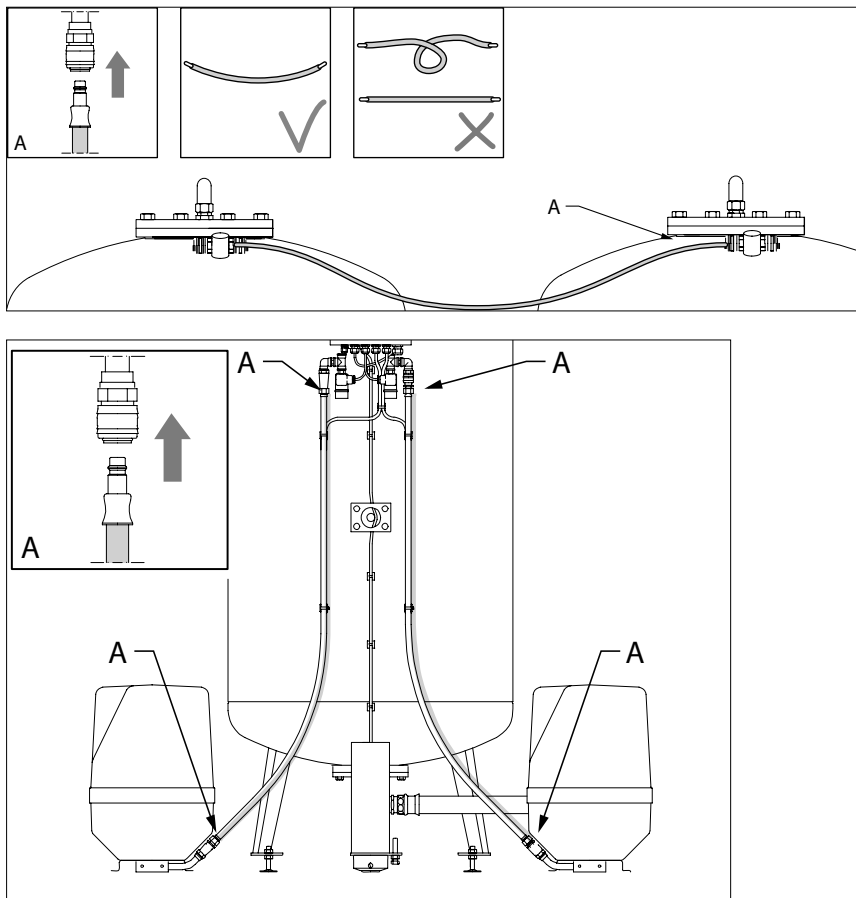


Gas compartment connection

Installations of one or more main vessels with one or more auxilliary vessels with combined pressure control and/or floor-standing compressors** at the automat require a gas compartment connection to be constructed on-site. For this purpose plug the pressure hose connection (lock in place)** into the connection-adapters mounted on the equipment. Plugging the connecting plug (pressure hose connection) into the adapter (quick-release coupling) opens the gas compartment. Disconnecting automatically closes the gas compartment (connecting examples: see equipment). Arrange hoses in such a way, that constrictions are avoided at all times.



Caution: compressed air jet. Note that if pressure hoses are connected or disconnected at one side this can lead to air being discharged (pressure loss). At the same time the discharge pressure in standard supply situations is up to 2 bar or it corresponds to the system pressure in the case of separately ordered optional extras. Do not point the compressed air jet at anybody! When discharging compressed air, unrestrained hoses make uncontrolled whipping movements and can lead to injuries.



** optional accessory.

Electrical installation

The provision of power supply, (protective) ground wire connection and line protection has to be made according to regulations of the responsible power company and the applicable standards. Required data can be found on the name plate of the control unit, the terminal plan (markings) and Appendix 3.

The connection to the power supply should be made through a CEE plug / socket combination with load switch. It should be a snap-on type, to avoid unintended disconnections. This power connection should be marked accordingly, easy to handle and placed appropriately in the vicinity of the automat.

Advice: install the potential equalization between earth connection and potential equalization conductor. The minimum diameter, quality and type of the power cables should apply to the on-site applicable rules and regulations for this application. Electrical power cable should be guides along cable gutters at all times.

The finished electronic installation allows the user to program the configuration and system-dependent parameters into the control unit.

7. Commissioning

First-time commissioning

- Document the commissioning procedure (actions and settings).
- Check that all the installation and other actions prior to use have been carried out in full (e.g. power supply available and connected, functioning or active fuses, seal tightness of the equipment, transport protection of the volume sensor removed).

Caution: Ensure that the basic vessel is not filled until all the commissioning measures have been completed.

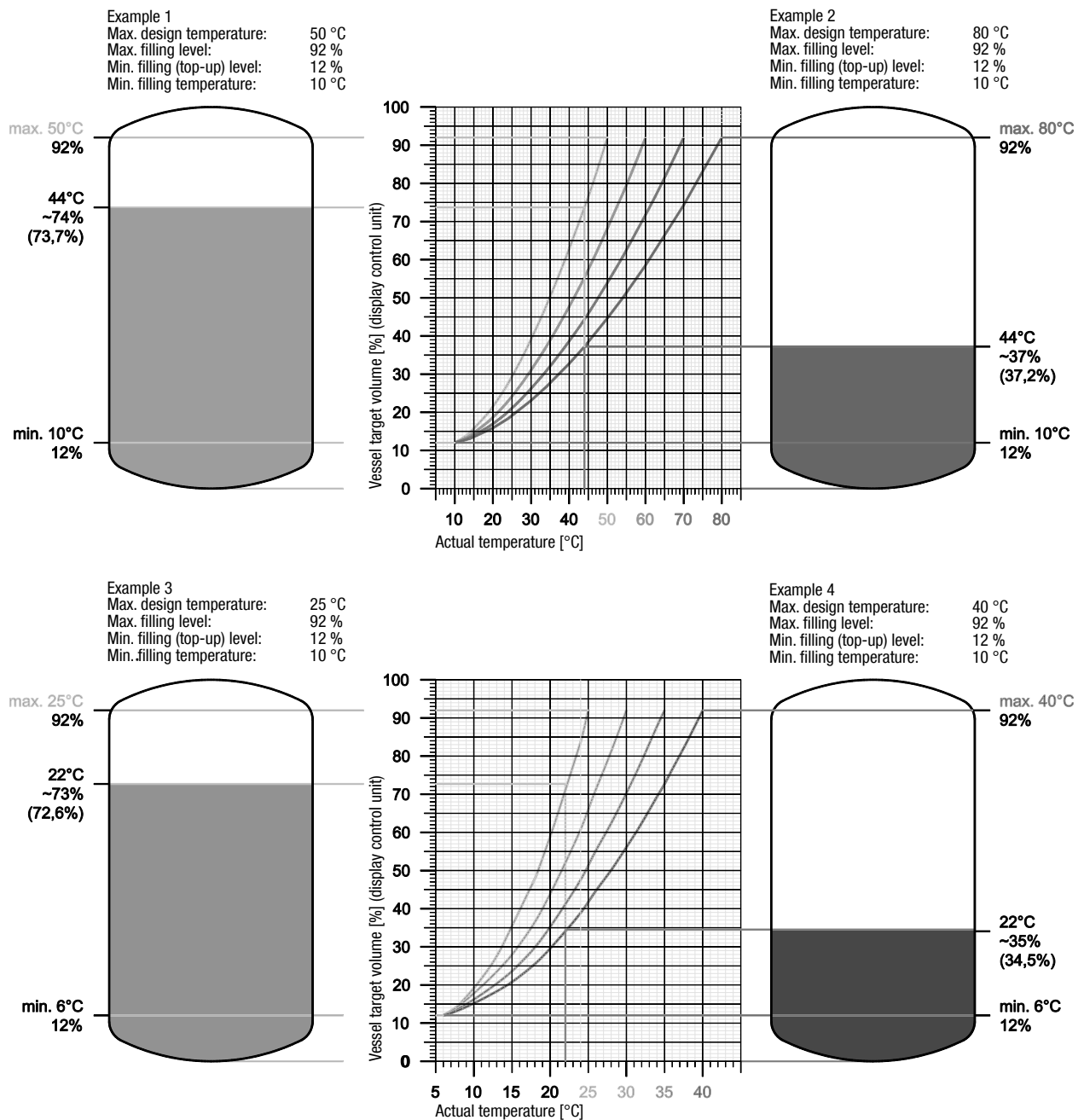
- Fill and de-aerate the heating or cooling system (**not the vessel!**)
- Check the operational readiness of the top-up line.
- Open the valve at the top-up connection.
- Switch ON the control unit and run the start menu procedure see: Overview of menu entries, lines 9 .. 9-9).
- This startup procedure is followed by switching ON the top-up unit (optional, see installation example with FlamcoFill PE).
- In other cases the main vessel or all vessels are to be filled with a minimum water supply. The amount of water to be filled should be around 20% of the vessel's volume based on practical experience. This value covers water losses and decreased filling levels caused by deaeration during operation. (Note the pressure difference between the available compressed air pressure and the flow pressure of the filling equipment! see also instructions for re-filling).
- Open the ball valve on the cold-leg entrainment (system connection).
- Seal the ball valve (open position).
- The completion of all the tasks to be carried out, the review of technical data, recommendations and explanations in this manual lead to the pressure expansion automat being ready for operation.



Commissioning, volume level and operating temperature

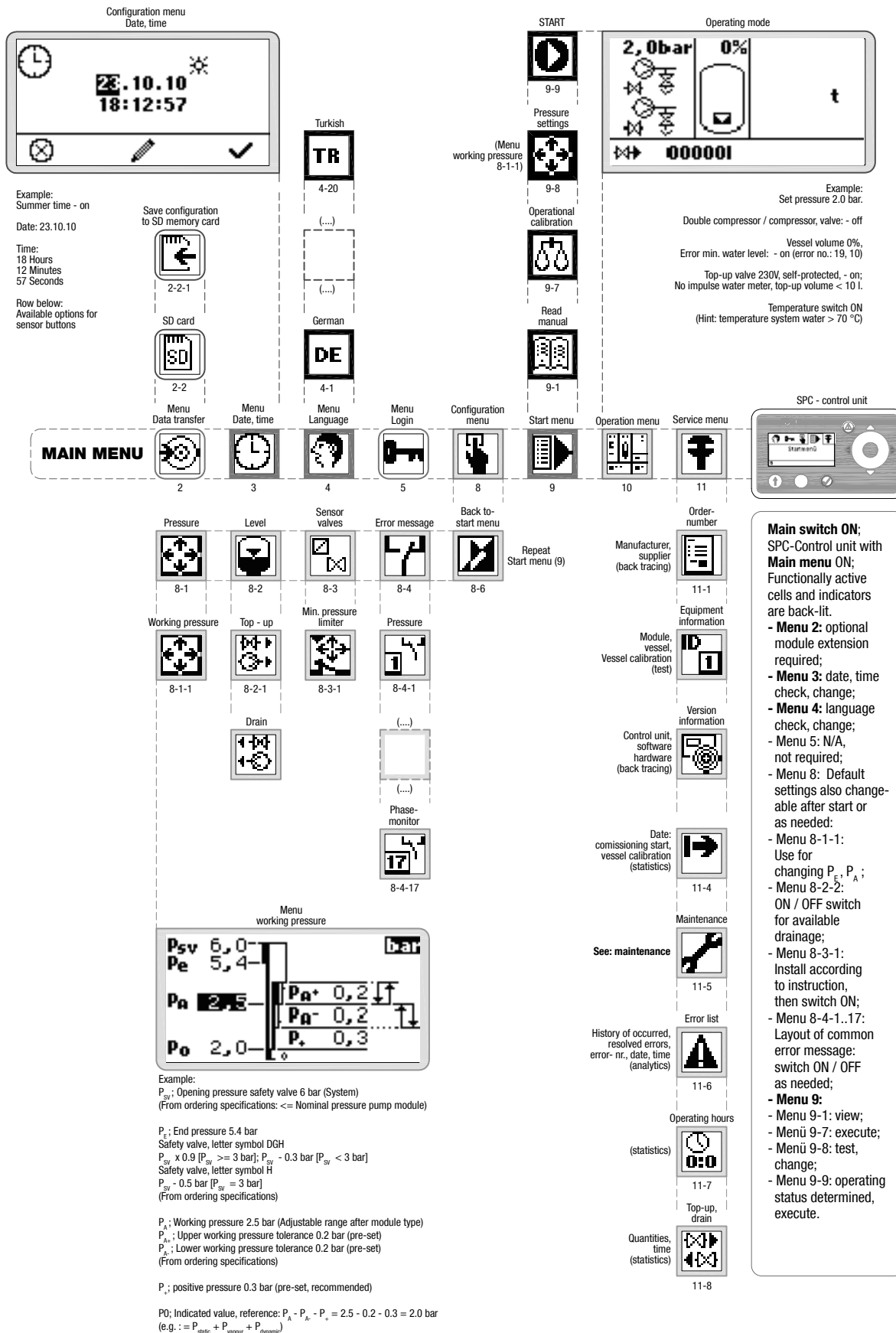


Advice: If a different volume level is required than the self-established minimum level after start (operational ready and installed top-up), the vessel should be filled according to the minimum required level needed for the actual system temperature, after completing the commissioning procedure on the control unit. For better understanding study the diagram below and the paragraph on maintenance, vessel draining and re-filling later in this document.



Control unit, commissioning

Overview menu options





Clarification of menu icons



Unlocking of key functions required
(auto-lock follows 10 minutes after last key stroke).
Unlock by holding the middle button until the energy
bar reaches the top.



Error when saving, data loss (» Service).



Wait for evaluation to finish.



No value stabilization during vessel volume
calibration (check for external forces affecting the
vessel, repeat vessel level calibration).



No input / output signal for volume sensor detected
(check volume sensor wiring connections).



Commissioning by Flamco
service engineer required.



Entry confirmed.



Entry cancelled, not applicable,
edit range exceeded.



Commissioning by Flamco
sales representative required

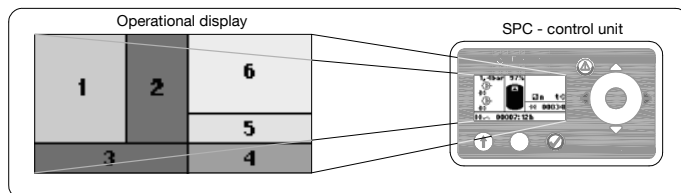


Vessel volume calibration with value above upper
range limit (empty vessel, check for external forces
affecting the vessel, level the vessel,
repeat vessel level calibration).



Vessel volume calibration with value below lower
range limit (check for external forces affecting the
vessel, level the vessel, repeat vessel level
calibration).

Operating menu, options for configuration



	<p>2,5bar (Over-) pressure, read out at pressure sensor (example)</p> <p>Compressor</p> <p>Compressor, ON (pressure ↑)</p> <p>Compressor, discharge connection opened, Pressure connection closed (no non-return valve)</p> <p>Compressor ON; discharge connection closed, pressure connection opened (pressure ↑)</p> <p>Compressor; discharge valve opened</p> <p>Compressor, ON; discharge valve closed (pressure ↑)</p> <p>Pressurisation valve</p> <p>Pressurisation valve ON (pressure ↓)</p> <p>Pressurisation valve (external compressed air source)</p> <p>Pressurisation valve ON</p>
	<p>12 % Vessel volume, read out (example)</p> <p>Vessel-volume, visual</p> <p>Min. filling level ON [Error- Nr.: 19; 10]</p> <p>Max. filling level ON [Error- Nr.: 11]</p>
	<p>Top-up, self monitored</p> <p>Valve, 230V 1~</p> <p>Valve, potential-free</p> <p>Pumpe, 230V 1~</p> <p>Valve, 230V 1~ ON</p> <p>Valve, potential-free, ON</p> <p>Pumpe, 230V 1~ ON</p> <p>[Possible errors: error-no.: 14; 18; 22- 27]</p> <p>Top-up, externally monitored</p> <p>Signal, 230V 1~</p> <p>Signal, potential-free</p> <p>Signal, 230V 1~ ON</p> <p>Signal, potential-free, ON</p> <p>[Possible consecutive errors: error-no.: 19; 8; 10]</p> <p>Indicated value of top-up in [hours] : [minutes] with impulse water meter in [litres].</p>
	<p> Water treatment, remaining volume of conditioned water in litres, (Top-up with pulse water meter required)</p> <p>Value 0: conditioned water used up [possible error: error-no.: 55]</p>
	<p>Drainage, self-monitored</p> <p>Valve, 230V 1~</p> <p>Valve, potential-free</p> <p>Pumpe, 230V 1~</p> <p>Valve, 230V 1~ ON</p> <p>Valve, potential-free, ON</p> <p>Pumpe, 230V 1~ ON</p> <p>[Possible errors: error-no.: 28; 29; 11]</p> <p>Drainage, externally monitored</p> <p>Signal, 230V 1~</p> <p>Signal, potential-free</p> <p>Signal, 230V 1~ ON</p> <p>Signal, potential-free, ON</p> <p>[Possible consecutive error: error-no.: 11]</p> <p>Indicated value of drainage with impulse water meter in [litres].</p>
	<p>m Maintenance mode ON (Default: ON, when pumps have not been activated within a period of 14 days)</p> <p>t Temperature limiter ON, (system water > 70 °C) [Possible error: No. 21] (optional)</p>



Error messages

Procedures and values for error identification, evaluation and output have been tried in practice, prevent secondary failures and invite user awareness. Please note that incorrect set-up conditions can lead to repeated errors and inhibit the intended use. Examples of incorrect set-up conditions are: incorrect or no longer applicable design, outdated equipment, incorrect installation and inadmissible operational parameters.

Common failure message Menu line Nr.	Error, Name [Cause; effect / measure]	Default setting	Value	Error Code
-	Voltage spike sensor (short circuit)	ON		1
-	Pressure sensor > 20mA	ON		2
	<i>Signal out of sensor range or short circuit, no pressure read-out; ball valve in cold-leg connection in incorrect position / Check electrical installation, threaded round connector, sensor range (4-20mA; 16bar), cold-leg connection, change sensor if necessary » service; Error off: self-resetting when error resolved.</i>			
-	Pressure sensor < 4mA	ON		3
	<i>Signal below sensor range or not connected, no pressure read-out / Check electrical installation, threaded round connector, sensor range (4 -20 mA; 16 bar), change sensor if necessary » service; Error off: self-resetting when error resolved.</i>			
-	Volume sensor > 20mA	ON		4
	<i>Signal out of sensor range or short circuit, no volume readout / Check electronic installation, threaded round connection or sensor range (FSI 1: 150-300; 2: 400-800; 3: 1000-2000; 4: 2500-5000; 5: 6500-10000), change sensor if necessary» service; Error OFF: self-resetting when error resolved.</i>			
	Volume sensor < 4mA	ON		5
	<i>Signal out of sensor range or not connected, no volume read-out/ Check electrical installation, threaded round connector or sensor range; change sensor if necessary» service; Error OFF: self-resetting when error resolved.</i>			
8-4- 1	Pressure	OFF		
	<i>Minimum working pressure ON (actual pressure): Default setting has been reached or not achieved; Ball valve in vessel or cold-leg connection in incorrect position, insufficient capacity of compressors, improper system layout, or as consequence of error-no. : 10-16; 15-17; 19; 20; 22-27 / Check system lay-out, electronic installation, compressors, valve 2; 2.1, leaks in the equipment and system and ball valve; insufficient capacity diagnosed » service; Error OFF: self-resetting when error resolved.</i>		$P_A - P_{A-} - 0,3 \text{ bar}$	8
	<i>Maximum working pressure ON (actual pressure): Default setting has been reached or exceeded; Ball valve in cold-leg connection in incorrect position, improper system layout, or as consequence of error-no. : 11; 20 / Check system lay-out, electronic installation, Valve 1; 1.1, valve silencer, cold-leg connection, ball valve; if necessary » service; Error OFF: self-resetting when error resolved.</i>		$P_A - P_{A+} + 0,3 \text{ bar}$	9
8-4- 2	Vessel volume	OFF		
	<i>Minimum vessel volume ON: Default setting has been reached or not achieved; Compressor 1; 2 (valve 4,5) is turned OFF; with top-up feature installed top-up is ON (rising level starting at 0%)/ See error-no.: 19; Error OFF: self-resetting when error resolved.</i>		5 %	10
	<i>Minimum vessel filling volume ON: Default setting has been reached or not achieved; Compressor 1; 2 (valve 4, 5) is turned OFF, no pressurisation; May be followed by error-no.: 8; Execution without top-up feature, insufficient initial filling or as consequence of error-no. : 22-27 / Check top-up functioning, leaks in equipment, system lay-out; if necessary re-fill manually, beware of error-no: 11 ! Error OFF: self-resetting when error resolved.</i>		6 %	19

Common failure message Menu line Nr.	Error, Name [Cause; effect / measure]	Default setting	Value	Error Code
	Maximum vessel filling volume ON: Default setting has been reached or exceeded; Valves 1; 2 (3 is OFF) are switched OFF, Compressors 1; 2 (valve 4,5) are not switched ON; no pressure increase or decrease; error-no.: (8) 9 can be consecutive error; improper system lay-out of initial filling / Check functioning of valves 1; 2; 3; check valve, re-calculate expansion volume, drain system water (beware of error-no.: 19); Error OFF, when error is resolved and reset.		96 %	11
8-4- 3	Bladder rupture (optional)	OFF		
	Bladder rupture sensor ON: Water at electrodes of conductive sensors; Compressors 1; 2 and valves 1; 2; 3 (4; 5) are switched OFF, no pressure increase / decrease or top-up; Error-no.: 8; 9 can be consecutive errors; Suspected bladder rupture / open condensate drain valve. If the opening results in water discharging continuously, the bladder should be visually checked for ruptures and leaks (Advice: inspect the vessel internally, which is part of the routine vessel inspection), clean the inside of the vessel, if necessary » service; Error OFF, when error is resolved and reset.			20
8-4- 4	Level top-up pump (optional)	OFF		
	Minimum volume level top-up pump ON: Break tank of top-up unit with insufficient volume level; Top-up pump is turned off, no top-up function, feed pressure is too low, feed-valve with insufficient flow rate, may be followed by error-no.: 8; 10; 19 / Check feed conditions; Error OFF: self-resetting when error resolved.			18
8-4- 5	Minimum pressure limiter (optional)	OFF		
	Minimum pressure limiter ON: The default setting at pressure limiter has been reached (limiter has opened); compressors 1; 2 and valves 1; 1.1; 2; 2.1;3 (4; 5) are switched OFF (further pressure decrease will lead to vapour build-up in the installation) / Check functioning of valves 1; 1.1 and check valve, check equipment and installation for leaks (Error-no.: 8 is ON); Error OFF, when error resolved (limiter reset) and reset.			17
8-4- 7	Motor runtime	OFF		
	Motor runtime of Compressor 1 exceeded: Default value has been reached or exceeded; suspected leakage in equipment or system, insufficient pump capacity, ball valve in vessel or cold-leg connection in incorrect position, improper system lay-out; may be followed by error-no.: 8 / Check system lay-out, electronic installation, compressors, leaks in equipment and installation, ball valves; insufficient pump capacity diagnosed, » Service; Error OFF, when error is resolved and reset.		30 Minutes	15
	Motor runtime of Compressor 2 exceeded: (see error-no.: 15)		30 Minutes	16
8-4- 8	Motor-circuit switch	OFF		
	SPCx-lw: No current signal to motor ON Motor 1 SPCx-lw: current-value is not reached, the temperature safety switch of the motor has been triggered due to elevated working temperatures, limiter has opened, (winding fault, power or temperature overload, no motor ventilation, Exception: the power supply installation of the motor is after signal „motor ON“ not available or disconnected), may be followed by error-no. 8 / Ensure that medium and ambient temperature (module) are within admissible ranges, if necessary supply sufficient ventilation; Check electronic installation, at recurring error » service; K01...03 (11...31) Manual reset pos. 29 (Page 11); Error OFF, when error is resolved and reset		...<0,0 A	12
	Motor 2 (see error-no.: 12)			13
	SPCx-lw: no current value after signal Motor ON		... <0,0 A	



Common failure message Menu line Nr.	Error, Name [Cause; effect / measure]	Default setting	Value	Error Code
	Motor 3; 3.1 (top-up, drainage, optional) (see error-no.: 12)			14
8-4- 9	Top-up (optional) <i>Top-up amount too low (pulse water meter, optional) No pulse from pulse water meter after top-up request; Valve 3, Motor 3 are switched OFF, feed pressure too low, valves in incorrect position or not functioning properly, motor 3 with insufficient pump capacity; Exception: signal leads not installed or otherwise missing, water meter not functioning properly / Check electronic installation, component functioning, restore feed conditions; Error OFF, when error is resolved and reset.</i>	OFF		22
	Uncalled-for top-up (pulse water meter, optional) <i>Pulse received from pulse water meter without request for top-up, valve 3, motor 3 are switched OFF; Equipment in in flow direction after the water meter or valve 3 is leaking or fails to close (incorrect flow direction due to non-return valve blocking) / Check functioning and leaks in the equipment; Error OFF, when error is resolved and reset.</i>			23
	<i>Minimum cycle distance exceeded</i>			24
	<i>Maximum no. of cycles per timeframe exceeded.</i>			25
	<i>Maximum top-up cycle amount exceeded (pulse water meter, optional)</i>			26
	<i>Maximum top-up cycle time exceeded</i>			27
8-4- 10	Draining (optional) <i>Draining amount too low (pulse water meter, optional). No pulse from pulse water meter after draining request; valve 3.1, Motor 3.1 are switched OFF, feed pressure too low, valve in incorrect position or not functioning properly, motor 3.1 with insufficient or defective pump capacity; Exception: signal leads not installed or otherwise missing, water meter not functioning properly / Check electronic installation, component functioning, restore drain conditions; Error OFF, when error is resolved and reset.</i>	OFF		28
	<i>Uncalled-for draining (pulse water meter, optional) Pulse to pulse water meter without request for draining; valve 3.1, motor 3.1 switched OFF; equipment may leak in flow direction after the water meter or valve 3.1 fails to close (incorrect flow direction due to non-return valve being blocked) / Check component functioning, leaks in the equipment; Error OFF, when error is resolved and reset.</i>			29
8-4- 11	Conditioning (optional) <i>Amount of additive in conditioning exceeded</i>	OFF		55
8-4- 12	Service 1 <i>Carry out service 1 (equipment service)</i>	OFF	365d	56
8-4- 13	Service 2 <i>Carry out service 2 (inspect vessel internally)</i>	OFF	1825d	57
8-4- 14	Service 3 <i>Carry out service 3 (strength test vessel)</i>	OFF	3650d	58
8-4- 15	Service 4 <i>Carry out service 4 (routine test electronic installation)</i>	OFF	584d	59
8-4- 16	Date, time invalid <i>Backup power for date, time is too small, not available or incorrect line entry of these data / Redo or complete entry or when after complete entry error recurs » service; Error OFF: self-resetting when error resolved.</i>	OFF		53

Restarting

After long periods of downtime:

- If this downtime was planned or scheduled, turn OFF the control unit and close off the ball valve to the system and the isolating valve to the top-up line. After that decompress the vessel and then drain the water compartment. We recommend you carry out maintenance before restarting.
- Use the commissioning records for restarting and check especially for system changes that lead to other operating conditions of the expansion automat (e.g. working pressure).

If the power supply has failed:

- The target parameters and default settings for pressure, aeration and top-up will remain unchanged, meaning automatic operation will resume automatically when power is restored (power on). Extraordinary system operating conditions (e.g. cooling to below the default setting) may fall outside the permitted settings of the expansion vessel.

Caution: please ensure that when the system cools down or warms up, the minimum or maximum system pressure does not exceed or fall below the permitted operating pressure. Under- and over-pressure safety for operation of heating or cooling systems are not within the standard scope of supply with the Flexcon M-K.

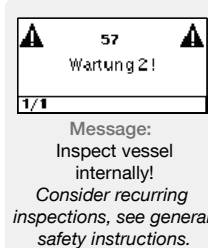
Check the automat's operation once power supply has been restored and, if necessary, set the actual date and time values (overview menu options).

8. Maintenance

The following additional or in the project pre-defined maintenance is to be carried out:

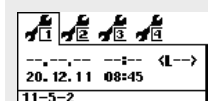
Service interval	Component, Standard scope of supply	Service activities, measures
Recommended: Monthly during peak sytem demand; every two months in off-peak sytem demand	Compressor, oil-free 25-28)*	Clean filter element, filter casing, air inlet; Dry installation required!)a
	Main vessel 1)*, Auxilliary vessel)*	Drain condensate [34]*;)a Deaerate water compartment [10]*;)b
)a: This procedure may be required due to special or temporary ambient conditions.)b: To be conducted especially after initial fillings (not applicable when a float vent [12]* is installed). When during repeated checks show that the above mentioned measures were not necessary, they are to be conducted at least annually.		
Annually	Control unit 35)*	Inspect and restore the required default settings (overview menu options)
	Compressor, oil-free 25-28)*	Check function. To be carried out manually by trained and certified personnel e.g. by changing the working pressure, monitoring operation during this pressure variation (See overview menu options, 9-8).
	Connection assembly 22-23)*	Check function such as compressor, safety valve through available air-intake equipment.
	Equipment expansion automat, connections, isolation valves	Check for leaks at all the connections to the vessel at both compressed air- and water compartments (visually). Check externally for damage, deformation or corrosion and restore operational readiness.

* Positions, page 11-13.



After completion of service or planned inspection the applicable service has to be confirmed.!

Example:



Service 1 is due at: 20.12.2011; it results in a message at this day. After completion of service, it should be confirmed with the [enter] key (entry of date and time in upper blank line).



Vessel draining / refilling.

If draining of expansion water in the main vessel or auxiliary vessels is necessary, please observe the following actions:

- Record the actual volume level (%) as shown on SPC control unit display.
- Reset to start menu (Overview menu options; menu-line 8-6).
- Switch the control unit OFF.
- Close the ball valve at the expansion line (System connection) and at the vessel connections.
- Carry out the required work on the vessel (drain, service, repair etc.).
- Switch the control unit ON and run start menu procedure (see overview menu options; menu-line 9...9-9).
- Fill the main vessel and (if applicable) the auxiliary vessels. The self-adjusting volume level can be monitored in the display of the control unit and the filling process should be interrupted on reaching the previously recorded target value.

Advice: When filling the working pressure should be ca. 1.5 bar below the feed pressure of the feed line, or set as such (see overview menu options, 9-8). Make sure that in the case of multiple vessels the volume levelling is delayed. Deaerate the water compartment (Manual bleed valve, pos. 10, page 11; not applicable when automatic air vents are installed).

- Disconnect the filling equipment and check operational readiness.
- If needed reset the value for working pressure (see overview menu options, 9-8 or 8-1-1).
- Open all the previously closed valves (seal).
- Operational mode has been restored.

9. Decommissioning, Dismantling

At the end of the of the lifespan or at planned shut-down of the equipment please make sure that the equipment is turned off and disconnected from the power supply. The hydraulic system connections and top-up connections (if available) should be closed off.

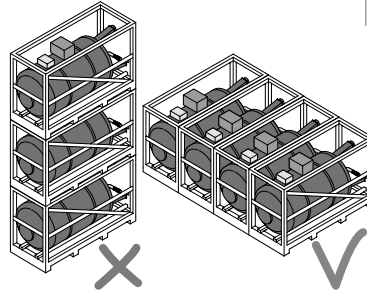


Caution: water areas should first be made pressureless and empty when the destination or re-use of system water should be designated in conformity with the applicable rules. This water may be treated, contain anti-freeze or other substances.

The designation of further processing of the construction parts should be carried out in agreement with the required waste management service provider.

Appendix 1: Technical data, information

**NICHT
STAPELN!**
Do not stack!

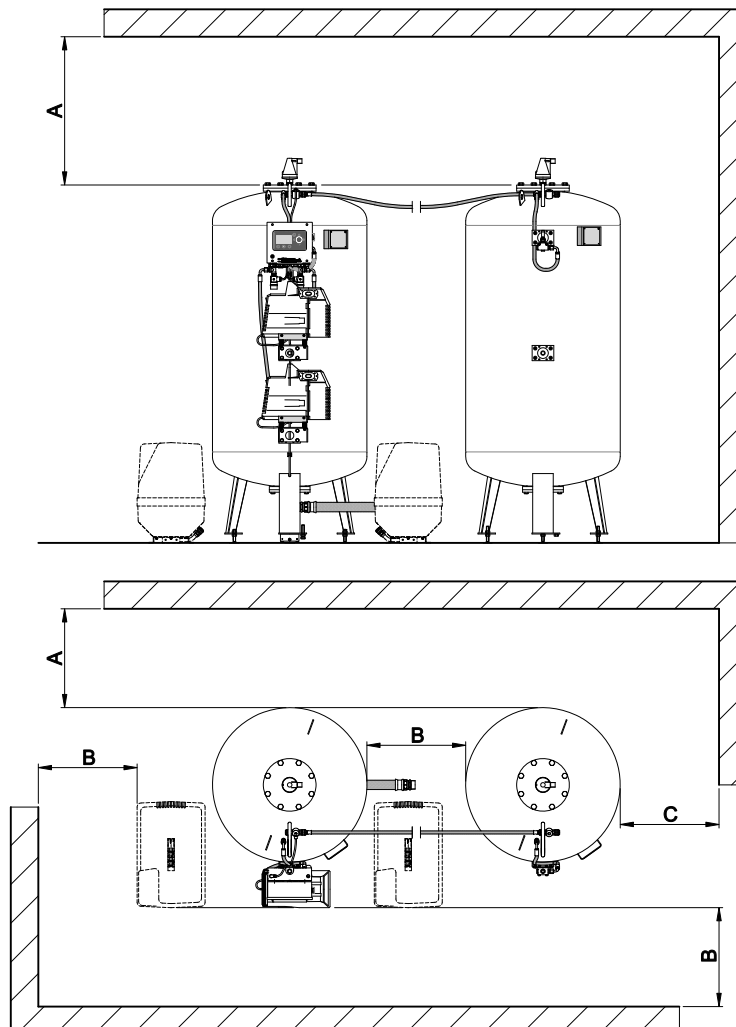


Ambient conditions

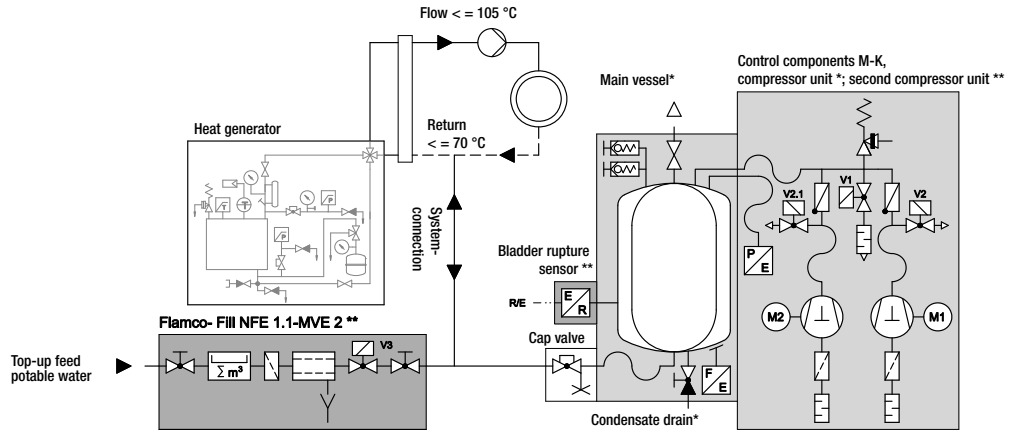
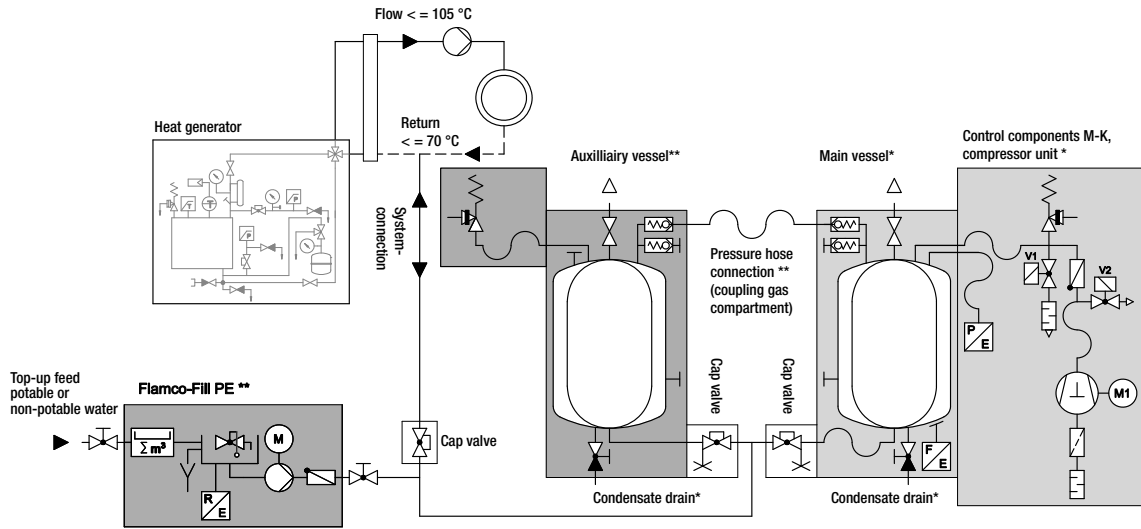
Storage		
Room:	Protected against:	Ambient conditions:
closed; frost free; dry.	Sunlight; Heat radiation; Vibration.	60...70 % relative humidity, non-condensing; Max. temperature 50 °C;
Operations room		
Room:	Protected against:	Ambient conditions:
closed; frost free; dry.	Sunlight; Heat radiation; Vibration.	60...70 % relative humidity, non-condensing; Temperatures 5 - 40 °C; Free from conductive gases and combustible gas mixtures. Caution: elevated temperatures may lead to overload of the compressors.

Minimum distances: clearance for service and repair.

Minimum distances			
Volume [litres]	A [mm]	B [mm]	C [mm]
400 600 800 1000 1200 1600	650	800	500
2000 2800 3500 5000 6500 8000 10000			



Installation examples

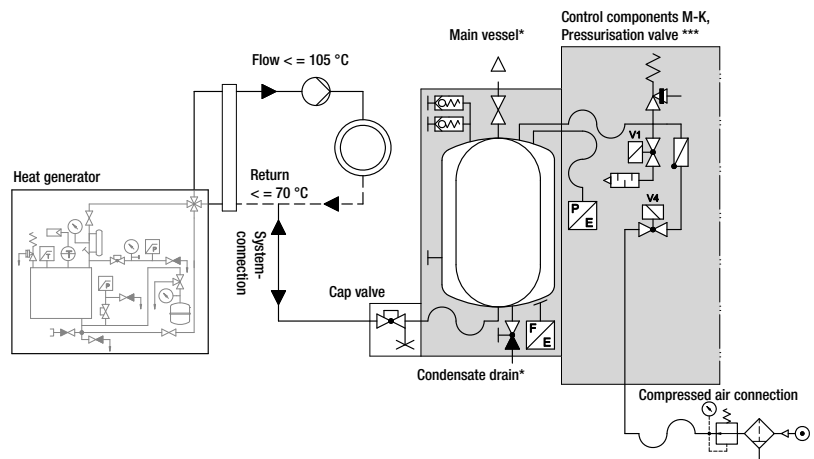


Control equipment Flexcon M-K
Compressor unit *
Second compressor unit **
Compressor load balanced operation **
(Parallel operating compressor **)
(Automatic changeover compressor **)
Main vessel *
Bladder rupture sensor *
Flamco-Fill NFE 1.1-MVE2 **
Auxiliary vessel **
Pressure hose connection **
Flamco-Fill PE **
Pressurisation valve ***

■ * Standard scope of supply ■ ** Optional, extension

(**) Optional, retrofitting

*** Special order

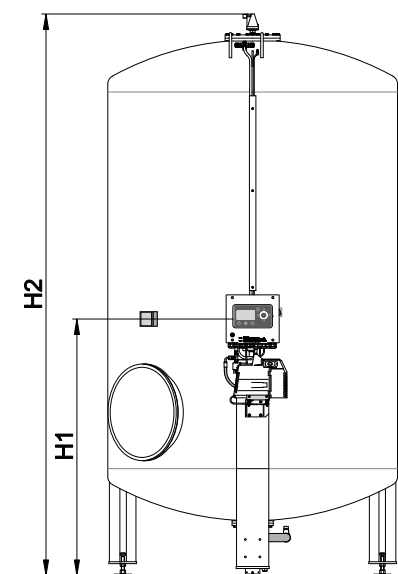


Appendix 2: Technical data, information, hydraulic and pneumatic equipment

Operational values, volume and dimensions											
Nominal volume	Maximum working pressure		Maximum working temperature	Maximum constant temperature at bladder	Vessel diameter	Display height	Height	Width		Length	System connection
								B (mm)			
[Litres]	[bar]		[°C]	[°C]	D [mm]	H1 [mm]	H2* [mm]	M-K/U	M-K	L2 [mm]	S [Inches]
400	6	10	120	70	790	1065	1437	1015	860	225	G 1½
600	6	10	120	70	790	1485	1737	1015	860	225	G 1½
800	6	10	120	70	790	1585	2144	1015	860	225	G 1½
1000	6	10	120	70	790	1585	2493	1015	860	225	G 1½
1200	6	10	120	70	1000	1615	2025	1225	1070	100	G 1½
1600	6	10	120	70	1000	1615	2525	1225	1070	100	G 1½
2000	6	10	120	70	1200	1635	2277	1425	1270	0	G 2
2800	6	10	120	70	1200	1635	2877	1425	1270	0	G 2½
3500	6	10	120	70	1200	1635	3677	1425	1270	0	G 2½
5000	3	-	90	70	1500	1600	3550	1765	1615	625	Rp 1½
6500	3	-	90	70	1800	1600	3465	2070	1920	475	Rp 1½
8000	3	-	90	70	1900	1600	3565	2170	2020	425	Rp 1½
10000	3	-	90	70	2000	1600	3985	2270	2120	375	Rp 1½

* H2 with Flexvent Super = H2 + 85 mm

Example: M-K/U



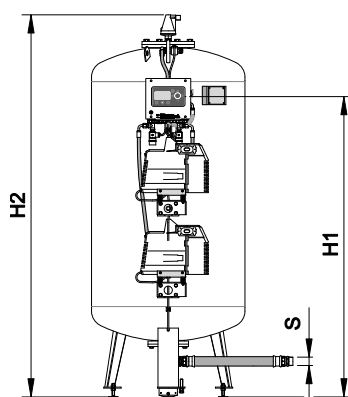
Dry weight of complete equipment [kg]

Nominal volume	M-K/U						M-K		
	K01 - K03 **			K04 **					
	Table value + 12 kg ***			Table value + 25 kg ***					
[Litres]	3 bar	6 bar	10 bar	3 bar	6 bar	10 bar	3 bar	6 bar	10 bar
400	-	90	117	-	166	201	-	77	104
600	-	105	140	-	196	241	-	92	127
800	-	120	165	-	231	271	-	107	152
1000	-	135	190	-	266	321	-	122	177
1200	-	313	418	-	326	431	-	290	395
1600	-	368	508	-	381	521	-	345	485
2000	-	453	618	-	466	631	-	430	595
2800	-	538	758	-	551	771	-	515	735
3500	-	648	938	-	661	951	-	625	915
5000	976	-	-	-	-	-	953	-	-
6500	1476	-	-	-	-	-	1453	-	-
8000	1581	-	-	-	-	-	1558	-	-
10000	1821	-	-	-	-	-	1798	-	-

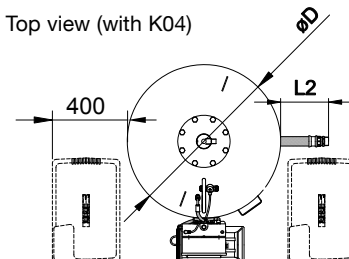
** compressor unit

*** second compressor unit

Example: MK/U



Top view (with K04)

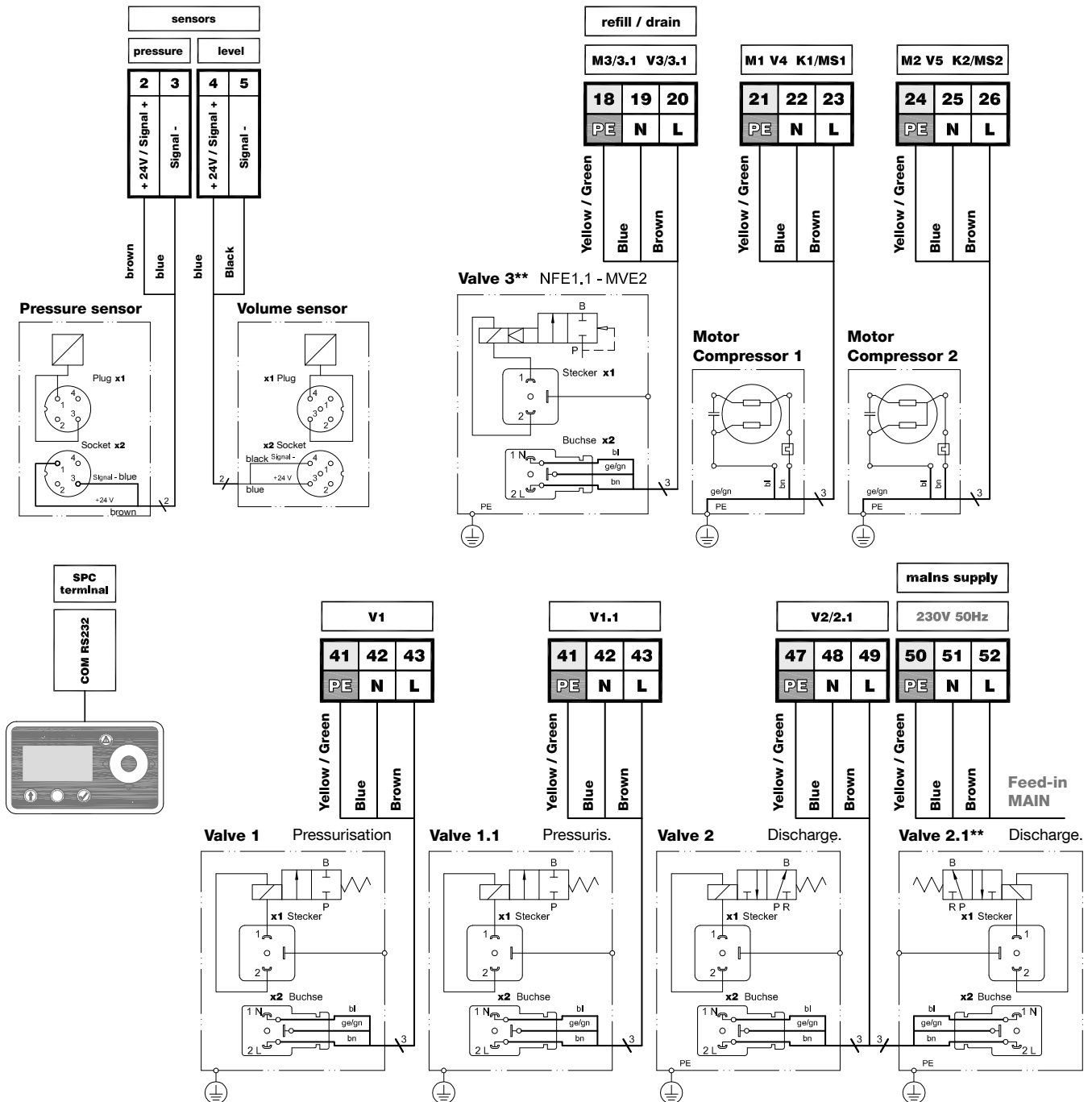


Appendix 3: Technical data, information, electrical equipment

Compressor unit: nominal characteristics

Type	Nominal voltage (V)	Nominal current (A)	Nominal capacity (kW)	Fuse line protection (on-site, recommended)
K01	230 V ~1 N PE 50 Hz	4.0	0.55	6 A (C)
K02	230 V ~1 N PE 50 Hz	4.0	0.55	6 A (C)
K03	230 V ~1 N PE 50 Hz	7.5	1.1	10 A (C)
K04	230 V ~1 N PE 50 Hz	7.5	1.1	10 A (C)

Control unit, terminal plan standard




Flamco

EU Declaration of Conformity

EU Konformitätserklärung

ENG

Manufacturer
Hersteller

Flamco BV
Amersfoortseweg 9, 3750 GM Bunschoten, the Netherlands

Product description
Produktbezeichnung

Compressor expansion automat
Kompressor-Druckhalteautomat

Product type
Produkt Typ

Flexcon M-K, M-K/U

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Union:

Machinery Directive / Maschinenrichtlinie
2006/42/EC

Pressure Equipment Directive / Druckgeräte-Richtlinie
2014/68/EU

Low Voltage Directive / Niederspannungsrichtlinie
2014/35/EU

EMC Directive / EMV-Richtlinie
2014/30/EU

The conformity of the product described above with the provisions of the applied Directive(s) is demonstrated by compliance with the following Standards / regulations:

Die Übereinstimmung des bezeichneten Produkts mit den Vorschriften der angewandten Richtlinie(n) wird nachgewiesen durch die Einhaltung folgender Normen / Vorschriften:

EN 61000-6-1

EN 61000-6-3

EN 13831 / AD 2000

Bunschoten, 07.10.2016

Signed for and on behalf of: / Unterzeichnet für und im Namen von:

FLAMCO BV

B. Houtman
QSHE Manager



**AALBERTS
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