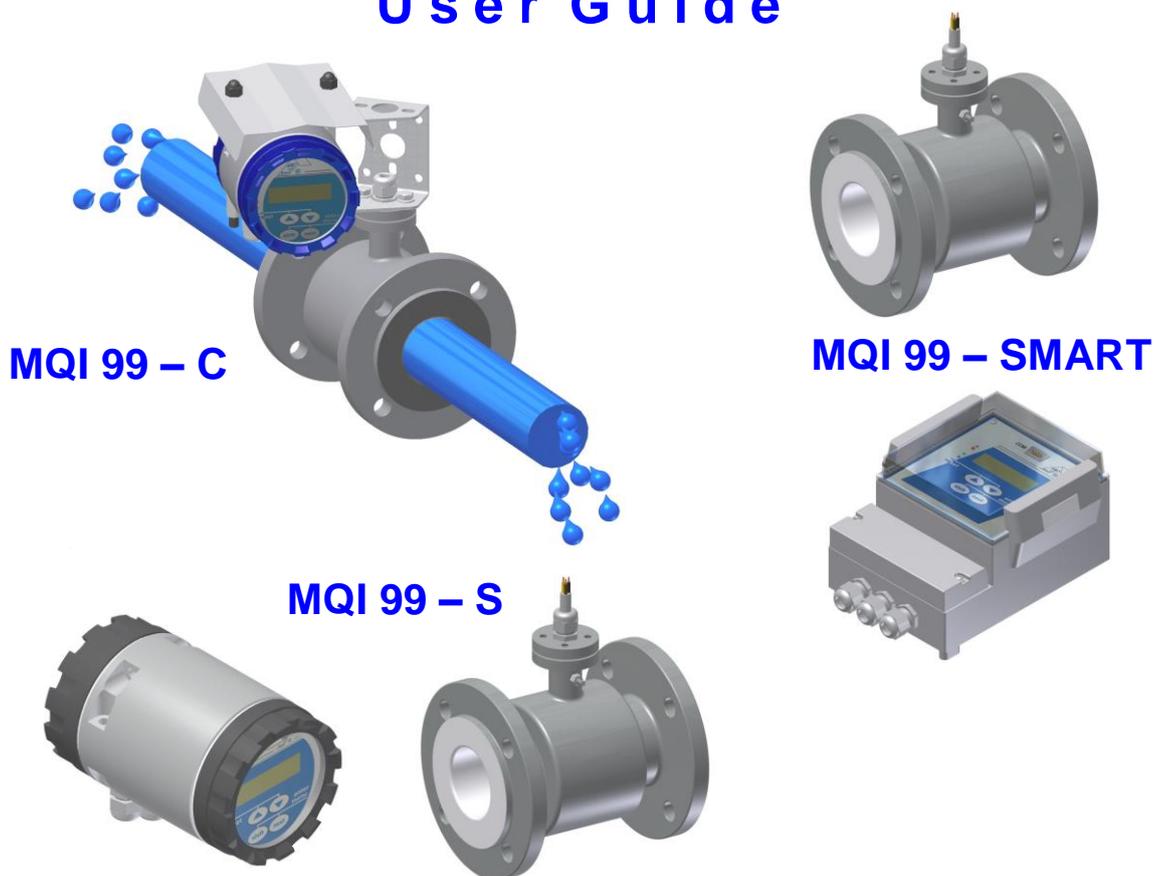


Magnetic-inductive flowmeter

MQI 99 type

Certificated product approved by ČMI, ref. no. 2664/97/010 in compliance with Act on Metrology no. 505/1990 Coll., the official mark of the approved type TCM 142/05 – 4233

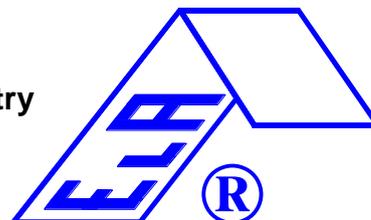
User Guide



- Flexible and clever assembling system
- Easy and fast-moving change from compact to remote version
- Innovative and high-power transmitter for every applications
- Robust and resistant cover of sensor and transmitter

Applications

- Water treatment
- Chemical, food, pharmaceutical industry
- Power, civil engineering
- Agriculture



ELA, spol. s r.o.

Work shop: Sokolova 32, 619 00 BRNO, CZ

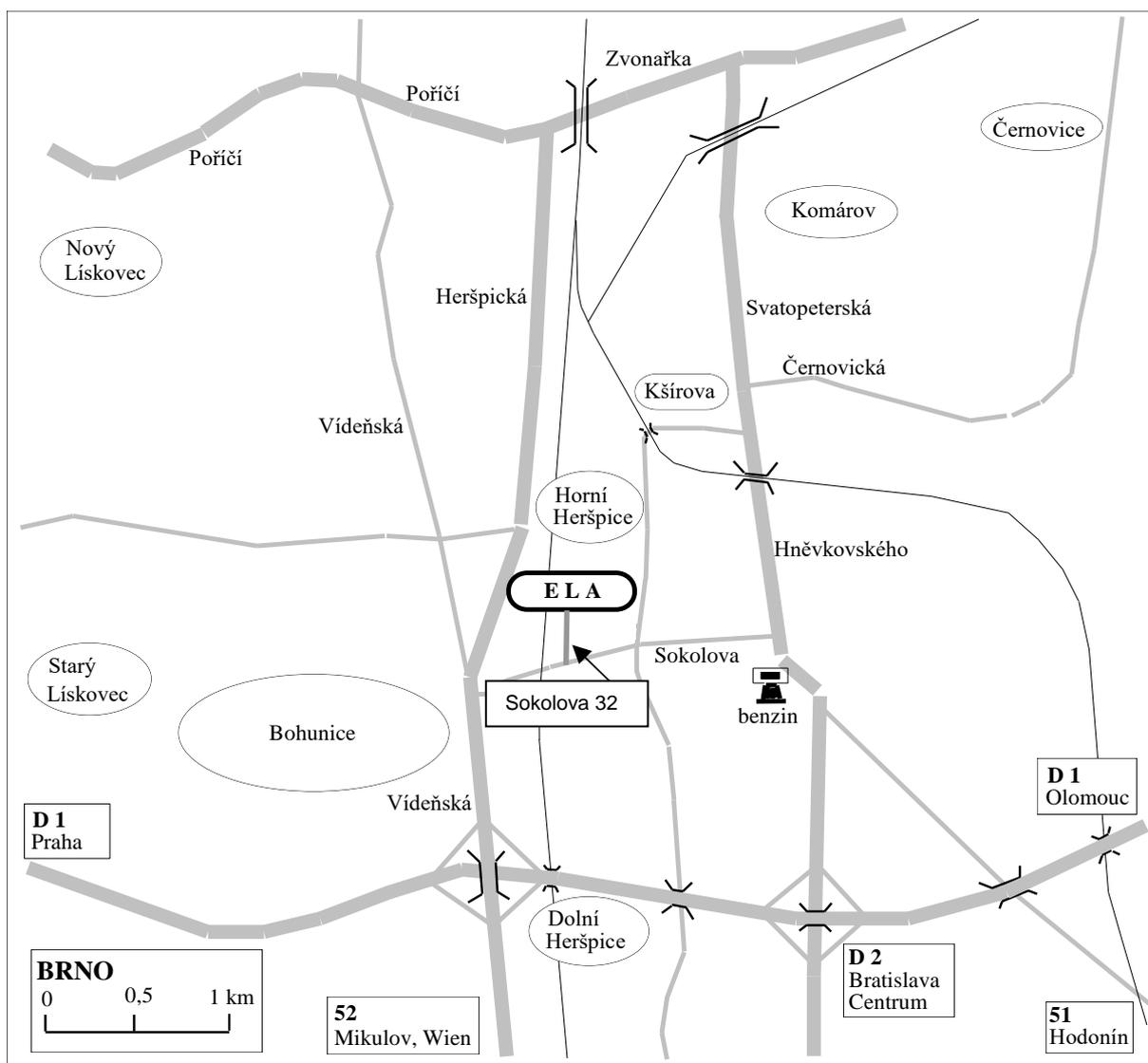
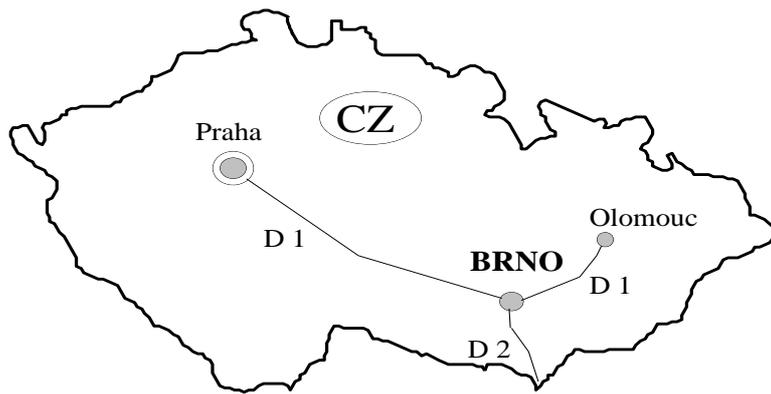
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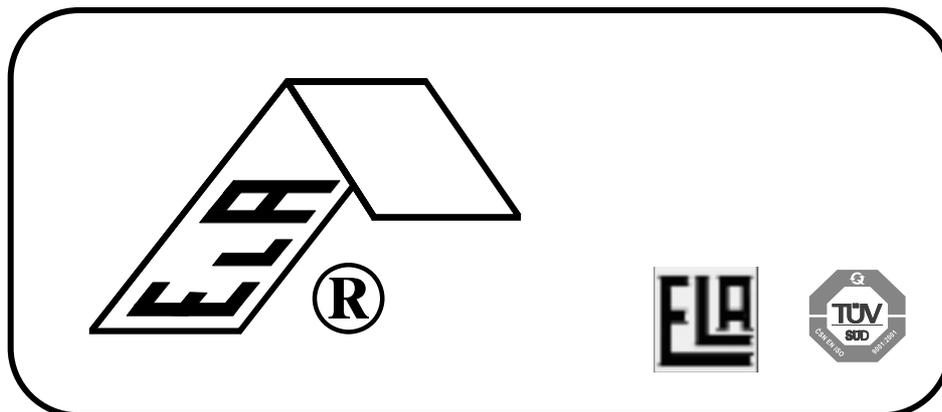


NOTE:

Because every product is subjected to a development, it can happen that during a period some changes may appear which are not included in the User Guide. Possible differences from the description in this Guide can be found by pressing keys on the keyboard in menu. All unclear items should be directly consulted in factory.

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ELA, spol. s r.o. produces and delivers:

- ⇒ DN 10 ÷ DN 1000 magnetic-inductive flowmeters
- ⇒ Ultrasonic flowmeters for all open profile types
- ⇒ Ultrasonic level meters
- ⇒ Electrode systems
- ⇒ Parshall flumes
- ⇒ Consulting service for fluid measurements

Introduction:

M Q I 99 magnetic-inductive flowmeters are precise measuring devices intended for the measurement of liquid flow of electrically conductive media. The meters may be used for measurements, registration, dosing, mixing, etc. as operating and/or certificated meters according to Act no. 505/1990 Coll. on Metrology.

M Q I 99 application

- Water management, drinking and waste water measurement
- Chemical, textile, paper, mining industry
- Food industry
- Power engineering and heating plants
- Agriculture

M Q I 99 advantages

- Independent of power supply fluctuation and line voltage interference
- Independent of pressure, temperature and density, etc of the media
- No pressure losses
- No disturbances of measured liquid consistency

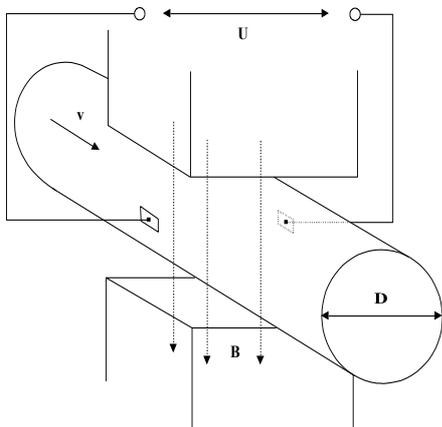
Do not install where

- Liquid conductivity is below 5 $\mu\text{S}/\text{cm}$ (20 $\mu\text{S}/\text{cm}$ for demineralized water)
- Partly filled pipe is possible
- Non lamina flow occurs
- Liquid velocity can be less than 0.3 m/sec

The principle of inductive sensor operation

The measurement is based on the principle of Faraday's law of electromagnetic induction. In compliance with this law, electric voltage is induced in an electrically conductive body, which moves across a magnetic field. The following equation is applied for voltage to be induced (generally):

$$U = B \times D \times v \quad \text{where:} \quad \begin{array}{ll} U = \text{inductive voltage} & D = \text{piping diameter} \\ v = \text{mean flow speed vector} & B = \text{magnetic induction} \end{array}$$



If magnetic induction B and piping diameter D are constant, then induction voltage is proportional to the mean flow speed. Liquid is flowing via a flowmeter perpendicularly to the direction of the magnetic field. Electric voltage which is monitored by two electrodes placed perpendicularly to both magnetic field and flow is induced by a stream of liquid with minimum electrical conductivity. Excitation current with a rectangular waveform is generated in a converter and fed to sensor coil windings generating the flowmeter magnetic field. The forced-current system provides constant excitation under all conditions that can occur during the operation.

Specifications:

Measurement conditions

Measurement is independent up on

- Liquid temperature and pressure
- Liquid density and viscosity
- Solids contents
- Usual level of magnetic field interference

For maintaining the MQI accuracy and reliability, it is necessary to meet the following conditions

- Minimum liquid conductivity >20 $\mu\text{s} / \text{cm}$ for demineralized cold water.
>5 $\mu\text{s} / \text{cm}$ for other liquid.
- Liquid velocity min. 0.3 m / sec, max. 12 m / sec.
- Steady flow section performance no DN change bevel pipe part(s) of maximum 8°
- Steady flow section length 5 DN upstream / 3 DN downstream (from sensor)
- Fully filled sensor profile with liquid measured.
- High quality operational contact between the sensor and liquid measured.

Measurement accuracy is interfered by

- Gassing of measured liquid and air bubbles
- Strong stray earth currents
- Liquid turbulence in the sensor
- Solids of magnetic metals in the medium measured

M Q I 99 options

Sensor option

- A measuring pipe is made of non-magnetic material with welded flanges and assembly clamps. An insulating liner with required properties is installed inside the pipe (according to the medium used). A system of driving coils generating the required magnetic field is directly fixed on the measuring pipe body.
- A pair of electrodes located opposite and passing through the measuring pipe with liner is made of high-grade steel and/or other material (according to the required chemical resistance against the medium being measured).
- The complete electrical section is assembled in steel housing (welded) with a neck for internal cabling.
- Remote version: A signal cable with the standard length of 8 m/ Cu type 2x2x0.25 mm² is attached to the neck and the cable passes through a cable seal (also other lengths are available).
- Compact version: The instrument box body is attached to the neck.
- The housing welding makes it possible to achieve a high-grade protection and surface finish provides a steady climate resistance.

Converter option

- Control and evaluation electronics is assembled into robust aluminium housing with a sight hole for the display, or in case of the blind version IP 67 protection is used.

Additional options

- M Q I 99 flowmeter as „working/certificated meter“ complies with the Act on Metrology no. 505/1990 Coll. Metrological properties according to the customer's requirements are determined by verification and identification with the official mark and these cannot be changed.
- Multi-point calibration of the measuring range. The flowmeters are usually calibrated in 3 points. On the customer's request, the number of calibration points can be increased.
- Higher sensor protection IP 68: the requirement must be precisely defined (i.e. immersion depth and time, and/or explosive zones).
- Higher PN, and/or different sensor built-in lengths, different flange options (DIN, ANSI, etc.), after consultation of your supply.
- Controlled data acquisition program – it allows evaluating the statistical readout data on a PC WIN.

M Q I 99 connection and assembly

Converter connection to power supply must be performed in compliance with the standards and rules to be effective



- **Connection of electrical instruments and appliances.**
- **Protection against electric shock.**
- **Heavy current distribution network in industrial plants.**
- **Safety operational rules for electrical installations operated by low-level experienced personnel.**

- If requested our Service Division will carry out commissioning. If work is done by any different organisation, the warranty can be cancelled in the case of such unauthorised work.
- Electrical protection allows the use of the instrument in all kinds of active, passive and complex environments, and after an agreement with us, it is possible to carry out some additional modifications even for severe climatic conditions.
- Signal and output cable routing should not be located near power output distribution network or in common ducts.

Table for 1 m / s flowrates

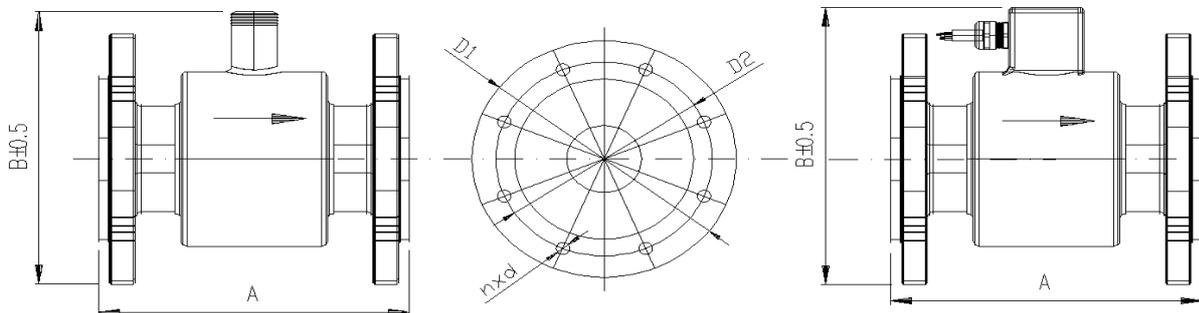
| DN | m ³ / h | l / min. | l / s |
|------|--------------------|----------|--------|
| 10 | 0,283 | 4,712 | 0,079 |
| 15 | 0,637 | 10,62 | 0,177 |
| 20 | 1,131 | 18,85 | 0,314 |
| 25 | 1,767 | 29,452 | 0,491 |
| 32 | 2,895 | 48,255 | 0,804 |
| 40 | 4,524 | 75,398 | 1,257 |
| 50 | 7,069 | 117,81 | 1,964 |
| 65 | 11,946 | 199,1 | 3,318 |
| 80 | 18,096 | 301,59 | 5,027 |
| 100 | 28,274 | 471,23 | 7,854 |
| 125 | 44,179 | 736,31 | 12,272 |
| 150 | 63,617 | 1060,3 | 17,671 |
| 200 | 113,10 | 1885 | 31,42 |
| 250 | 176,71 | 2945,2 | 49,087 |
| 300 | 254,47 | 4241,2 | 70,686 |
| 350 | 346,36 | 5772,7 | 96,211 |
| 400 | 452,39 | 7539,8 | 125,66 |
| 450 | 572,26 | 9537,5 | 158,96 |
| 500 | 706,86 | 11781 | 196,35 |
| 600 | 1017,9 | 16965 | 282,74 |
| 700 | 1384,7 | 23079 | 384,65 |
| 800 | 1809,6 | 30159 | 502,65 |
| 900 | 2289,1 | 38151 | 635,85 |
| 1000 | 2827,4 | 47124 | 785,4 |

Constructional dimensions and weights of inductive sensors

| DN | PN | Dimensions [mm] | | | | | | Weight kg |
|------|--------------|-------------------|------|------|-----|----|-----|--------------|
| | | A | B | D1 | D2 | d | n | |
| 10 | 16 or 200 | 150 | 153 | 90 | 60 | 14 | 4 | 2,5 |
| 15 | | 155 | 95 | 65 | 14 | 4 | 2,5 | |
| 20 | | 160 | 105 | 75 | 14 | 4 | 3 | |
| 25 | | 167 | 115 | 85 | 14 | 4 | 3,5 | |
| 32 | | 180 | 140 | 100 | 18 | 4 | 5 | |
| 40 | | 185 | 150 | 110 | 18 | 4 | 6 | |
| 50 | | 200 | 191 | 165 | 125 | 18 | 4 | 7 |
| 65 | | | 209 | 185 | 145 | 18 | 4 | 8 |
| 80 | 224 | | 200 | 160 | 18 | 8 | 9,5 | |
| 100 | 250 | 245 | 220 | 180 | 18 | 8 | 12 | |
| 125 | | 276 | 250 | 210 | 18 | 8 | 15 | |
| 150 | 300 | 305 | 285 | 240 | 22 | 8 | 20 | |
| 200 | | 350 | 375 | 340 | 295 | 22 | 12 | 36 |
| 250 | 400 | 430 | 405 | 355 | 26 | 12 | 58 | |
| 300 | | 500 | 487 | 460 | 410 | 26 | 12 | 70 |
| 350 | 600 | 542 | 520 | 470 | 26 | 16 | 85 | |
| 400 | | 615 | 580 | 525 | 30 | 16 | 100 | |
| 450 | | 657 | 640 | 585 | 30 | 20 | 120 | |
| 500 | | 750 | 715 | 650 | 33 | 20 | 160 | |
| 600 | 800 | 870 | 840 | 770 | 36 | 20 | 190 | |
| 700 | | 927 | 910 | 840 | 36 | 24 | 260 | |
| 800 | 900 | 1050 | 1025 | 950 | 39 | 24 | 350 | |
| 900 | | 1145 | 1125 | 1050 | 39 | 28 | 450 | |
| 1000 | 1000 | 1285 | 1255 | 1170 | 42 | 28 | 550 | |

Tolerance of built-in lengths:

DN 10 – DN 150 ⇒ A ± 5 mm, DN 200 – DN 1000 ⇒ A ± 10 mm



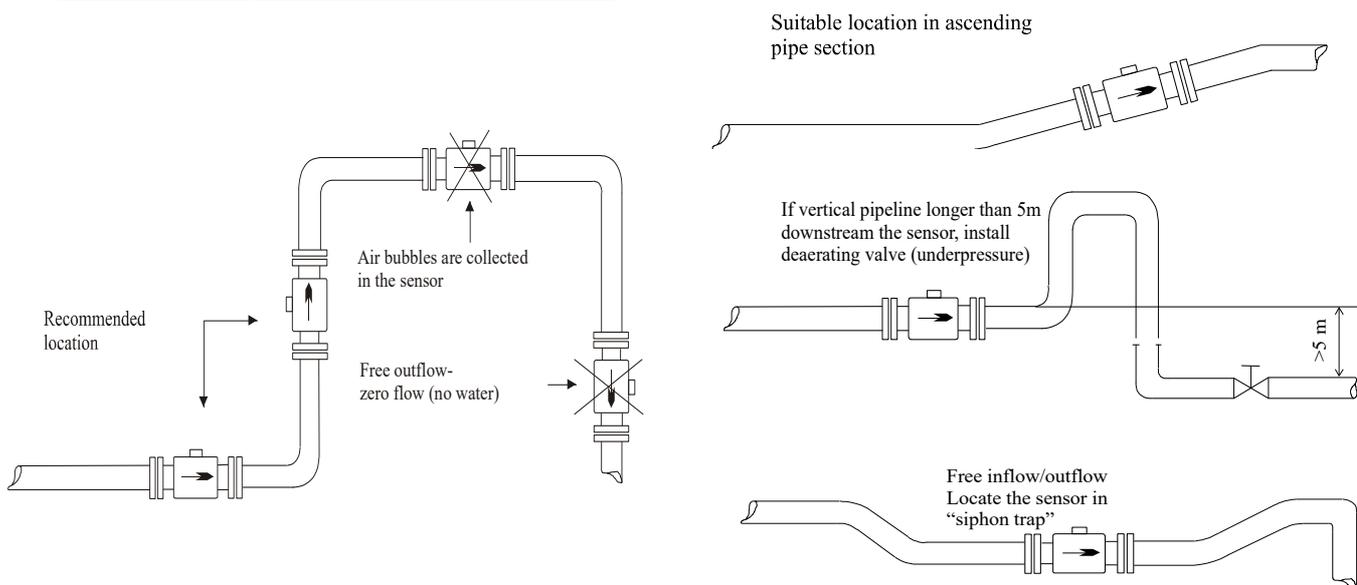
Signal cable connection

- Signals which are transmitted from a sensor electrode circuit to the converter will be in a range of millivolts. They will be very sensitive to magnetic and electrostatic interference from neighbouring high-voltage cables, power supply cables and high power output motors, etc. The interference is mainly compensated for by the converter connection, nevertheless if possible, it is necessary to prevent all spurious signals.
- The signal cable is of a special construction and length and is a part of the shipment, its length should not be changed (for certificated meter must not be changed). The proper cable connection to the converter is important; doing so may cause measurement failures. Special requirements are laid on shielding, and the measurement precision depends on its quality.
- The cable must not be extended.
- The shielding must be well insulated on the whole route from ground and the other metal subjects. It is recommended that the cable is located in a separate conduit or trays.

Sensor location and its position in piping

- The inductive flowmeter sensor can be installed in any position according to requirements, however for horizontal assembly, the electrode axis must always be horizontal.
- Sensor must remain full of liquid.
- It is recommended that the flow direction should follow the arrow on the sensor cover; the converter is also preset for this direction. On the operating meter, it is possible to adjust the reverse flow direction by changing the MQI 99 converter parameter.
- Bolts and nuts – verify if there is a sufficient space for their installation near flanges.
- Vibration and deflection of piping – fix the piping on both sides from the flowmeter to avoid any deflection and vibrations.
- If you install any pipes with higher internal diameters, install a reducer; this will provide an axial shift without increased mechanical stress of piping and sensor flanges.
- To improve flow, use only the recommended straight lengths upstream (5DN) and downstream (3DN). Any change of a diameter with an angle up to 8° is excluded from the above-mentioned straight lengths. Suitably assembled flow deflectors and a combination of diffusers are used in more sophisticated installations.
- When you install the sensor in insulated piping (e.g. glass, artificial mass, etc.), use proper sealing ground rings. A conductive connection between a sensor ground point and the liquid to be measured is needed for a proper measurement!

Recommended positions for sensor installation



To avoid any measurement errors which are caused by air bubbles or failures on the lining, pay attention to the following recommendations

- During assembling correctly seat the sensor, tighten screws uniformly and move on a diagonal one after another.
- It should be noted that the parallelism of flanges has a greater effect on packing than excessive tightening forces on curved and seated flanges.
- The sensor must be installed inside piping so that the axis of sensor electrode is always **horizontal**.
- A PTFE (teflon) lining calls for extra care during handling and assembly. During installation/operation avoid excessive underpressure in pipes. Please do not change and damage the outlet extension on both ends of the sensor. The sensors are shipped from the factory with special covers to avoid any shape deformations. (PTFE elastic memory should cause a partial compensation in future). Please remove the covers just before installation, and when you insert it between counterflanges, replace by a number of smooth metal sheet pieces which are removed just before tightening the bolts.
- Packing – The extended part of lining does not operate properly as a seal, hence appropriate packing must be inserted between sensor and pipeline. If the packing protrudes into a flow profile at any point, this will cause turbulence and reduce the measurement quality.
- During installation, make sure the sensor slides into piping if the pipeline is not flexible enough. It is recommended that installation inserts (especially for greater internal diameters) should be used. During installation of the sensor, counterflanges must not be welded (danger of the sensor lining failure).

MQI 99 grounding

- For reliable and proper operation of the inductive meter, it is necessary to use high-quality protective grounding. Internal flowmeter cables and power supply PE (PEN) conductors provide protective grounding. Working grounding is also provided via internal cables and a high-quality connection of the sensor body with two metal pipe counterflanges. It is recommended that a connection made with M6 welded screws or bored threaded holes is used. The connection under flange fixing screws is not recommended because of possible corrosion resulting in measurement failures.

- When assembled into piping made from non-conductive material (or with non-conductive lining), it is necessary to provide working grounding with liquid by a different method, e.g. by grounding rings – valid for DN 10 ÷ DN 100. The rings can be ordered from factory, their material and chemical resistance must comply with the liquid to be measured – usually produced from the same material as sensor electrodes. The flowmeters from DN 50 ÷ DN 1000 are equipped of grounding electrode. Function of grounding electrode is same as grounding ring.
- When assembled, it is necessary to insert the packing on both sides of the grounding ring. Make sure that no parts will protrude into a internal sensor profile (turbulence).

Drawing of sensor working grounding inside pipeline Use of grounding rings –valid for DN 10 ÷ DN 40



Electrodes

- The electrode material must be selected according to its chemical resistance of the liquid to be measured.
- The electrode purity can affect the measurement precision, and high impurity concentration can affect the measurement process (liquid insulation).
- Immediately after shipping, it is not necessary to clean the electrodes before installing the sensor inside piping. Clean with a fine cloth, or use a chemical detergent. Avoid any damage of the lining! If the electrodes must be cleaned during operation, either mechanical or electrolytic methods may be used. Mechanical cleaning can only be used for a suitable sensor assembly, otherwise dismantle the sensor from the pipeline. After cleaning reinstall the sensor.
- Any electrolytic method is advantageous for its simplicity, however it can only be applied for the contamination that can be removed by electrolysis (low contamination and deposit).
- All detailed instructions are available from the flowmeter manufacturer on request.
- If a flowmeter operates under normal conditions, for most liquids it is not necessary to clean flowmeters during their life, only self-cleaning by flowing liquid is satisfactory (a recommended velocity is over 3 m/s).

MQI 99 commissioning

Checking installation and connections.

- Proper sensor and grounding
- Tightening all cable connection clamps and plug in all connectors.
- Verify the completeness of the shipped set according to the serial numbers of sensor and converter.
- Verify proper supply voltage; see the label on the converter.
- Verify proper electrical protection.
- If the installation is fault-free, fill the pipeline with liquid and verify the sensor tightness inside the pipeline. After short washout, switch the system on-off-on.

Service

- The commercial, service and technical assistance for - **M Q I 99** is provided by **Ela Brno, Ltd** in cooperation with **Petr Bajsa, Košuličova 6, 619 00 Brno, CZ. Fax: +420 543 251 594, Tel +420 602 737 201.**
- The Service Division secures all activities that are related to the commissioning and all parameter changes at site (with the exception of certificated meters).
- Ela Brno, Ltd can authorise another organisation to provide service. The organisation must be able to submit the appropriate approval/certificate on request. The producer carries out recalibration of all meters and their repairs.

Additional devices

The additional devices are intended for remote control of the converter output signals (displaying and processing).

The additional devices are not usually included in MQI 99 shipment, but their type should be approved by the manufacturer. In such a case, the manufacturer is only responsible for the suitability of input parameters, and all other parameters are set according to the manufacturer's specifications of the additional devices.

If MQI 99 is used as a certificated meter, the additional devices that have passed a separate type test or have been included in the MQI 99 type test can be used.

Packing, transportation and storage

If a set is ordered without installation, the sensor is packed in corrugated paper and the converter is enclosed in a cardboard box or wooden palette

Technical data

WARNING: The customer assume personal responsibility for reasonable using of sensor and unit.

Specification for magnetic-inductive sensor:

| | |
|-------------------------------|--|
| Nominal sizes | DN 10 ÷ 1000 |
| Interconnecting cable | Compact version – standard 0,5 m / 2 x 2 x 0,25 mm ² Remote version – standard 8 m / option up to 50 m |
| Control principle | Pulse DC |
| Excitation coils supply | From the transmitter |
| Excitation of coils isolation | Class E |
| Connection | Flanged DIN (ANSI, BS) / hygienic - food DIN 11 851 |
| Maximum Pressure | Standard 1,6 MPa (0,6 / 1,0 / 2,5 / 4,0 MPa) |
| Protection | Standard IP 67 / NEMA 5 (IP 68 / NEMA 6) |
| Liner material | Hard + soft rubber DN 10 ÷ DN 1000 / Teflon PTFE DN 10 ÷ DN 500 |
| Liner temperature | Hard + soft rubber -5°C ÷ +90°C / Teflon PTFE -25°C ÷ +130°C |
| Electrodes | Stainless steel 316Ti, L (Hastelloy / Tantalum / Titanium / Platinum) |
| Outer casing and flanges | Carbon steel standard (Stainless Steel 304, 321) |
| Flow tube | Stainless steel 321 |
| External coating | Acrymetal multi component lacquer |
| Ambient temperature | -20°C ÷ +60°C |
| Accessories options | Stainless Steel Earthing rings for plastic pipe |
| Special Options | Stainless Steel version, food industry version |

Specification for – M Q I 99 control unit:

| | |
|---|---|
| Medium electrical conductivity | ≥ 5 μS/cm, for demi water ≥ 20 μS/cm |
| Input resistance | ≥ 10 ¹⁰ Ω |
| Measurement accuracy | 0,2 % of reading, while flow is within 10 ÷ 100% of range; (for reference conditions only *) |
| Flow filter | Multi-mode adjustment |
| Low flow rejection | Adjustable in steps of 0,1% |
| Flow direction | Bi-directional measurement distinguished by sing, current flow is summarized by total volume counters (S+ for possitive flow and S- for negative flow) |
| Zero flow | Automatic zero point setting |
| Empty pipe detection | With adjustable detection period |
| Data logger | 4 months capacity; average 5-minute current flowrates, total volume and operating time by hour/day/month time slices |
| Real time | Clock and calendar including leap years until 2099; with battery backup |
| Display | LCD, alphanumeric, 2 x 16 characters, with backlight |
| Keyboard | 4 keys |
| Analog output | Active galvanically separated, 0(4)÷20 mA / 500 Ω, 0÷5 mA / 2 kΩ or generally selected to maximum 30 mA / 300 Ω, <i>overvoltage protection of III. level</i> |
| Frequency output | 0÷1 kHz / 0÷100 % from flow rate range, galvanically separated, passive - free optocoupler, external load 8,2 – 10 kΩ, voltage supply for external load max. 24VDC+10% |
| Binary outputs | 1÷4 x relays, non-voltage contact, non-inductive load 30VDC/3A; modes: pulse (according to total flow in possitive and negative flow), comparing (4 submodes), status (air intake) – see <i>Instructions for use</i> |
| Communication output (must be specicated) | RS 485 (galvanically separated) or RS 232 C or Modbus RTU, company protocol ELA-2; for current and stored data transmission to PC, PLC etc.; on request: software for data acquisition Smart MQI for Windows |
| Cable outlets | 3x PG 11, power supply cable 3 x 1 – 1,5 mm ² Cu |
| Power supply | 85 ~ 260 VAC/50~60 Hz/10 VA \wedge 9 ~ 36 VDC/10 W \wedge 24 VDC/10 W (\pm 1 V) |
| Fuse | 630 mA/F |
| Electric protection | MQI 99 – C,S: IP 67 (NEMA 5) / MQI 99 – SMART: IP 65 (NEMA 4) |
| Ambient temperature | -20° C ÷ +50°C |
| Dimensions | MQI 99 – C,S: 180 x Ø 115 mm / MQI 99 – SMART: 300 x 210 x 100 mm |
| Weight | MQI 99 – C,S: 2,6 kg / MQI 99 – SMART: 1,5 kg |
| Housing material | MQI 99 – C,S: Cast AISi 10Mg / EN AC-47100 // MQI 99 – SMART: plastic box |
| Surface finish | Powered coated (komaxit, anodizing) / - |

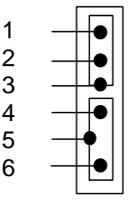
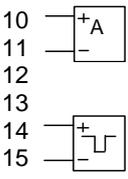
*) Reference conditions (according to EN 29 104):

| | |
|---------------------|---|
| Measuring range | 0,3 – 12 m/s |
| Measured medium | Water 10 – 30° C |
| Conductivity | > 300 μS/cm |
| Power supply | U _N ± 2% (U _N = voltage rating) |
| Ambient temperature | 18 - 25° C, steady humidity |
| Stabilization min. | 20 minutes |
| Steady flow section | 10 x upsteam sensor, 3 x downstream sensor |
| Sensor | Fixed, centered and earthed properly |

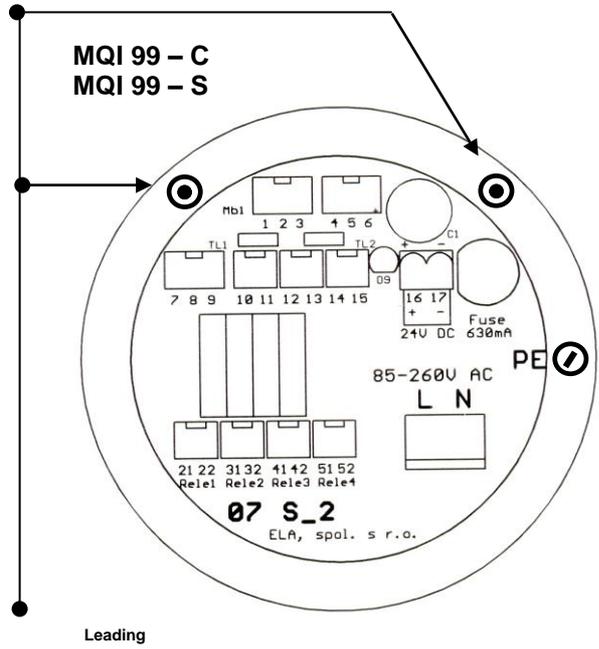
Technical data

WARNING: For reason of safety and protection health of consumers is necessary to make equipment ground ! (Separate terminal PE on body of equipment.)

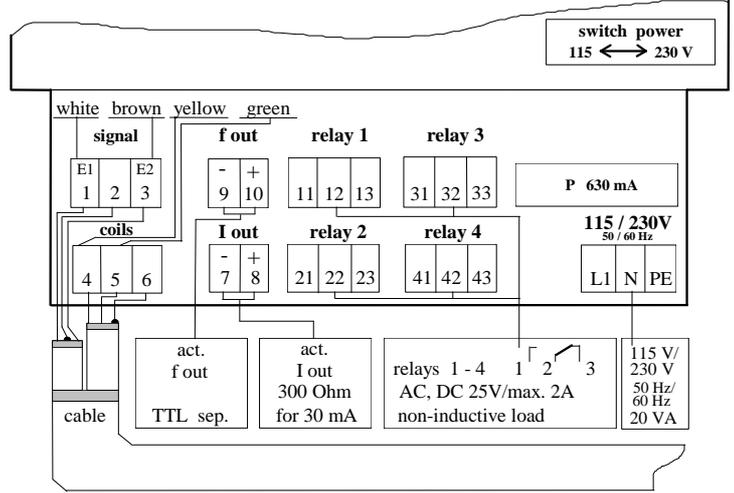
Control unit terminal board, input / output connection and basic functions:

| | | | |
|---|--|---|---|
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">SENSOR</p>  | <p>STANDARD</p> <p>1 yellow field 2 green field 3 braiding function ground and screen 4 E2 brown signal 5 braiding screen 6 E1 white signal</p> <p>compact version – cable lenght 0,5 m remote version – cable lenght 8 m</p> | <p>OPTION</p> <p>cable lenght for remote version 16, 24, 32, 40, 48 m</p> | |
| <p>7 8 9</p> | | <p>RS 232</p> <p>RxD TxD GND</p> <p>cable max. 10 m</p> | <p>RS 485</p> <p>A B</p> <p>cable max. 500 m</p> |
| <p>10 11 12 13 14 15</p>  | <p>10 analog output 11 active output 12 unwired contact 13 unwired contact 14 frequency output 0 ÷ 1 kHz 15 passive free optocoupler</p> | | |
| <p>16 17 L N PE</p>  | <p>85 ~ 260 VAC/10VA</p> <p>do not connect do not connect mains L mains N mains PE</p> | <p>9 ~ 36 VDC/10W</p> <p>do not connect do not connect + 9 ~ 36 V 0 V protective wire</p> | <p>24 VDC/10W</p> <p>+ 24 V 0 V do not connect do not connect protective wire</p> |
| <p>21,22 31,32 41,42 51,52</p>  | <p>relay 1 / <30 VDC/<3A</p> <p>totalizer, comparators, failure, etc.</p> | <p>relay 2 / <30 VDC/<3A relay 3 / <30 VDC/<3A relay 4 / <30 VDC/<3A</p> <p>totalizer, comparators, failure, etc.</p> | |

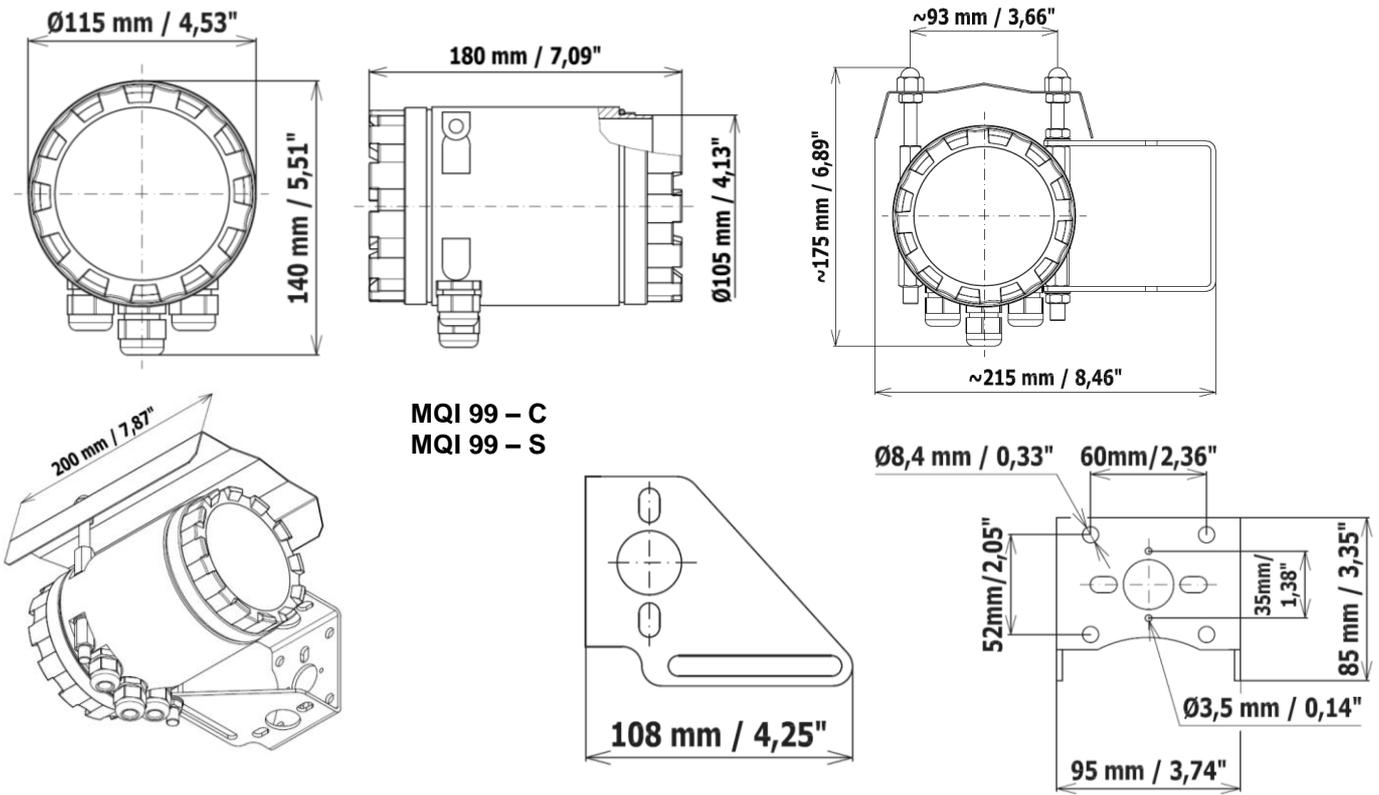
BOARD CONNECTION



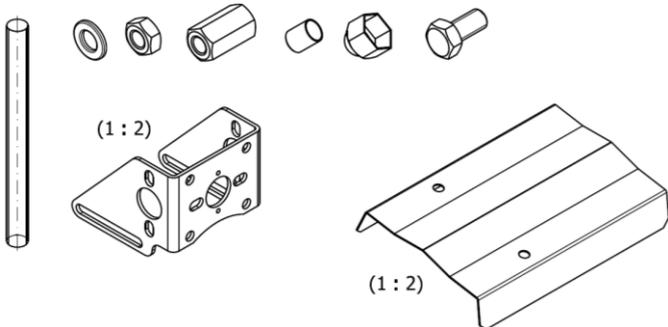
MQI 99 – SMART



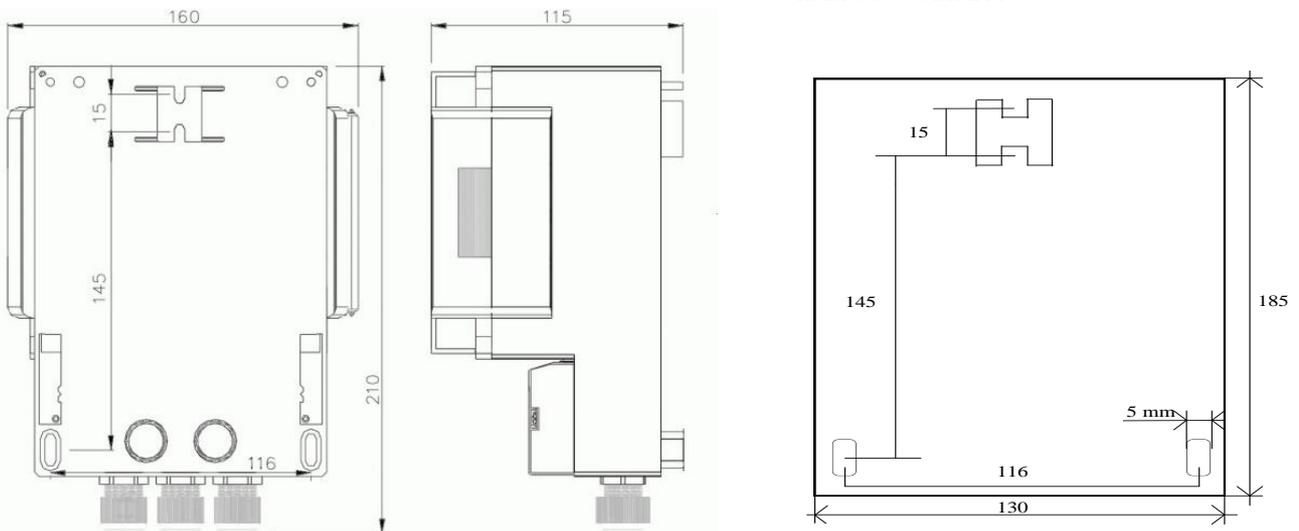
Control unit dimensions - M Q I 99



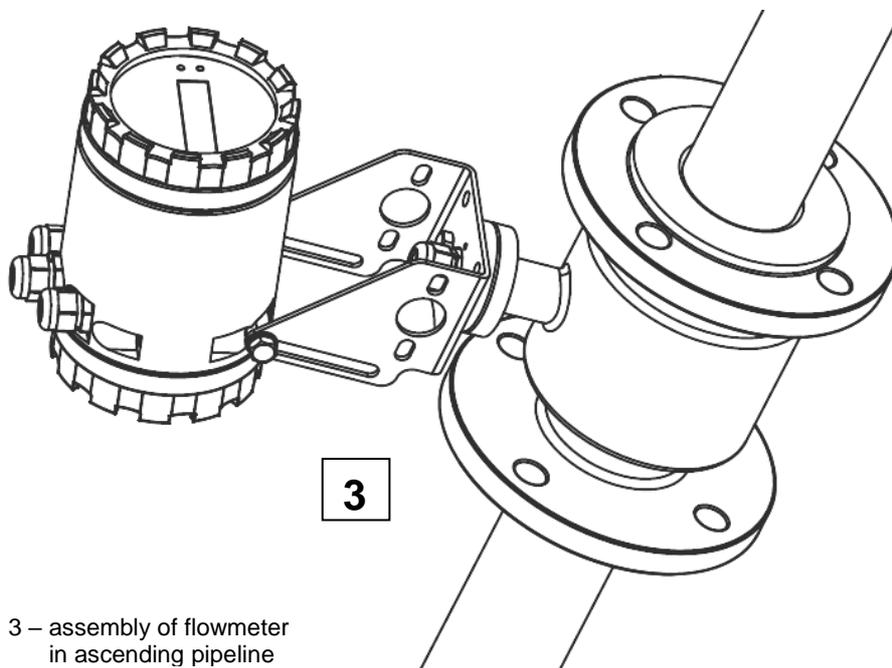
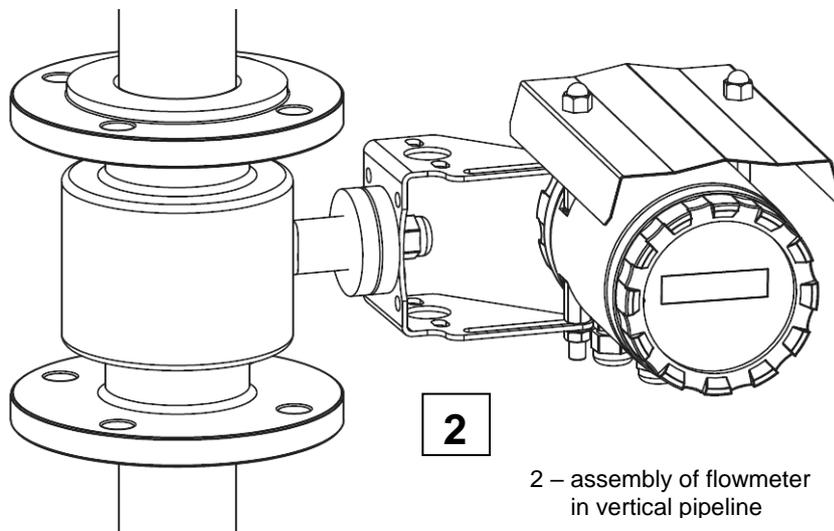
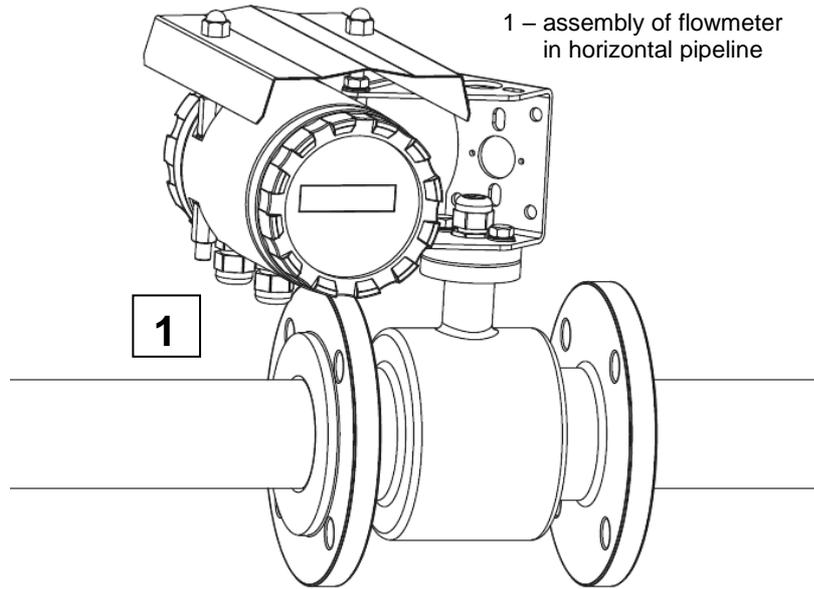
Mounting kit



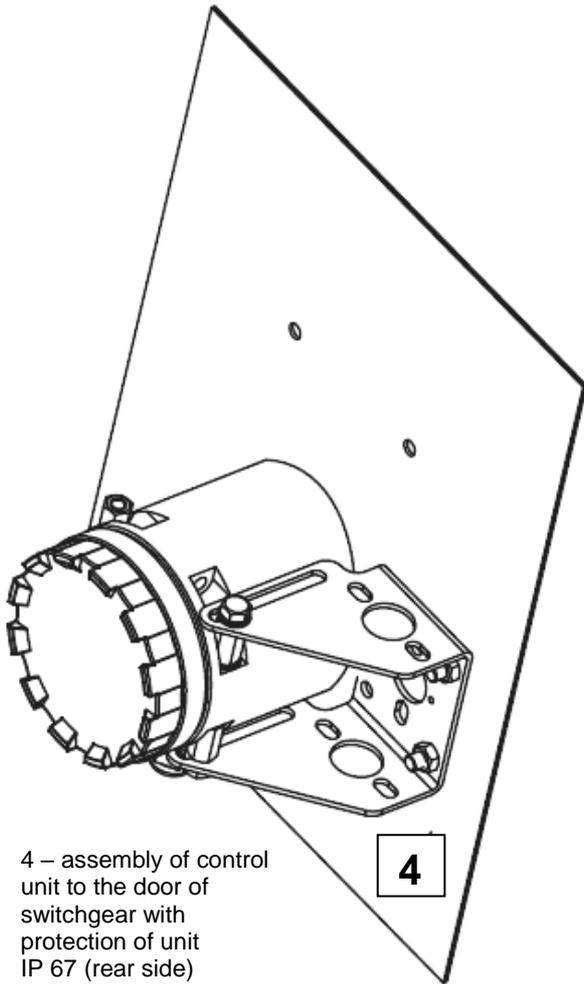
MQI 99 - SMART



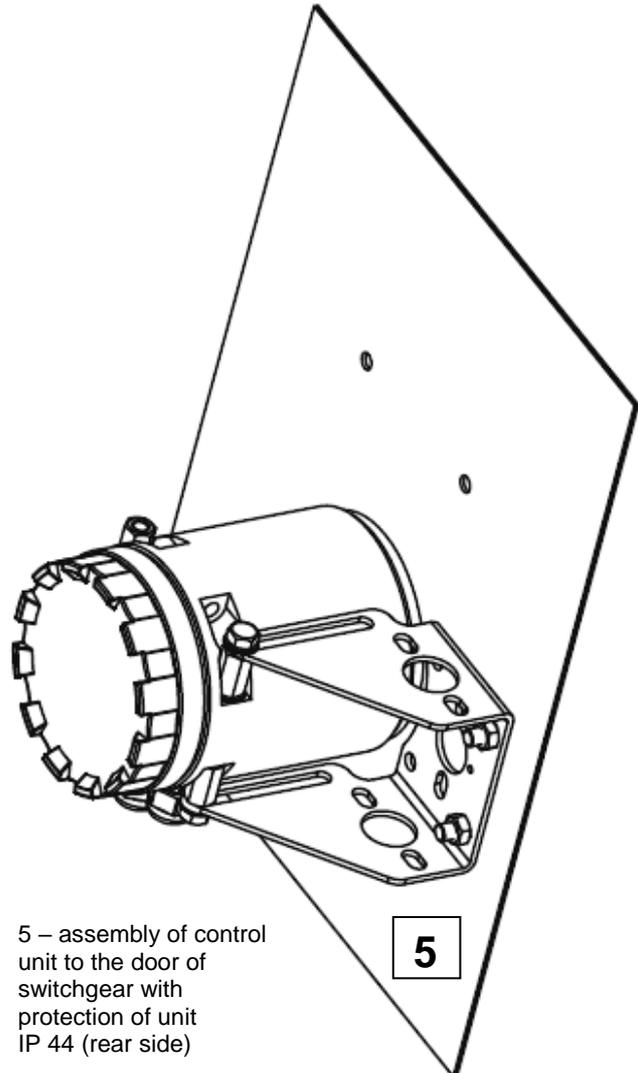
Possibilities of assembly – compact version



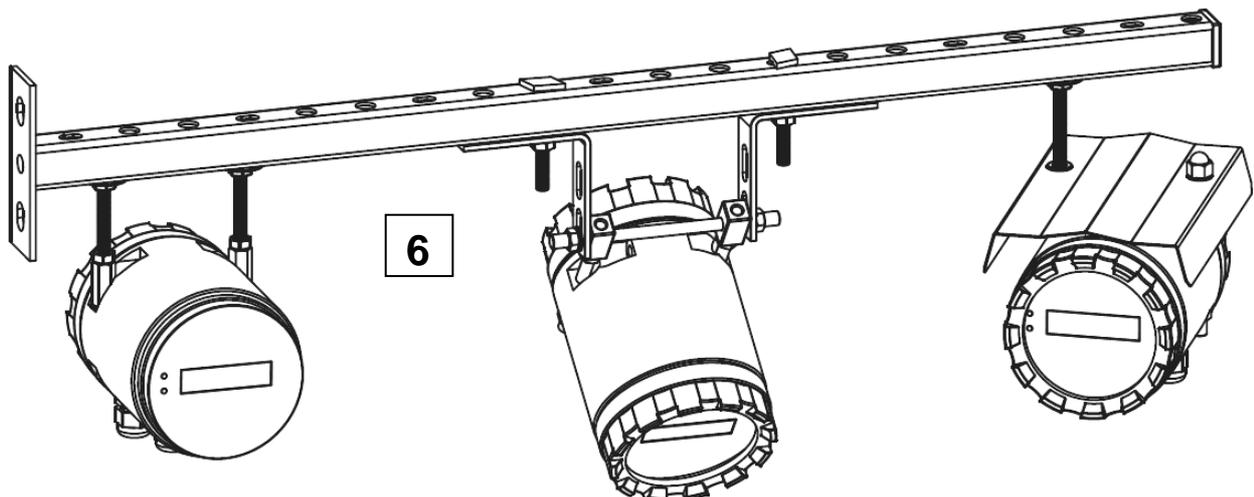
Possibilities of assembly – remote version



4 – assembly of control unit to the door of switchgear with protection of unit IP 67 (rear side)

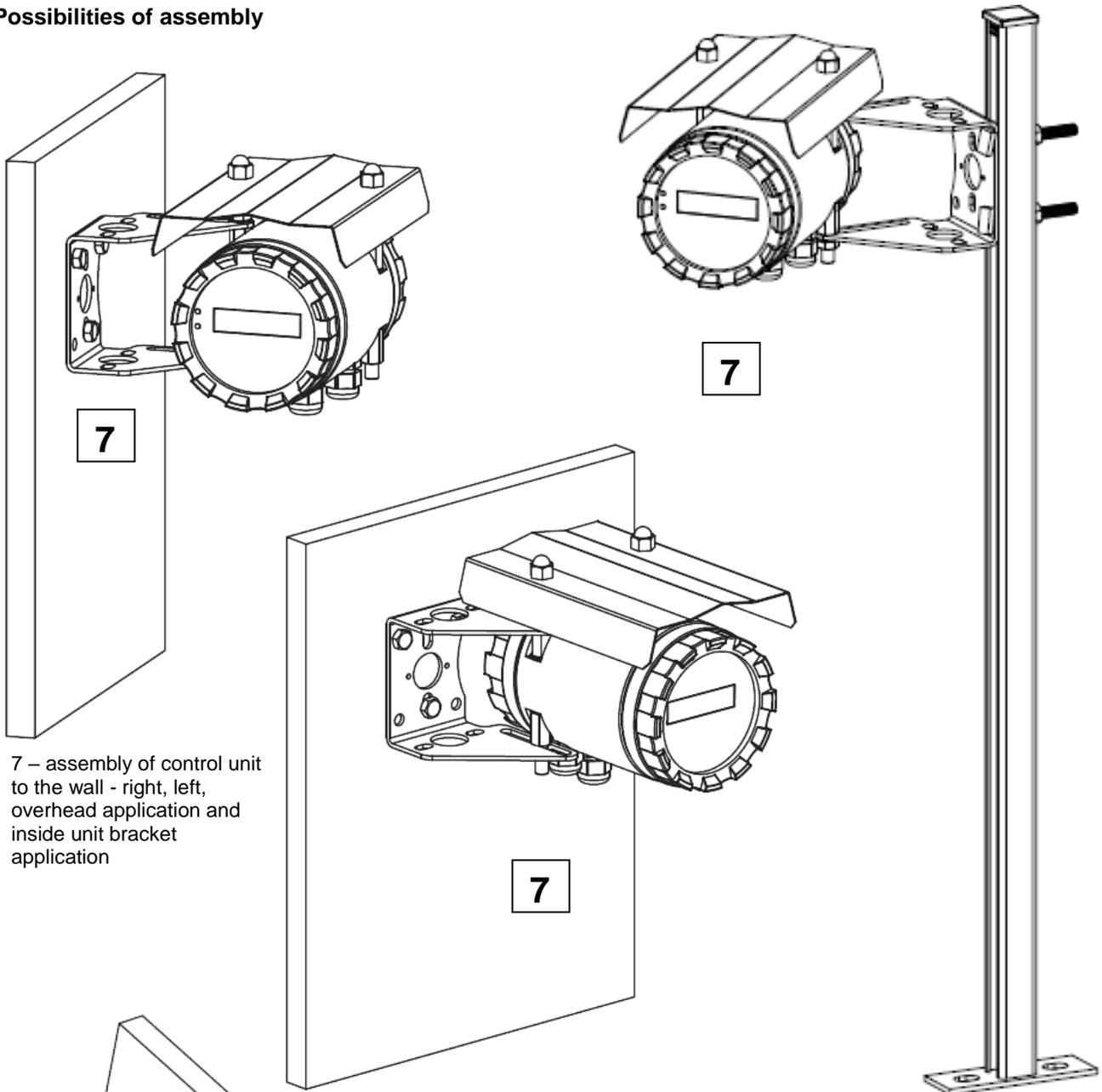


5 – assembly of control unit to the door of switchgear with protection of unit IP 44 (rear side)



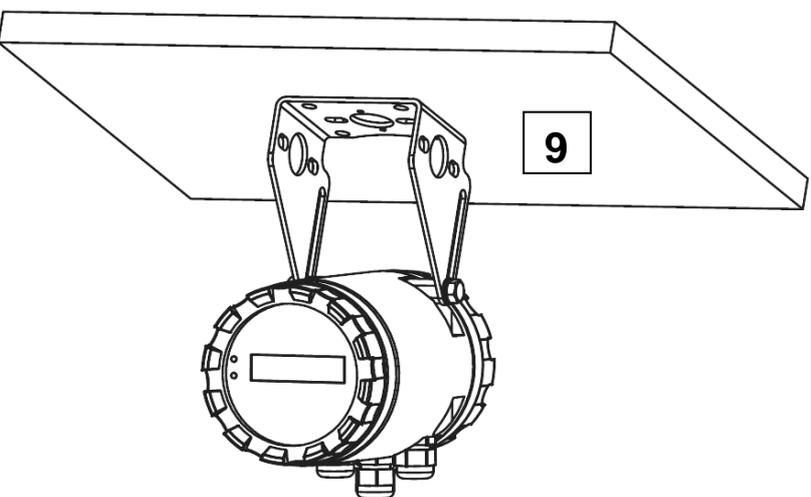
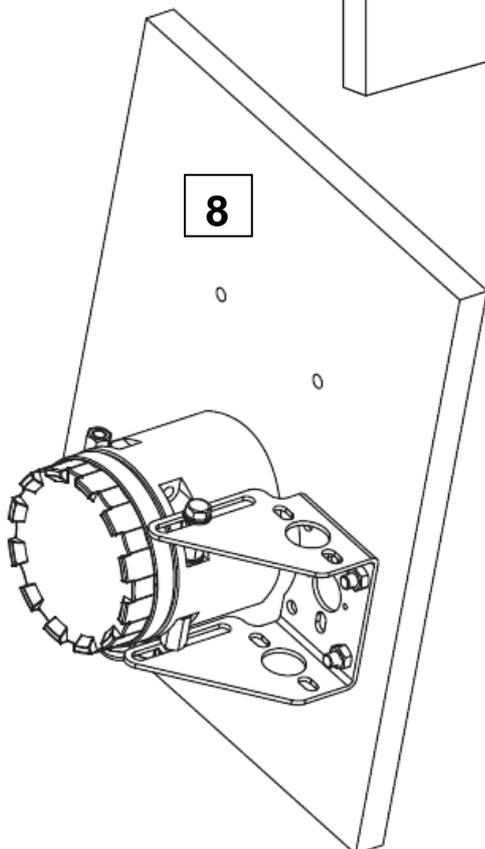
6 – assembly of control unit to the DIN attachment bar or construction of switchgear - multiple overhead and side-by-side application

Possibilities of assembly



7 – assembly of control unit to the wall - right, left, overhead application and inside unit bracket application

9 – assembly of control unit – overhead application



8 – assembly of control unit to the plaster board – back side



ES CONFORMITY STATEMENT

We **ELA, spol. s r.o.**
Mikulovská 1, 628 00 BRNO, Czech Republic, ID: 46969063, VAT: CZ46969063

declare herein as the producer, on one's own responsibility that

product: „Magnetic-inductive flowmeter, type „**MQI**„
description: magnetic-inductive flowmeter is intended for total liquid volume measurement, and as a working or certificated meter or as an integral part of heat meters

is in compliance with the following technical standards:

| | | |
|------------------|------------------|-------------------|
| ČSN EN 61010 - 1 | ČSN EN 61326-1 | ČSN EN 61000-4-5 |
| | ČSN EN 61000-4-2 | ČSN EN 61000-4-6 |
| | ČSN EN 61000-4-3 | ČSN EN 61000-4-8 |
| | ČSN EN 61000-4-4 | ČSN EN 61000-4-11 |

and with the following government directives, in wording of the subsequent by-law and EU regulations :

| | |
|---------------------------------------|------------|
| GD 17/2003 Coll. of validity wording | 73/023/EEC |
| GD 18/2003 Coll. of validity wording | 89/336/EEC |
| GD 464/2005 Coll. of validity wording | 32004L0022 |

The **CE** mark has been assigned to the product since year: 04
Issued in : Brno

Ing. Milan Vlček
Director of Company
Signature :

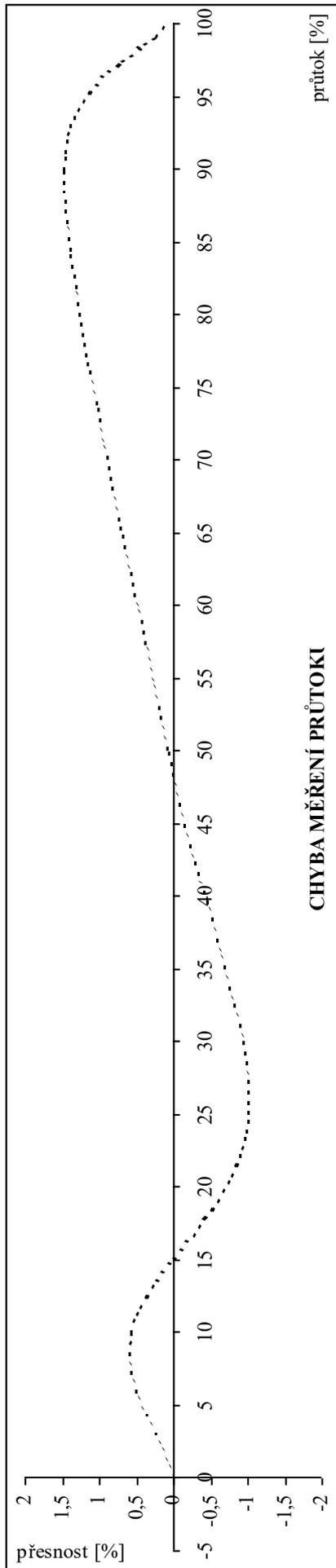


Date of issue: 1.1.2007

ELA, spol. s r.o.
Work shop
Sokolova 32
619 00 Brno, Czech Republic
Tel: +420 543 214 755, +420 543 214 782
Fax: +420 543 214 755

ID: 46969063
VAT: CZ46969063
Bank: KB Brno-město
Account No.: 7218440297/0100





Adjustment protocol

Customer:

Measuring site:

Serial number:

Measurement range:

ČMI certificated meter

Test room:

Sensor DN: mm
 Sensor PN: MPa
 Sensor electrodes: stainless steel
 Sensor: lining: rubber
 Sensor: max. temp. °C
 Sensor: cable length 10 m
 Sensor elect. protection IP
 Sensor measured medium water
 Sensor exciting current [mA]

Converter type

Outputs:

Converter forced current :

Converter relay 1

Converter relay 2

Converter relay 3

Converter relay 4

Converter data line

Calibrated by :

Date:

Constant :

Note:

Warranty:

Instrument:

Serial number:

Dispatch date from storehouse:

Commissioning:

Date:

Company:

The manufacturer warrants that the instrument corresponds to Technical Specifications, and to be free from defect in workmanship and material and complete. During installation and commissioning, all hints that are presented in Technical Specifications and related norms and safe work rules must be met. The supplier is fully responsible for completeness and proper product operation. The customer during the acceptance of product must check the completeness.

The manufacturer does not warrant – before the warranty period will elapse – for damages caused by improper or unqualified operation or using the flowmeter under such conditions that do not correspond to those given in Technical Specifications. The manufacturer reserves to perform all warranty and after-warranty repairs. For warranty repairs, please submit your warranty sheet.

If the conditions presented in both Technical Specifications and Warranty are met, the warranty period is twelve months from the date of commissioning by the manufacturer or another authorised company, however at most 18 months from the date of shipment to the site.

Flowmeter repair:

Date:

Company:

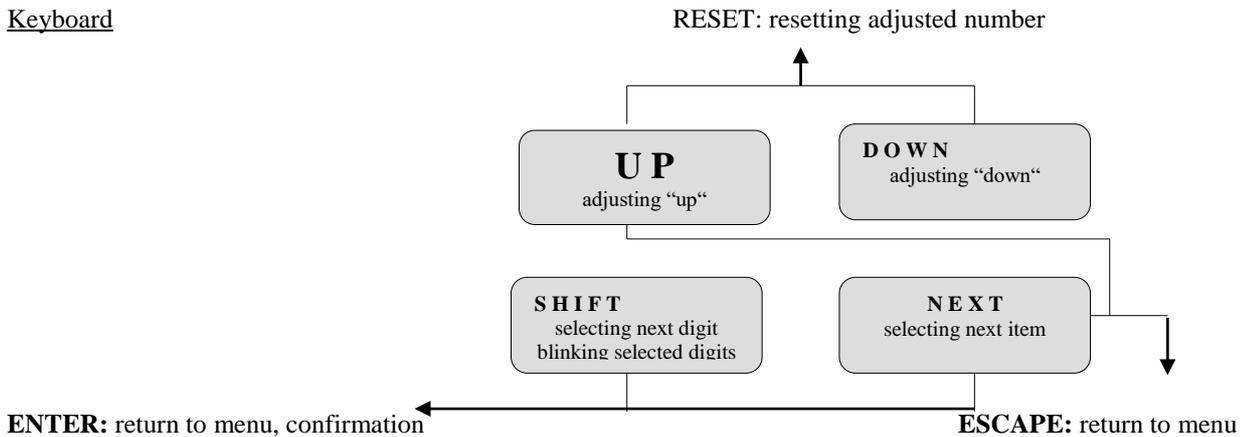
Flowmeter repair:

Date:

Company:

Instructions for use:

Keyboard



S + Q menu description – user mode:

S + Q - Displaying current flow in both directions, total volume in both directions, closing a relay. Individual items can be selected in **MAIN** menu, **Display** box.

RUN menu description – measurement mode, reading the statistic data:

Standard view - Moving from user mode and return.
Q(t) record - Recorded 5-minute average flowrates.
H-statistics - Hourly statistics: total volume, operational time and flowmeter failure time.
D-statistics - Daily statistics: total volume, operational time and flowmeter failure time.
M-statistics - Monthly statistics: total volume, operational time and flowmeter failure time.
Date/time view - Displaying date and time.
Password check - Password check point – see explanations on page 11.
Version - Instrument type and program version.

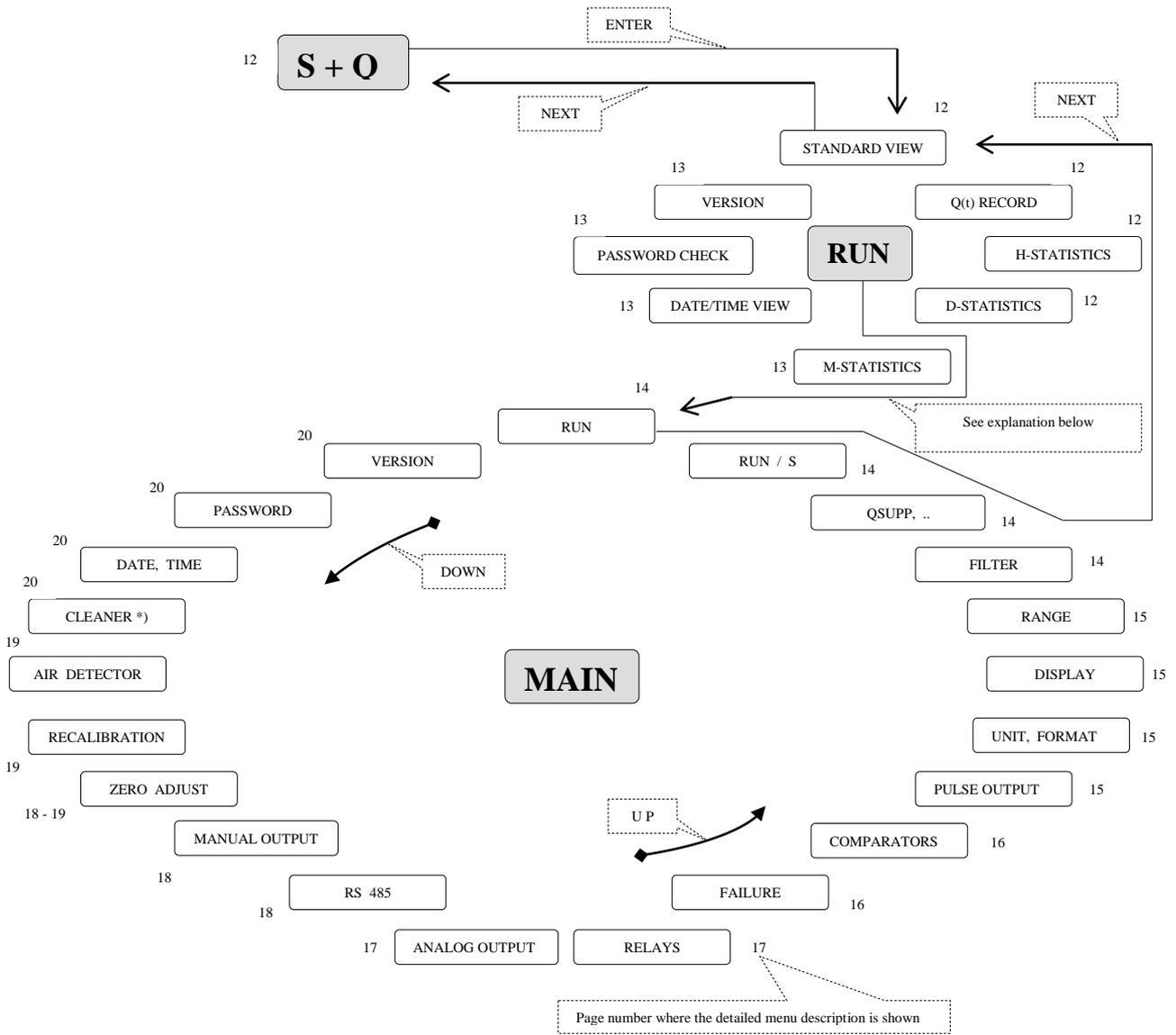
MAIN menu description – instrument adjustment:

Run - Moving to measurement mode, reading the statistical data and return.
Run / s - Running in service mode (intended for installing and testing the instrument).
Qsupp, .. - low flow rejection limit, identifying positive flow direction, *measurement delay after switching on.*
Filter - *filtration constant and filter delay.*
Range - *current flow range.*
Display - time parameters that display the individual quantities, displaying individual quantities.
Unit, format - flowrate unit Q and format of displaying the quantities Q, S+ and S- .
Pulse output - pulse output for the external counter, total volume per one pulse, pulse width.
Comparators - four flow comparators with 4 modes, static or pulse mode.
Failure - intended for future checking status parameters.
Relays - assigning the functions for relays 1 to 4, external counter pulse output, 1 to 4 comparator outputs, failure, aerating the sensor.
Analog output - assigning output quantity, output range, nominal current (0-20, 4-20, 0-5, 0-10 mA), extending current range above the upper limit of nominal current (e.g. up to 24 mA), negative output range.
RS 485 - entering transmission line parameters (ELA factory protocol).
Manual output - manual control (testing) of 1 to 4 relays, current and frequency outputs.
Zero adjust - *adjusting device zero point: performed during calibration in factory, after installation can be completed.*
Recalibration - *adjusting parameters of automatic internal recalibration in the measurement mode.*
Air detector - *adjusting detection parameters of empty piping .*
Cleaner - *cleaner hardware is not present by MQI 99, therefore cleaner mode must be left off.*
Date, time - adjusting the date and time: for initialisation press only NEXT key and hold for 3 seconds.
Password - adjusting the service password, see explanations on page 11
Version - instrument type and program version.

CAUTION:

The description in the MAIN, menu written in *Italics* should not be changed. The parameters are preset with respect to the given location and the sensor type.

Graphic structure of individual – M Q I 99 menus :



*) Cleaner hardware is not present by MQI 99

Explanations about service password:

1. Service password is defined by following parameters: MAIN \ Password \ Password.
If Password is set to 0000 (Zero) then password is off and MAIN menu is always ready to open.
2. Password check point is located at: RUN \ Password check \ Password check.
3. Moving from RUN menu to MAIN menu can be done by pressing ENTER anywhere while:
(Password = 0000) or (Password check = Password)

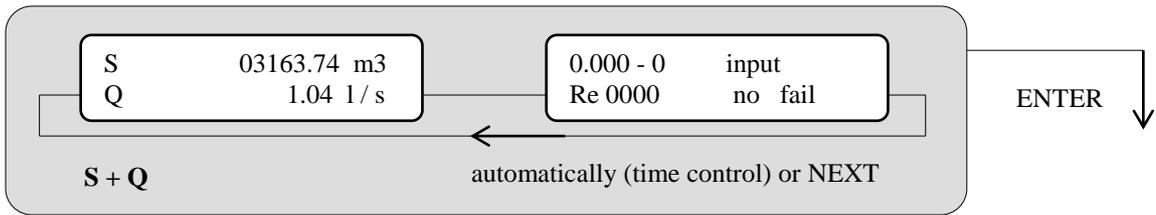
WARNING:

In order to disable the MAIN menu access after completion of setting process, user must clear (i.e. set to 0000) the Password check item !!

Instructions for use – detailed menu descriptions:

S + Q – user mode:

The program identification and the program version will be displayed during the first three seconds after switching on the instrument. The individual screens of selected quantities will alter (in preset time intervals) automatically after the elapse of a 3-second interval, pressing the NEXT button may also alter the screens. The screens and the intervals may be selected in the MAIN menu, and Display screen.

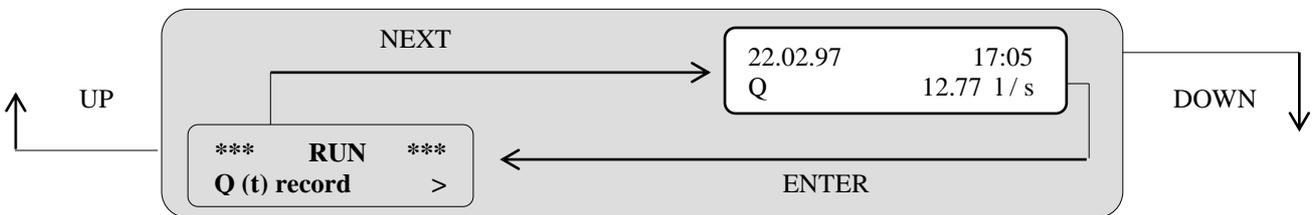


Standard view – moving from the user mode and return: The measurement is proceeding.



Q (t) record – recording 5-minute average flowrates Q: The measurement is proceeding.

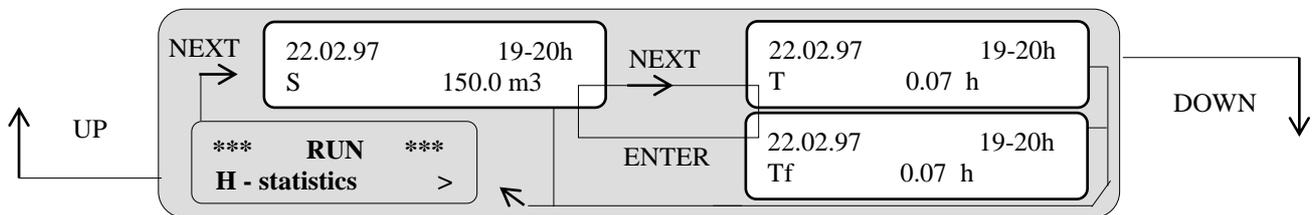
Key functions – UP or DOWN - selection in 5-minute steps, UP+DOWN resets hours and minutes, SHIFT+UP or DOWN - selects the days.



H-statistics – hourly statistics: total volume S, measurement time T and failure time Tf for every hour:

The measurement is proceeding.

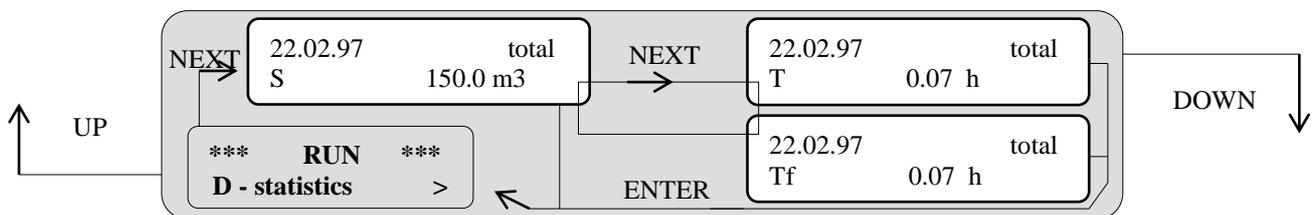
Key functions - UP or DOWN, selection in hours, UP+DOWN resets the clock, SHIFT+UP or DOWN selects the days.



D-statistics – daily statistics: total volume S, measurement time T and failure time Tf for every day:

The measurement is proceeding.

Key functions - UP or DOWN, selection in days, SHIFT+UP or DOWN, selection in months. **D-statistics - denní statistika:**

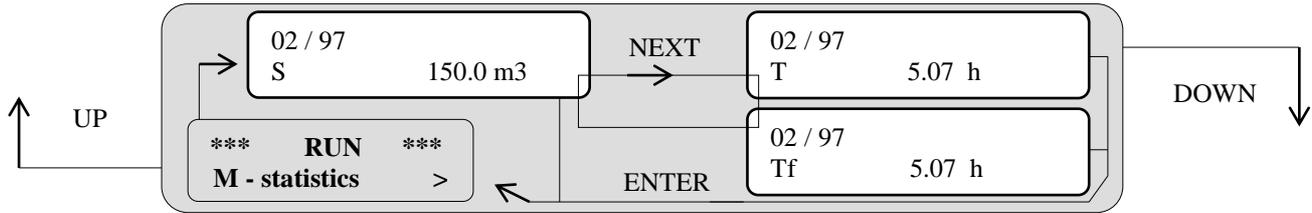


Instructions for use – detailed menu description:

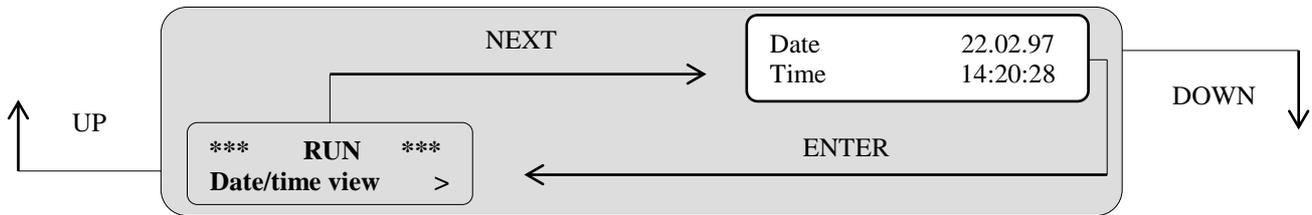
M-statistics – monthly statistics: total volume S, measurement time T and failure interval Tf for every month:

The measurement is proceeding.

Key functions - UP or DOWN selection in months.



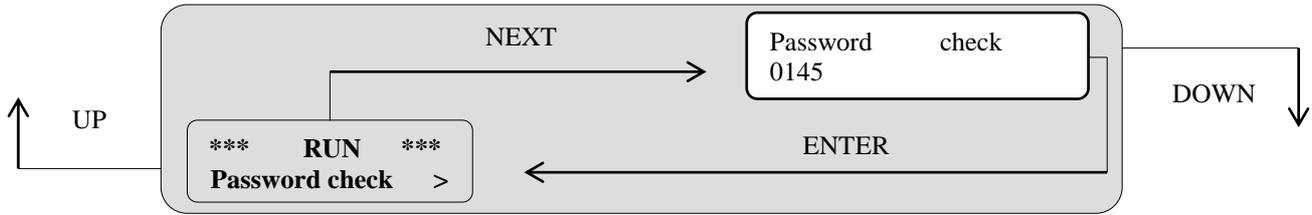
Date/time view – displaying the date and time: The measurement is proceeding.



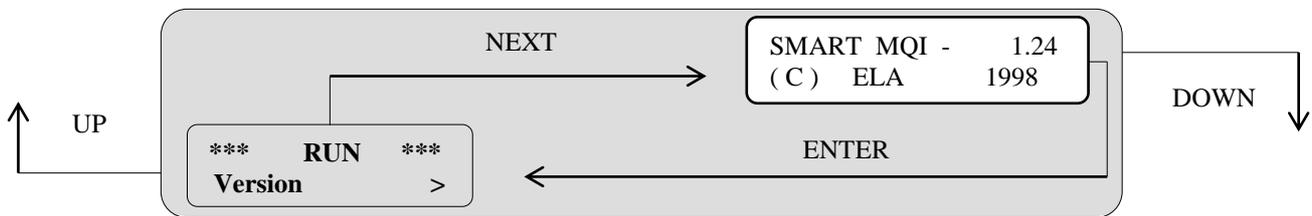
Password check – see explanation on page 16 below.ng.

The password is necessary for moving from RUN to MAIN. The access code for moving in the device menu is set in the factory usually to the value of last three digits of the flowmeter serial number. For example the serial number is 97145 – then the password = **0145**.

Key functions - SHIFT selecting the next digit (selected digits are blinking), UP or DOWN selecting the numbers.



Version – the instrument type and program version: The measurement is proceeding.



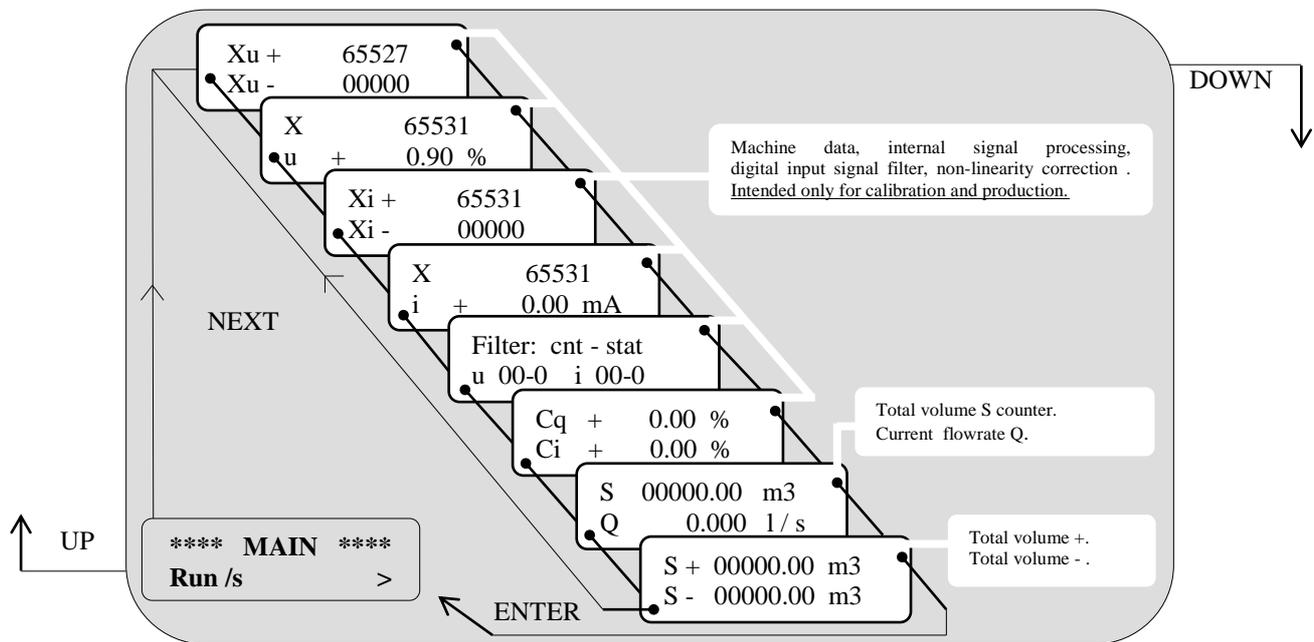
Instructions for adjustment – detailed menu description:

Run – moving to the measurement mode and return:

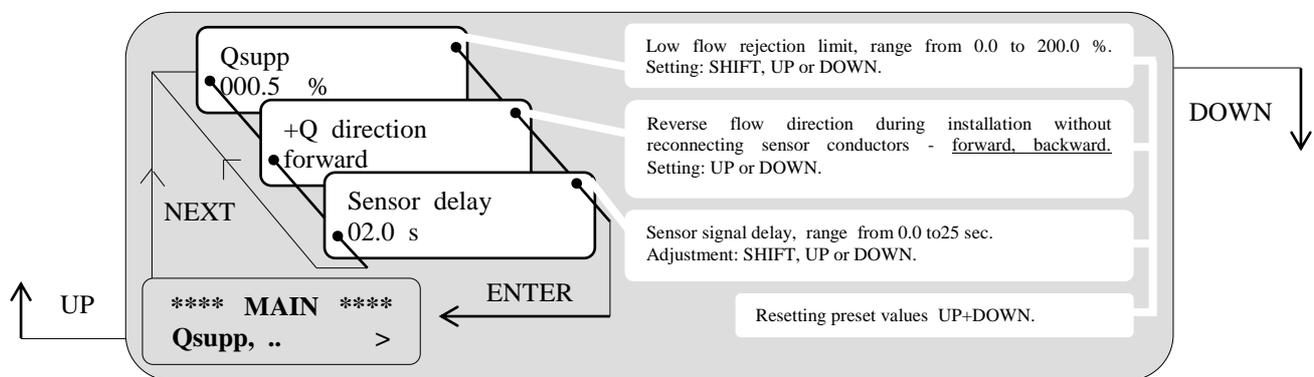


Run /s – the measurement process in the service mode:

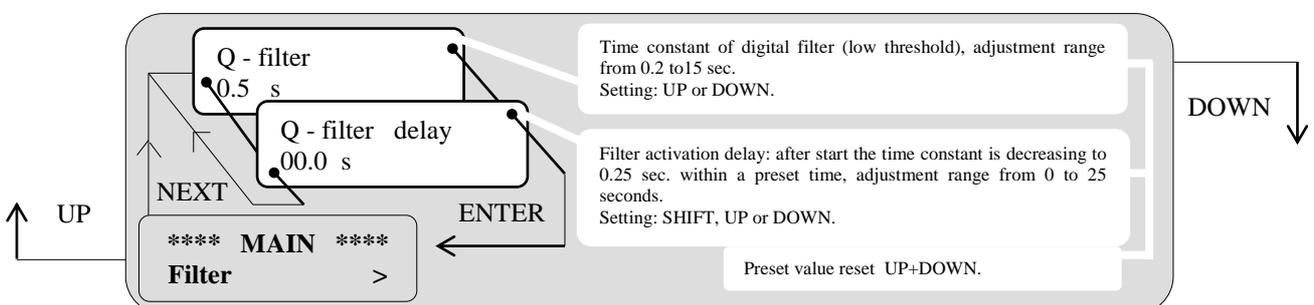
This is intended for installing and testing the device. The measurement process is launched in the service mode by pressing the NEXT key. The proper measurement runs in the same way as in the user mode, however the method of displaying the quantities on the screen is modified according to service control. Eight screens can be scrolled on the display by pressing the NEXT key.



Qsupp, .. – low flow rejection limit, identification of positive flow direction, measurement delay after starting the flowmeter:

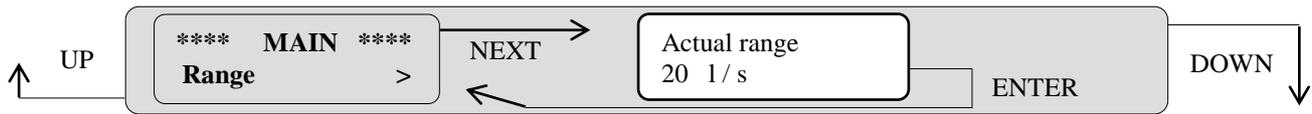


Filter – these parameters must not be changed without consultation with producer:

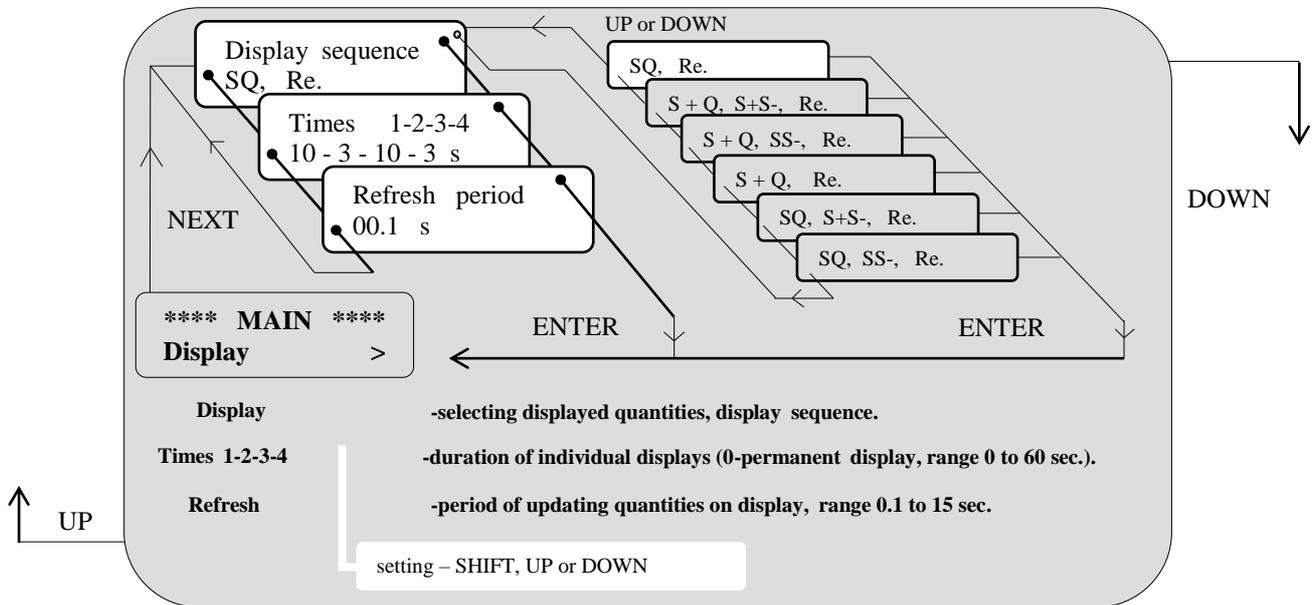


Instructions for adjustment - detailed menu description:

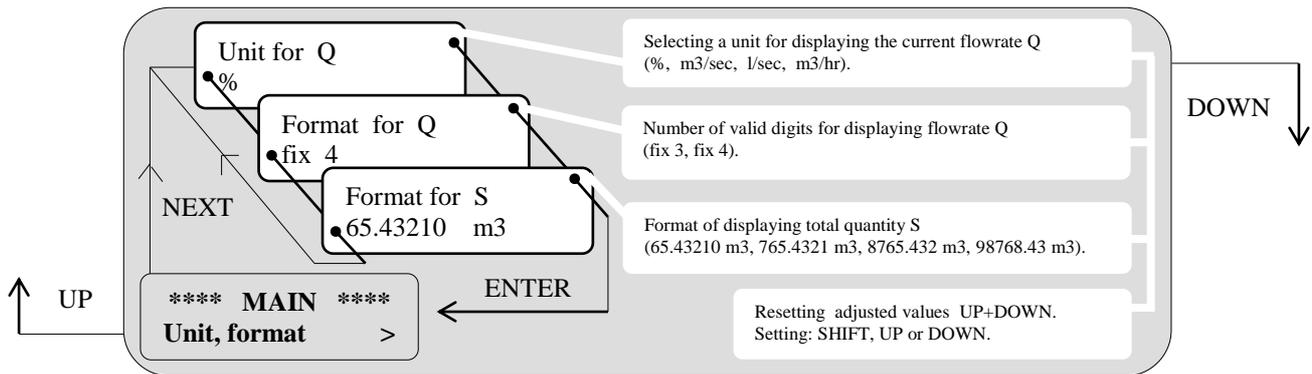
Range – current flowrate range: *however the instrument operates up to 200 percent of this value!*
Must be not changed without consultation with producer !



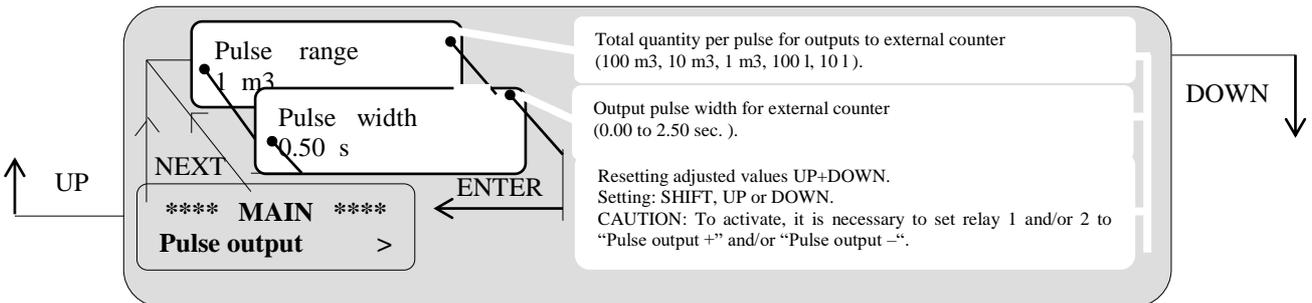
Display – time parameters displaying individual quantities, format of displaying individual quantities:



Unit, format – flowrate unit Q and format of displaying quantities Q, S+ and S-:

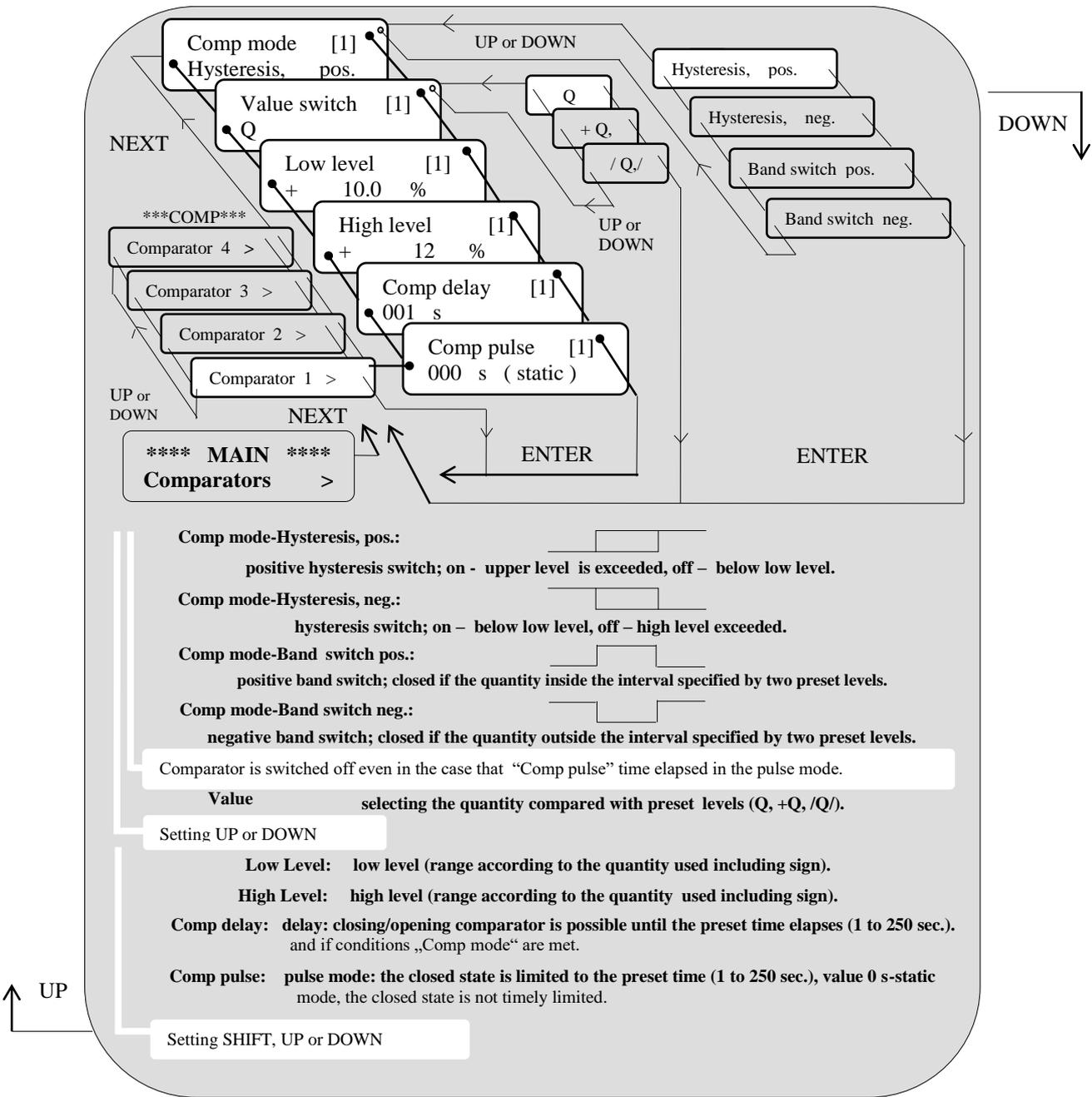


Pulse output – pulse output for external counter, total quantity per 1 pulse, pulse width.



Instructions for adjustment - detailed menu description:

Comparators – four flow comparators with 4 modes, static and/or pulse modes are available:



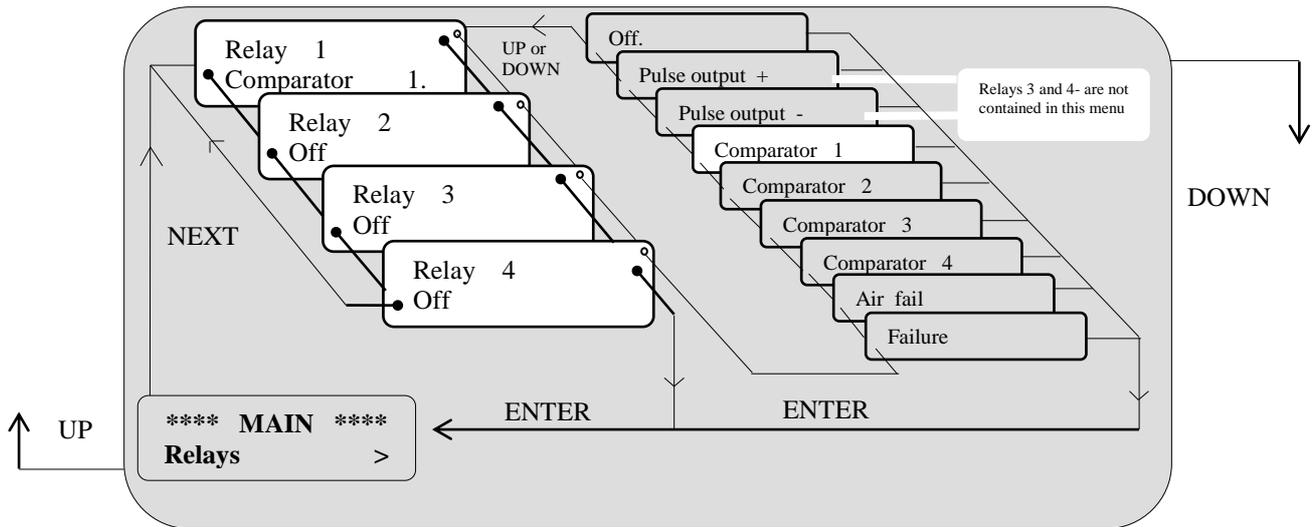
CAUTION: In addition to setting the quantities in compliance with the above-mentioned table, it is necessary to select a relay in „Comparators 1 to 4“ mode. Otherwise the comparator has no effect on M Q I 99 outputs.

Failure – intended for a future parameter extension that will control the status:

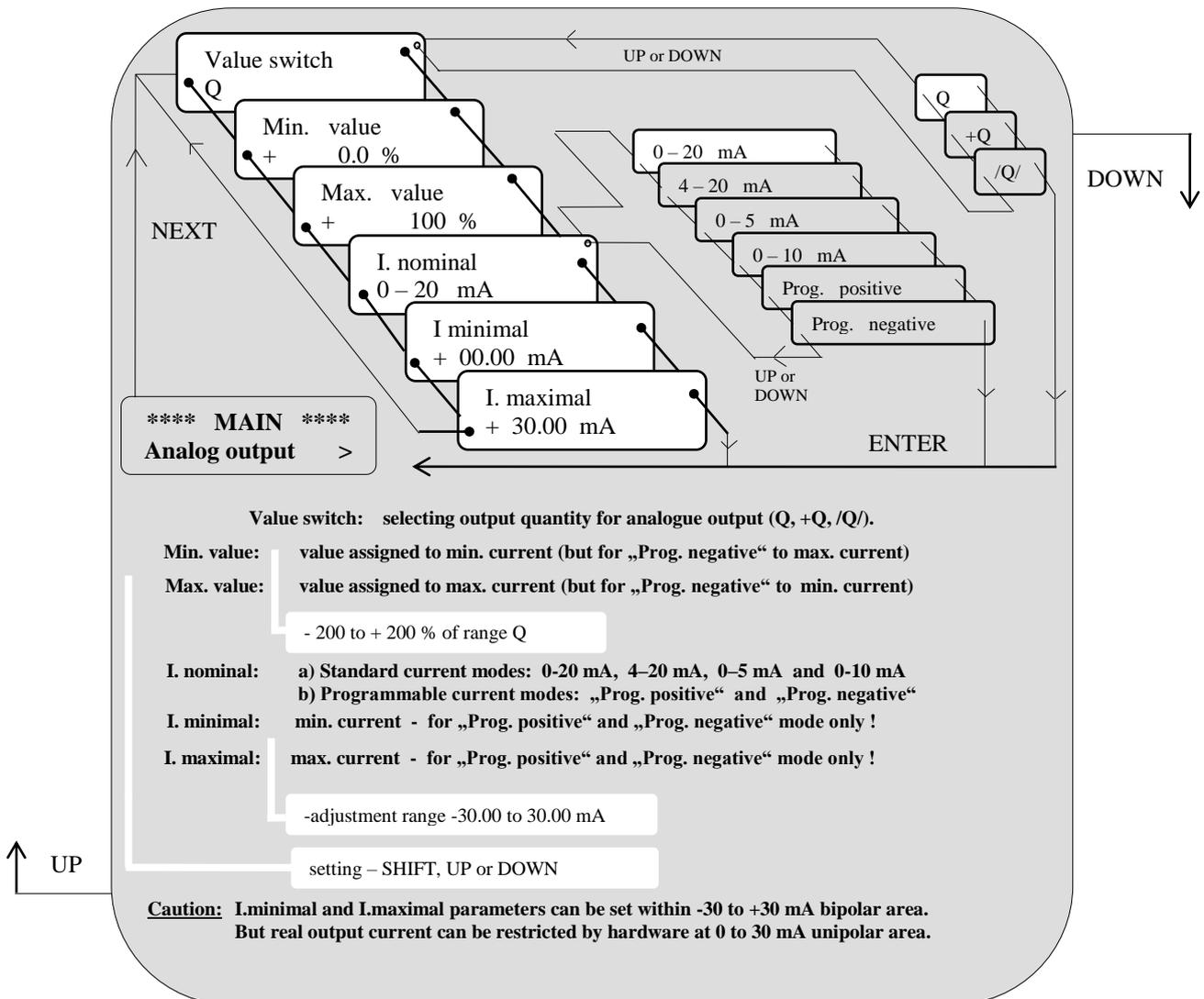


Instructions for adjustment – detailed menu description:

Relays – assigning the functions for relay 1 to 4, pulse output for external counter, 1 to 4 comparator output, sensor failure and sensor aeration:



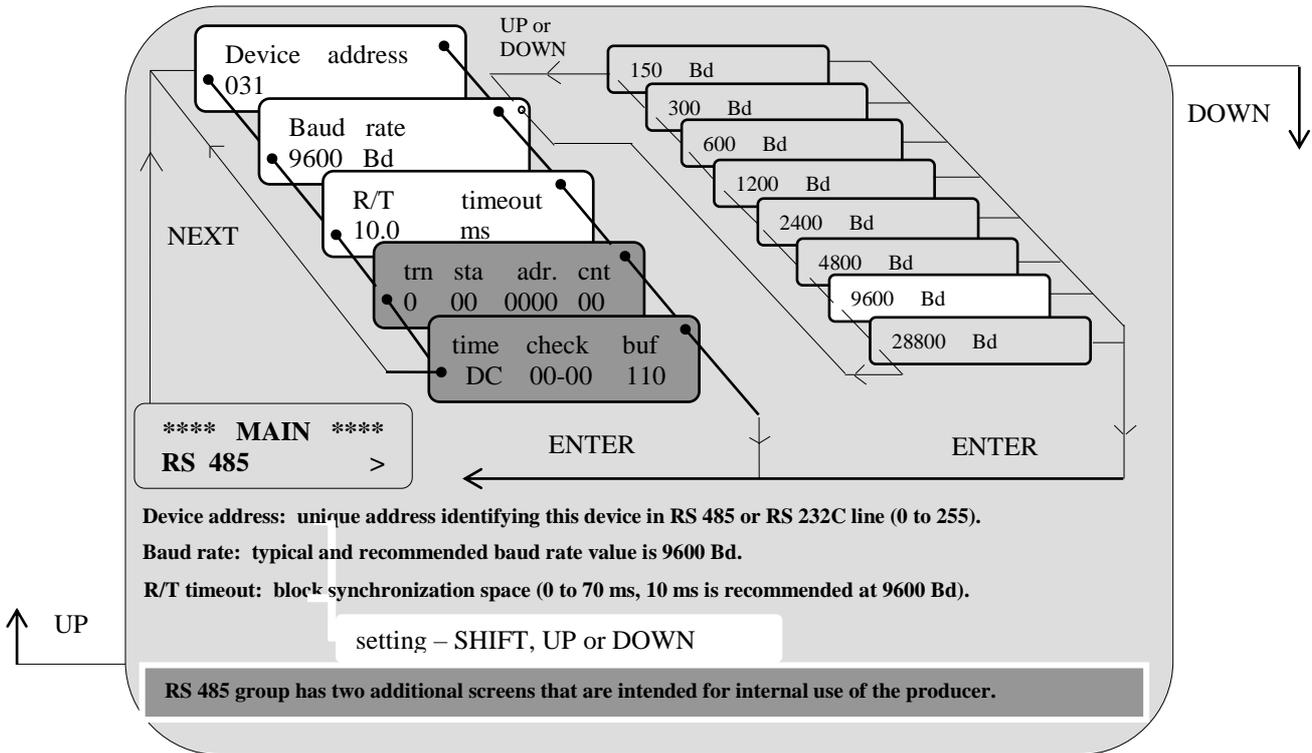
Analog output – assigning output quantity, output range, nominal current, current range extension:



Instructions for adjustment - detailed menu description:

RS 485 – parameters for RS 485 or RS 232C communication port:

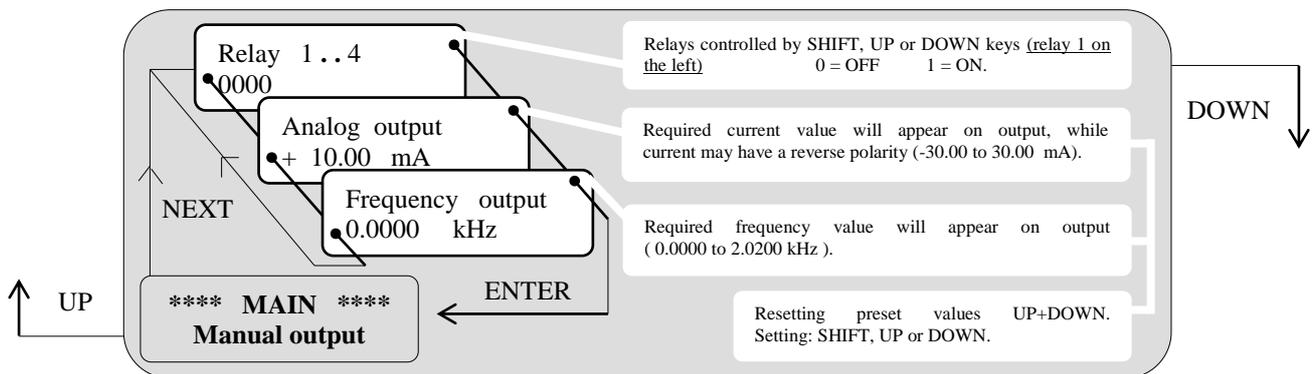
Device communication port serves for transfer of basic device quantities (Q, S, S+, S-, status informations) and all statistics memory contents. It uses „ELA-2“ special factory communication protocol described in programmers manual „ ELA-2 Protocol and its use ...“ (not commonly shipped).



Warning:

In order to ensure correct function of communication and data acquisition process, any device inside network or database group must have unique Device address. It is necessary for any line standard (RS 485, RS 232C or other).

Manual output – manual control (testing) of 1 to 4 relays, and current and frequency output:



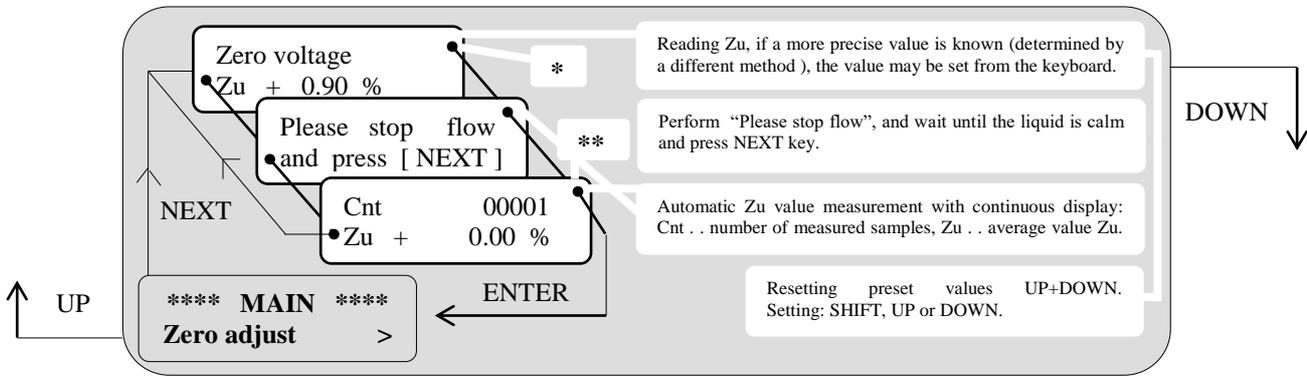
Caution: Manually set (requested) output current value is within -30 to +30 mA bipolar area. But real output current can be restricted by hardware at 0 to 30 mA unipolar area.

Zero adjust – setting the zero point of the device, performed during calibration in factory, any readjustment during installation is possible:

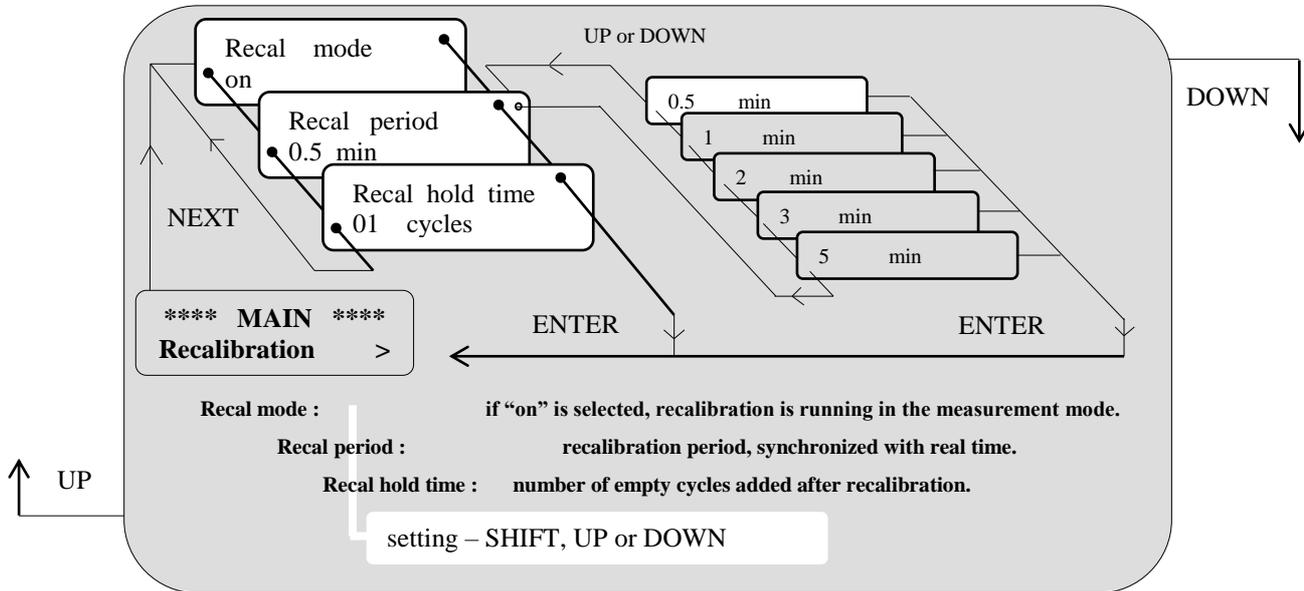
Consult the manufacturer if you want to change zero adjust. The adjustment is given by the quantity value Zu [%] that can be measured or set from the keyboard.

Legend to the following graphics:

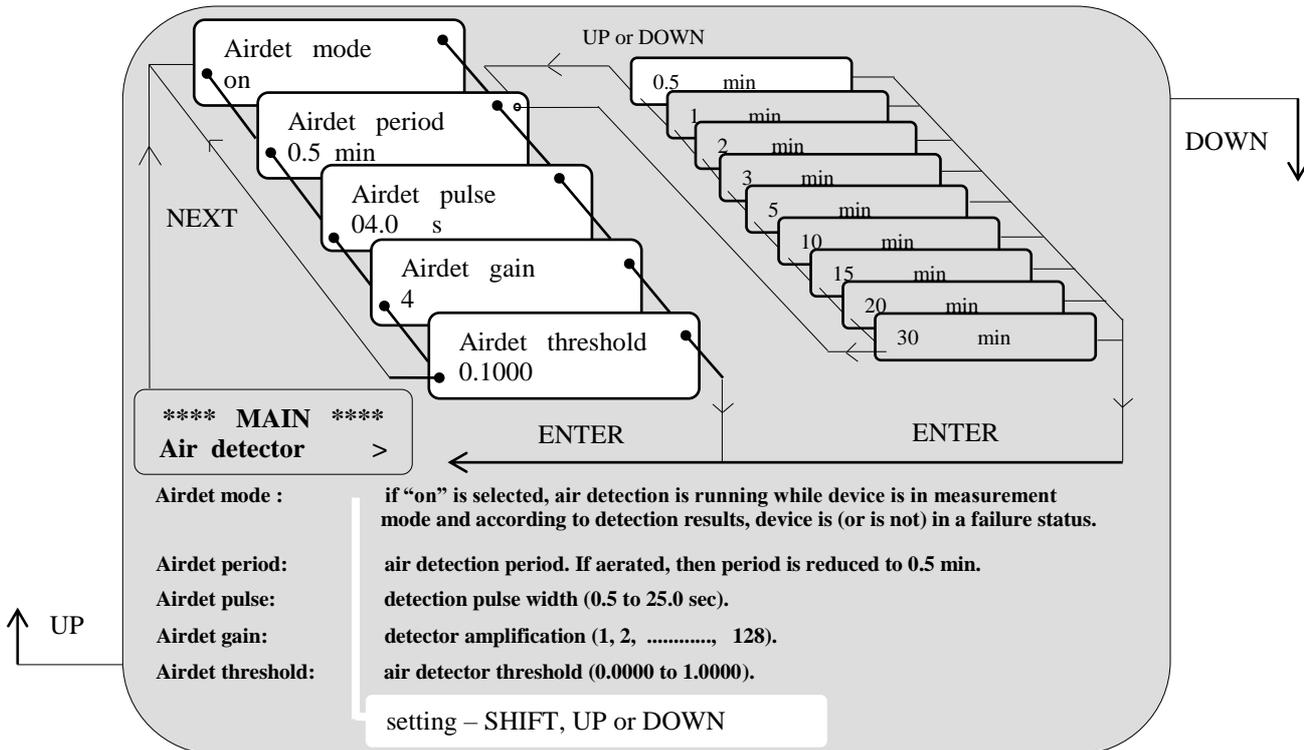
- * Press NEXT key in the case that the Zu value should be measured, otherwise use ENTER or ESCAPE to return to menu.
- ** The measurement is completed automatically when the preset number of samples (limit) has been measured (this number of samples is optimised in the factory). Only in an emergency, should pressing NEXT or ESCAPE key from the keyboard be used to interrupt the measurement.



Recalibration – consult the manufacturer if you want to change these settings.

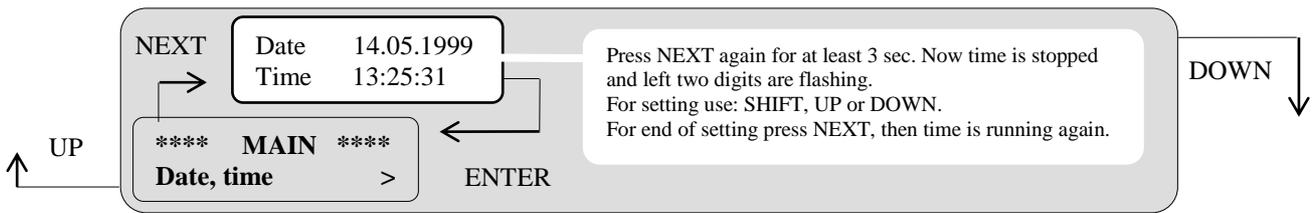


Air detector – consult the manufacturer if you want to change these settings.

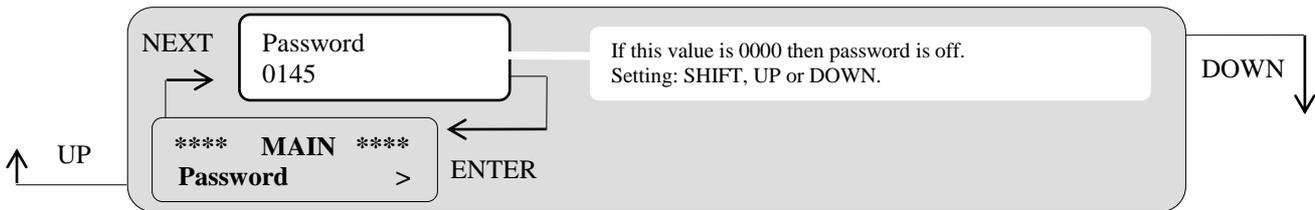


Cleaner – cleaner hardware is not present at MQI 99.
Therefore cleaner mode must be left off.

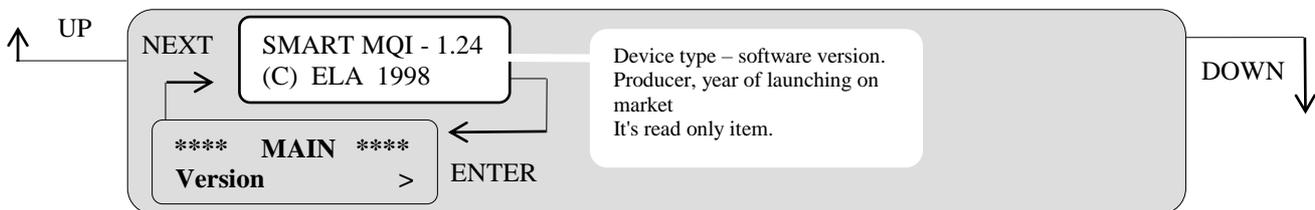
Date, time – setting the date and time, for initialisation press NEXT key and hold for 3 sec.:



Password - setting the service password (see explanation on page 11 below)

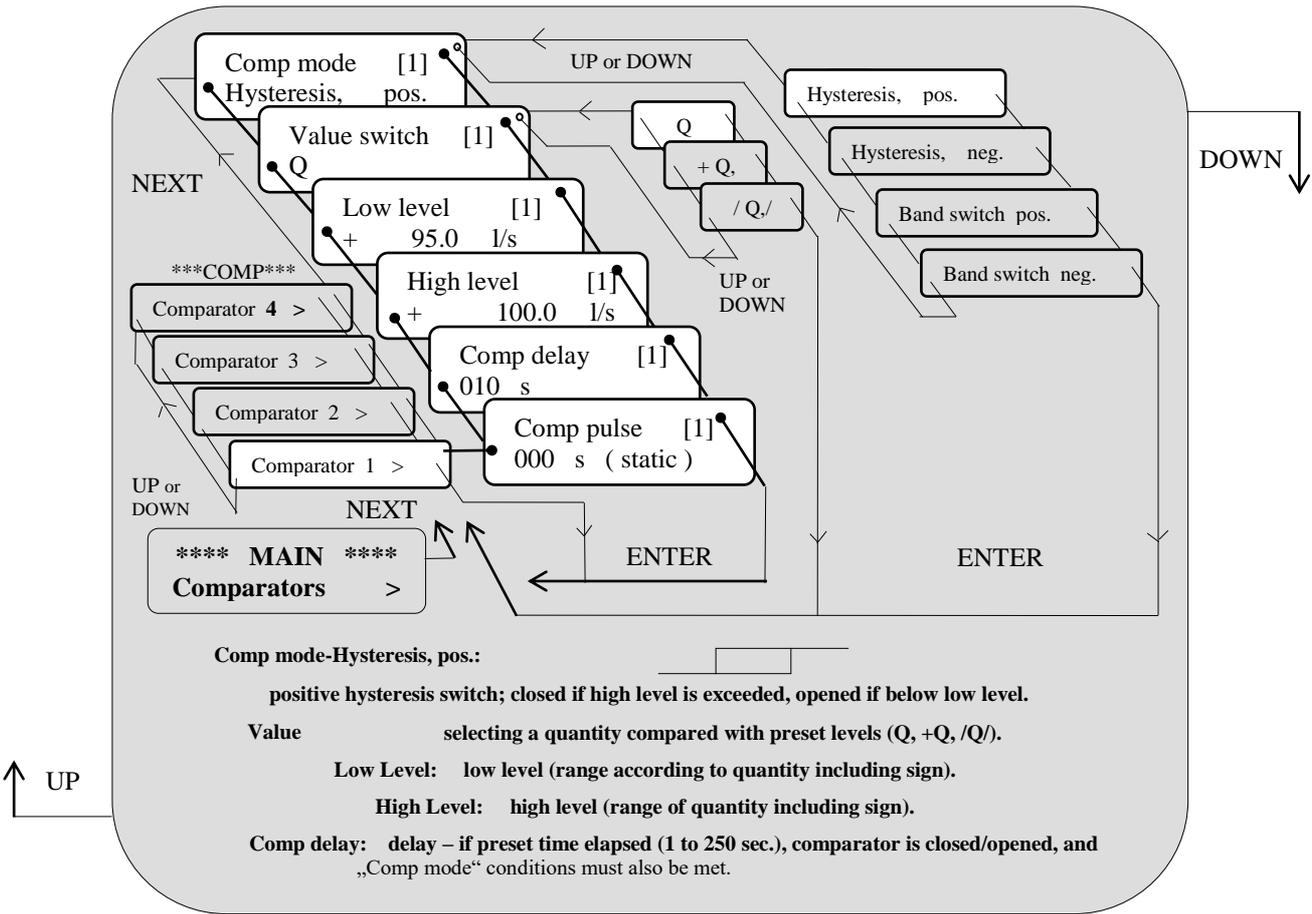


Version – device type and program version:



Example:

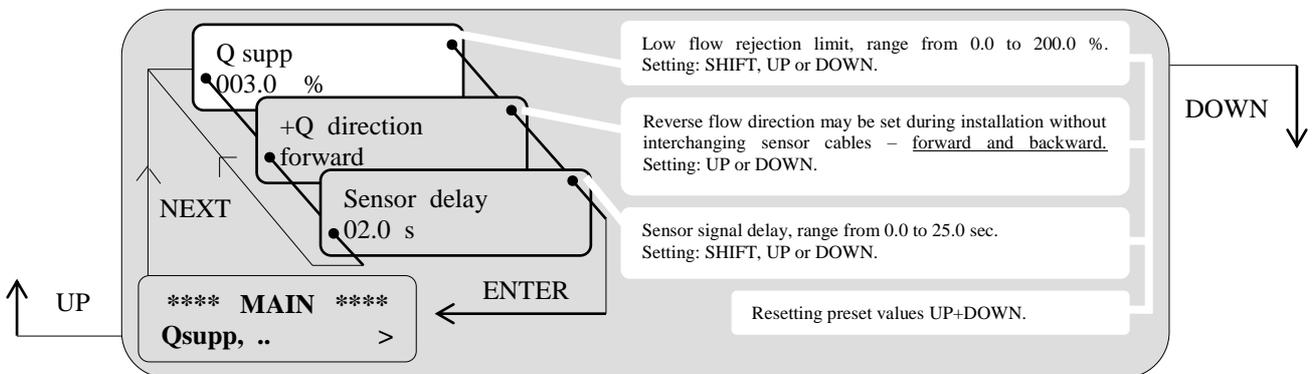
If flow is higher than 100 l/sec., it is necessary to close a relay contact in the M Q I 99 unit. Adjust the following parameters:



Relay 1 – for Comparator 1 must also be assigned in the **Relays** menu to the preset comparator. The preset comparator including the assigned relay will close/open relay 1 if current flowrate exceeds 100 l/sec. with a preset delay of 10 sec. The closed relay 1 will open if flowrate reduces below 95 l/sec. with a delay 10 sec.

Example:

The flowrates below the low limit of up to 3 percent of the range must be blocked (i.e. sneak flowrate). Adjust the following parameters:



The preset low limit will prevent to measure in a range lower than 3 percent for a flowmeter (including the counter integration).

All other corrections and adjustment of M Q I 99 device may be carried out similarly according to the instructions for adjustment.



Smart MQI - Data Acquisition Software

Smart MQI Data Acquisition Software provides following support for MQI 99 magnetic-inductive flowmeters:

- Online monitoring** ► of status and main measured values (current flow, total volume counters in both directions, ...) of connected flowmeters, see **Transfer** panel
- Statistic data transfer** ► from flowmeters to PC database file, see **Transfer** panel
- Statistic data outputs** ► from PC database file to PC display, printer or to exporting CSV files, see **Statistics** and **Flow** panels

TRANSFER PANEL

Statistic data transfer

Transfer panel serves for statistic data transfer from flowmeters statistics memory to PC database file, which is accessed by **Statistics** and **Flow** panels for displaying, printing and exporting process.

Online monitoring

Other function of this panel is online monitoring of status indicators and main measured values:

- **Measuring:** "Measuring process active" indicator
- **Fail:** "Air in the pipe" failure indicator
- **Relay 1 to 4:** Relay status indicators
- **Q:** Flow in this time, **in l/s, gallon/s or UK gal/s**
- **S:** Total bidirectional volume in m^3 ; $S = (S+) - (S-)$
- **S+:** Total forward direction volume in m^3
- **S-:** Total backward direction volume in m^3

STATISTICS PANEL

This panel serves for managing the output functions of following statistic values:

- **Measuring [h]** operating time (for tables only)
- **Failure [h]** air in pipe failure duration (for tables only)
- **S+ [m^3]** forward direction volume
- **S- [m^3]** backward direction volume
- **S [m^3]** bidirectional volume, $S = (S+) - (S-)$

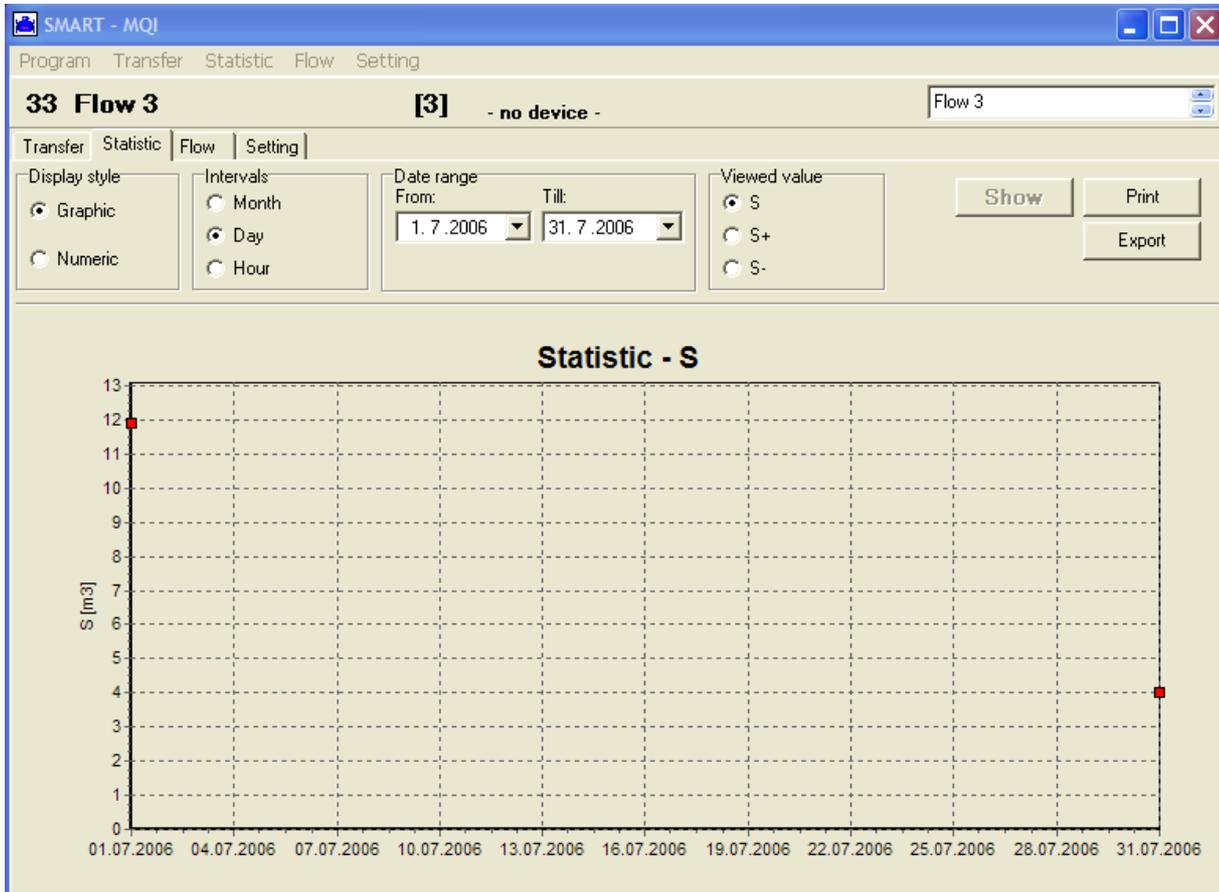
Output function are started by following keys:

- **Show** Displaying of graphs and tables
- **Print** Printing of graphs and tables
- **Export** Exporting to CSV format files (for EXCEL or other software)

Graphs, tables and exporting files are organized in time slices, according to time slice switch alternatives:

Month / Day / Hour.

Every table line includes day of week, date, time and five above listed values for respective time slice. Below any output table column sum values and **minimum** and **maximum** values (with respective date and time informations) are added.



FLOW PANEL

This panel serves for managing the output functions about Q(t) record (exactly: 5-minute arithmetic mean values of flow). Output functions and keys are the same as at Statistics panel.

Below any output table minimum and maximum values (with respective date and time informations) are added.

Recommended PC configuration (at least):

- PC Pentium 133, 64 MB RAM, 100 MB hard disc free space
- Windows 98 SE operating system
- Internet Explorer 5.5
- Communication port: COM (RS 232C or RS485) port or USB (1.1 or 2.0) port
- Virtual port driver, while using USB port
- Respective connecting cable and/or line converter for correct connection between PC communication port and flowmeter interface, which may be of RS232C or RS485 standard - see Smart MQI User Manual for details about converter type and settings

Language List

When starting the Smart MQI Data Acquisition Software user can choose among following languages: English, Czech, French, German and Spanish.