Valmet Kappa Analyzer – Valmet Kappa QC

Installation manual

K03302 V1.5 EN

Valmet FORWARD

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Technical specifications

Warnings & safety information

Always check input voltage & frequency before making any connections. Incorrect connections will damage the equipment! Always follow the applicable electric safety regulations in all installation work!

Before replacing any parts, first make sure that the device is powered off, and that the water and air supply lines are shut off.

During installation, maintenance and service operations, remember that the sample line may contain hot sample or water – be careful!

Only trained, authorized service personnel may service the analyzer.

Analyzer's measurement loop is pressurized during measurement (pressure > 2 bar / 29 psi)!

Sulphur water or sodium bisulphate are used as neutralization chemical. These chemicals are corrosive! Handle with care, and follow the safety instructions provided by the chemicals supplier.

Before starting the analyzer, make sure that the pump contains water - running dry will damage the pump!

First aid measures:
Take the patient to a hospital immediately if
- the patient has difficulty breathing,
- the patient has convulsions, or
- the patient is unconscious.

If no immediate symptoms are observed, give first aid on the spot as instructed below:
- After ingestion: Do NOT induce vomiting! Find out if vomiting is necessary, recommended, or harmful; this is dependent on the chemical in question! In most cases taking medicinal carbon is the primary cure, however NOT if some corrosive chemical has been ingested.
- After contact with skin: Immediately rinse the contaminated area thoroughly with plenty of lukewarm running water. Then wash with soap, rinse with water.
- Contact with the eyes: Immediately rinse the eye thoroughly with plenty of water, e.g. by pouring water from a glass into the eye. Continue rinsing for about 10 minutes. Do not use a strong hard shower that may damage the eye. If the substance is corrosive, rinse for at least 10-30 minutes and seek medical attention.
- After inhalation: Allow the patient to rest in fresh air.

After first aid measures seek medical advice!

1. Introduction

1.1. Analyzer's basic functions

Valmet Kappa Analyzer (Valmet Kappa QC) is a modular analyzer, with measurements selectable according to customer needs.

It measures various pulp properties from different parts of the pulping process, using the installed measurement modules (kappa number, brightness, shive/fiber properties). The analyzer uses the sweep measurement principle; the advantages of this method include speed and high repeatability. When a measurement is going on, the measuring loop is pressurized (2 - 4 bar) to dissolve any air bubbles that might otherwise disturb the measurement.

Sampling devices provide samples from the process pipeline. Up to 16 sample lines can be connected to one analyzer. The analyzer is also able to measure manual samples; the user pours these directly into the chamber. The device also contains a sample collector which which parallel samples can be collected for subsequent laboratory analysis.

1.2. Main parts of analyzer

The analyzer always contains the following parts:

– **Measurement unit** contains the sample preparation equipment ("wet part"). This unit contains the measurement and valve control electronics, the laboratory sample collector, and the selected measurement modules. One or two measurement units (cabinets) may be included.
– **Analyzer electronics box & connection box,** located in one end of the device. These boxes contain the main switch, fuses, main power supply, inverter(s), electronic boards, and electric connections. The connections and the number of installed boards are dependent on the number of modules.

Water and instrument air supply lines are brought into the device via the lead-through bushings on analyzer's left side. All cables are connected to the connection box.

1.3. Analyzer's modules

The measurement properties of the device are dependent on the modules installed to it. See Fig. 1.

One Cabinet model contains one measurement unit (A), the analyzer electronics box (B) and connection box (C). The measurement unit may contain a Kappa module, a Brightness module, or both.

Single Chamber measurement unit (Fig. 2) has only one chamber (washing chamber) where sample preparation and measurement take place. Dual Chamber measurement unit (Fig. 2) also contains a separate Sweep module, where the prepared sample is transferred for measurement. This enables faster operation, as the analyzer is able to prepare the next sample while the previous sample is still being measured.

The device may also be provided with a second measurement unit (D, option), either Single Chamber or Dual Chamber model. This Two Cabinet analyzer then contains two measurement loops.

The Fiber-Shive module (E, option) can be attached to both One Cabinet and Two Cabiner analyzers.

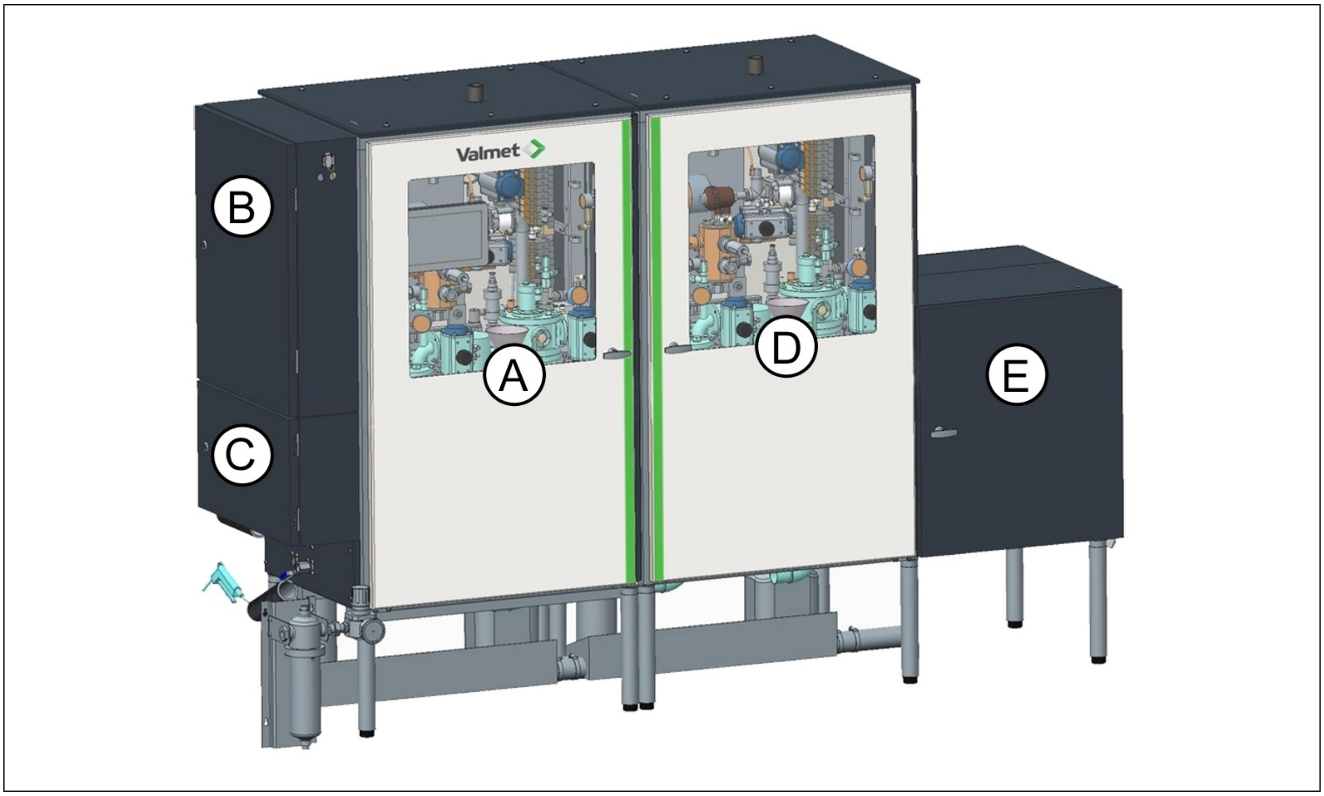


Fig. 1. Valmet Kappa QC: A - measurement unit 1, B - analyzer electronics box, C - connection box, D - measurement unit 2 (option), E - Fiber-Shive module (option).

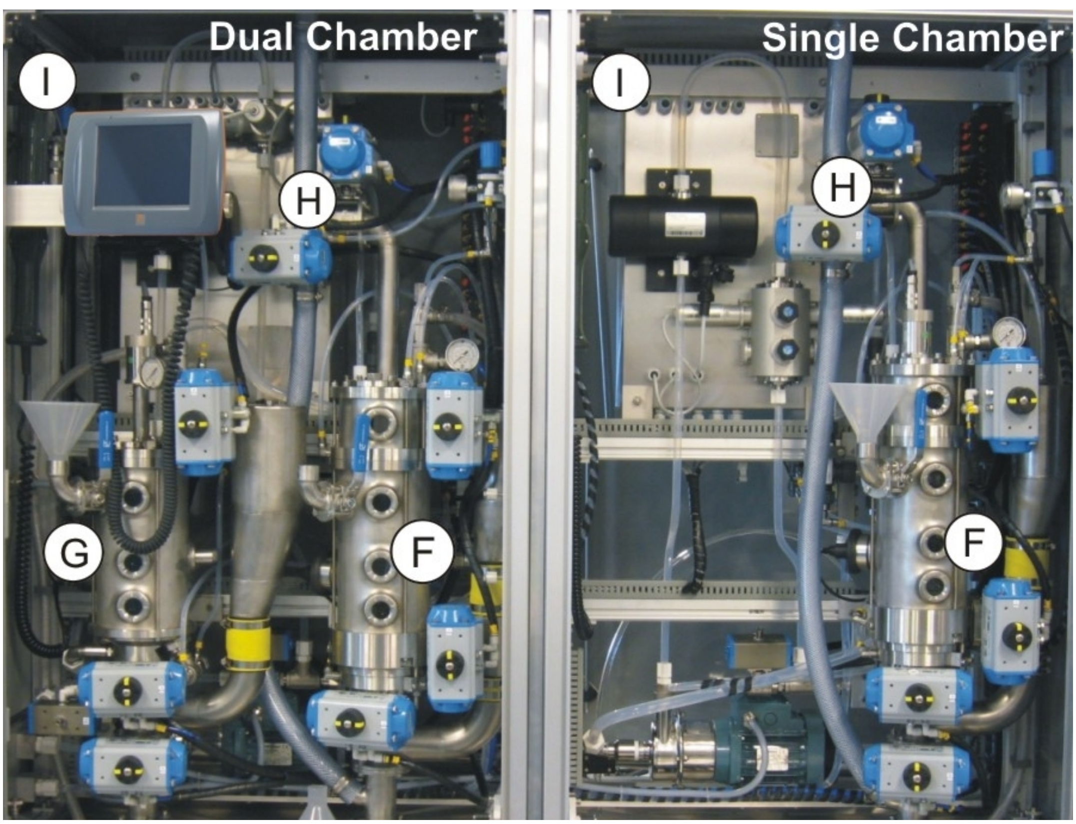


Fig. 2. Valmet Kappa QC: F - washing chamber, G - Sweep module, H - shive screen, I - connector for operating terminal.

1.4. Kappa and Brightness measurement

The analyzer measures pulp kappa number and brightness using an optical measurement principle (Fig. 3). The sample flows through a measuring cell that is illuminated with a Xenon lamp. Detectors (1) measure the scattering and absorption of light in the sample at different wavelengths.

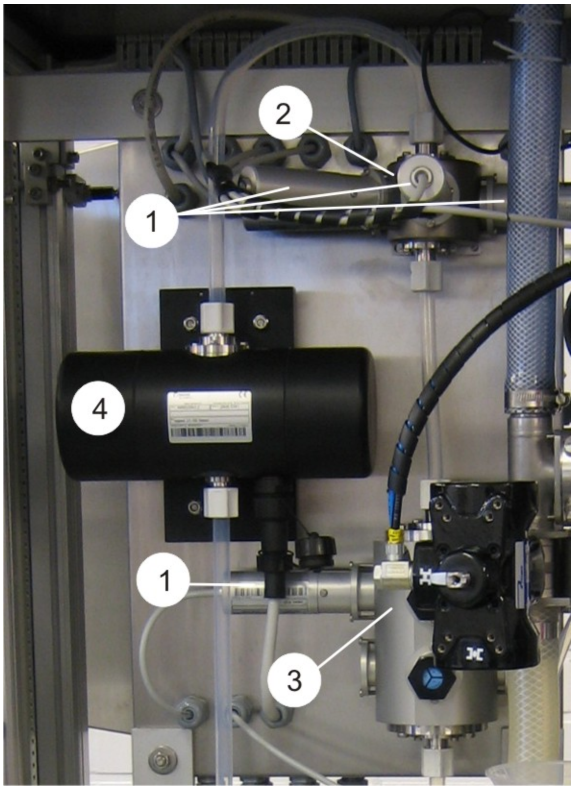


Fig. 3. Kappa and Brightness measuring cells, seen from the front side. 1 - detectors, 2 - Kappa measurement, 3 - Brightness measurement, 4 - LC100 consistency transmitter.

The kappa measurement cell (2) is used to determine pulp kappa number. The analyzer also monitors the cleanliness of the cell. Pulp brightness is measured in the Brightness cell (3). The measuring cells and light source are installed in the module electronics box, located in the measurement unit (Fig. 4).

The module electronics box contains sensitive optical components. Always keep the box closed and avoid opening it unless absolutely necessary - air impurities will contaminate the optics and measurement accuracy deteriorates.

After a consistency sweep, the values measured by the detectors are applied to calculate kappa number and brightness results.

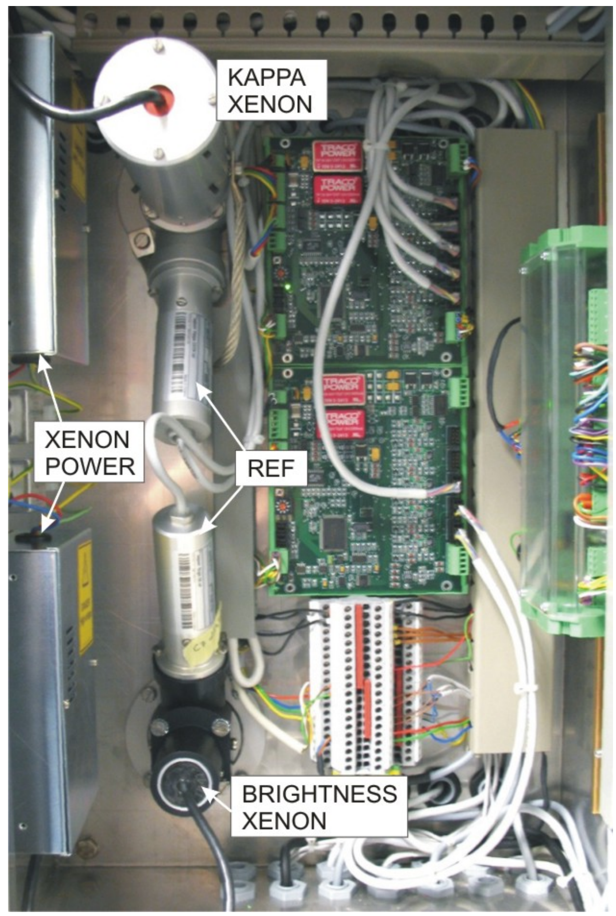


Fig. 4. Module electronics box, opened: Xenon Power = Xenon power supply, Xenon = Xenon lamp, REF = reference detector.

Note

2. Installation of analyzer

2.1. Installation site and preparations

Choose an installation point where the analyzer is easily accessible for operation and service. Place the analyzer in such a place that it can be expanded later on if necessary.

Fig. 1 shows how much space the different analyzer configurations need when the doors are opened. If necessary, the doors can be removed before installation and service works. Also make sure that the sample collector, located behind the analyzer, is easily accessible.

Manufacturer recommends making a concrete platform for the analyzer (Fig. 2). If the cleaning chemical tanks will be placed under the analyzer, leave suitable space for them in the platform, but in this case the platform must be so high that the tanks do not disturb the discharge connections or sample collector!

Fig. 3 - 4 show examples of how the analyzer can be placed.

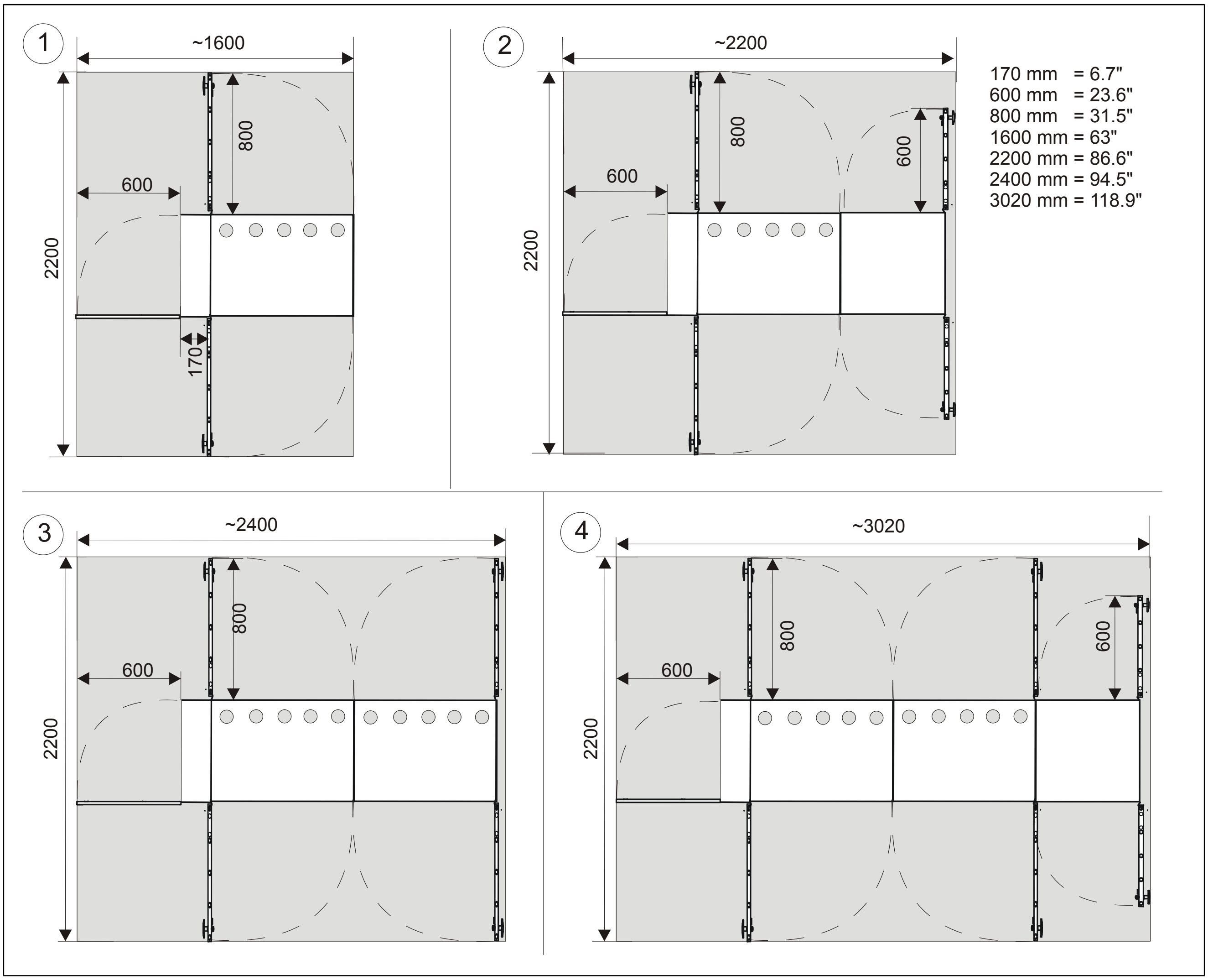


Fig. 1. Analyzer's space requirement when the doors are opened: 1. One cabinet (one measurement unit), 2. One cabinet + Fiber-Shive module, 3. Two cabinet (two measurement units), 4. Two cabinet + Fiber-Shive module.

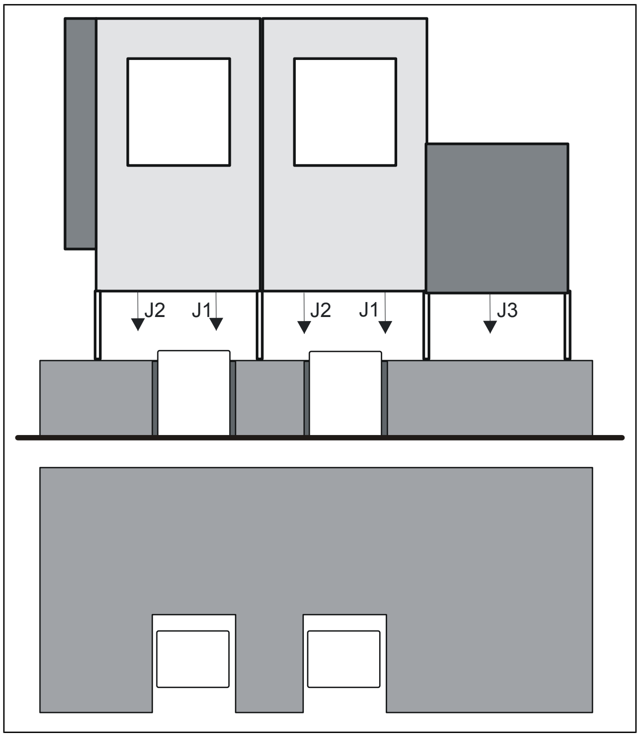


Fig. 2. The concrete platform must be large enough for the selected analyzer configuration. NOTE: If the chemical tanks will be placed under the analyzer (as in this picture), the platform must be high enough to leave free space between the tanks and discharge connections!

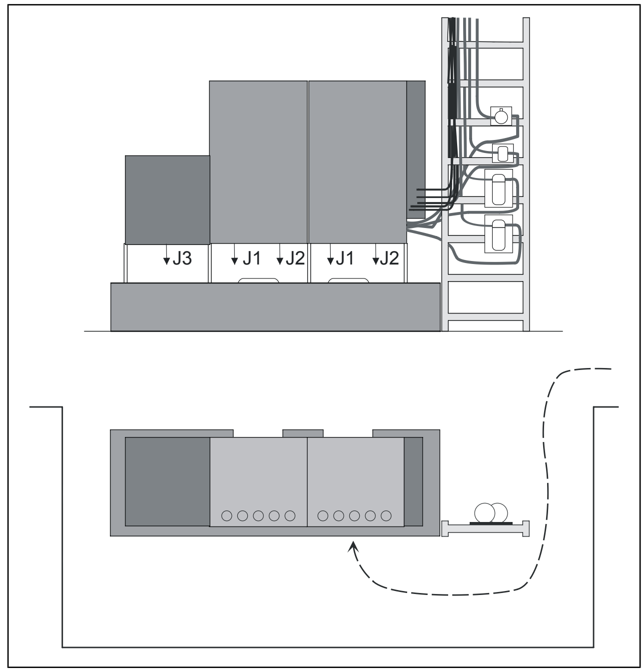


Fig. 3. Example layout of analyzer's installation site, regulators placed next to the analyzer.

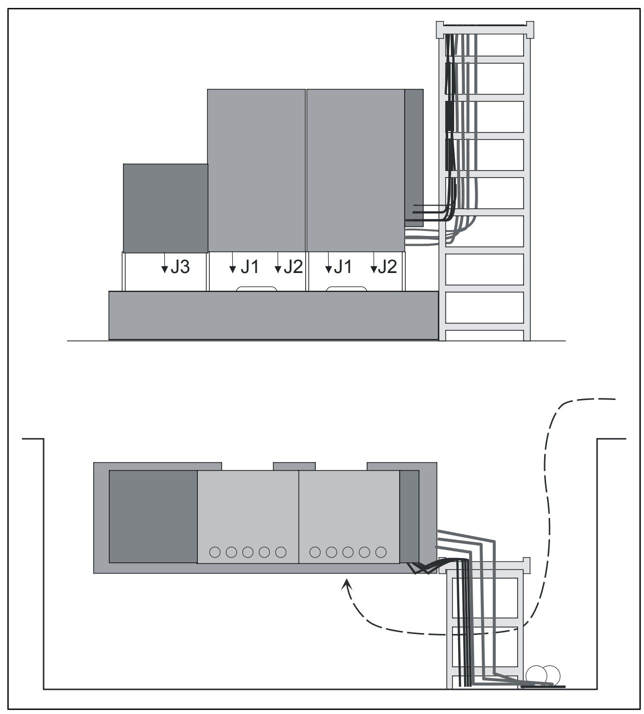


Fig. 4. Example layout of analyzer's installation site, regulators installed on the wall.

2.2. Moving the analyzer

The analyzer can be moved with a forklift. During transportation the device stands on a wooden platform. Before pushing the fork of a forklift under it, insert wooden raising blocks under its metal legs (Fig. 5). Proceed as follows:

- Tilt the analyzer and place raising blocks 1 & 2 under its metal legs If the analyzer is fitted with the Fiber-Shive module (option), no raising blocks are needed under its legs. Be careful when tilting, the analyzer must not fall over!
- Tilt the analyzer from the opposite side and place raising blocks 3 & 4 under its legs on the other side.
- Now you can drive the lifting fork under the analyzer. Be careful not to damage the lab. sample collector located underneath it!
- Raise the analyzer with the forklift and install the metal extension legs as instructed below.
- Moving the analyzer onto a platform for moving or transportation: follow these instructions in reverse order.
- If the device is moved using lifting ropes or belts, preferably remove the doors first to protect them from damage. If the doors are left in place, open them and tie the ropes/belts around the device cabinet, not over the doors.
- - If the analyzer is allowed to lean against the forklift while moving it, protect its doors with some soft padding.
- Support the Fiber-Shive module (option) so as to protect its fastenings from damage.

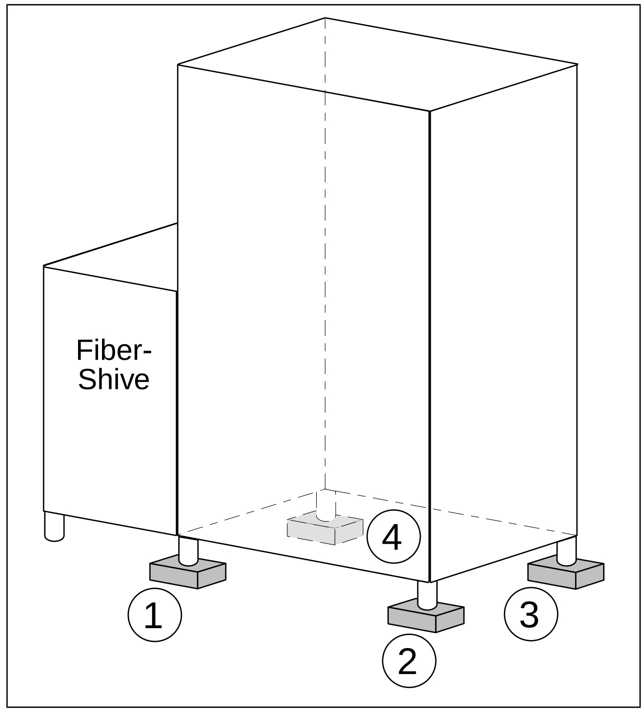


Fig. 5. Moving the analyzer.

2.3. Extension legs

Make sure the analyzer stands straight, adjust leg height if necessary (Fig. 6).

Installing analyzer's legs:

- Attach extension C to analyzer's leg A.
- Secure the leg parts together with screw B.
- Adjust leg height by turning the adjustment piece (0 - 40 mm / about 0 - 1 1/2").

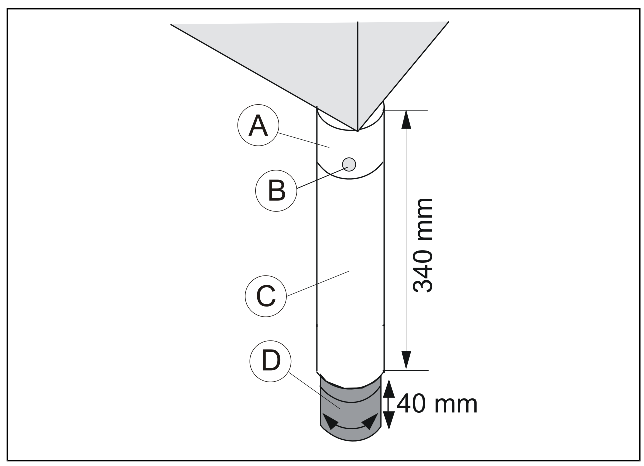


Fig. 6. Installing extension legs to analyzer.

2.4. Location of connectors

Fig. 7 shows the location of analyzer's sample, water, air and discharge connectors. The discharge lines can be led away from the analyzer in different directions, depending on the conditions in the installation point (also see Discharge connections).

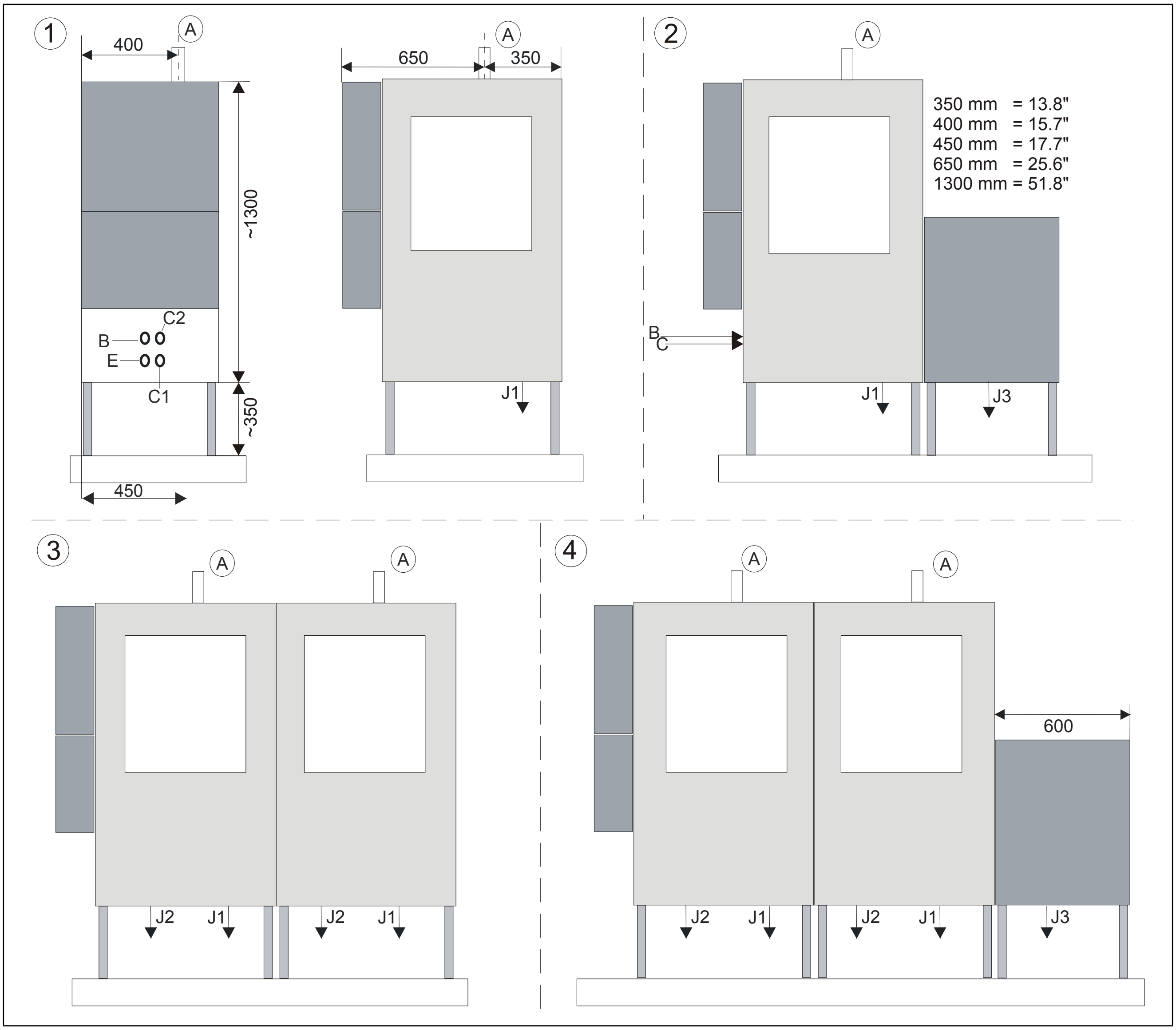


Fig. 7. Location of connections: A - sample line, B - instrument air, C1 - cold water to meas. unit 1, C2 - cold water to meas. unit 2, E - hot water, J1 - discharge from washing chamber, J2 - discharge from Sweep module, J3 - discharge from Fiber-Shive module.

3. Cleaning chemical tank

3.1. Construction

An ejector inside the analyzer sucks cleaning chemical from a separate container and injects it into the measurement loop during the washing sequence. Recommended chemical: Deconex® 26+.

The delivery includes a chemical tank (Fig. 1) and some FEP tube (6/4, about 2 m/6 - 7 ft) for connection to the analyzer. Also some other suitable container can be used if necessary.

NOTE: Follow the safety instructions provided by the chemical manufacturer/supplier when handling and storing the chemicals! When handling the chemicals, wear appropriate protection (gloves, goggles, protective clothing, breathing mask).

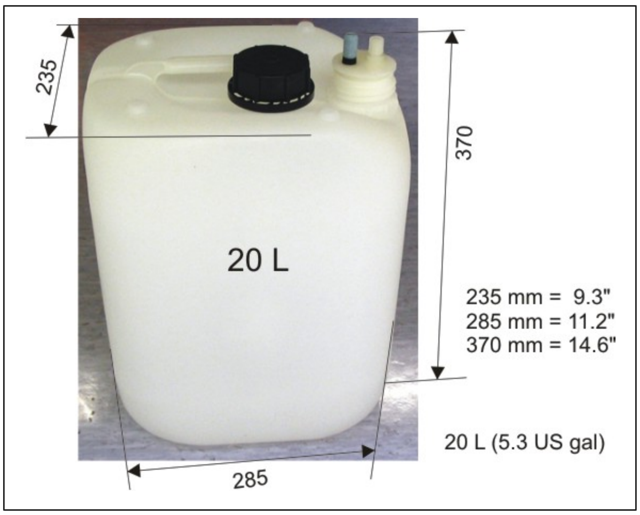


Fig. 1. Chemical tank included in Valmet's delivery.

3.2. Installing and connecting

Place the chemical tank close to the analyzer, in a place where it does not hinder operation or maintenance work. The best place is underneath the analyzer, in a recess made to the concrete platform under the analyzer (see chapter Installing the analyzer, Fig. 2). However, in this case the concrete platform must be so high that there is enough free space between the chemical tank and the discharge outlets. The tank should preferably be placed inside a vat or trough to contain potential leaks/overflow.

Connect the chemical tube to its connector on the tank cover, and lead it into the analyzer through one of the discharge outlet holes in the bottom of the cabinet. Fasten the tube to the discharge connector for example with a cable tie, so that it does not hang loose and chafe against the sharp edge of the hole. Connect the other end of the tube to analyzer's ejector (Fig. 2, part 1).

Fig. 2. Ejector.

Note

4. Water and air regulators, option

4.1. Function

The pressure and quality of the pressurized air and water supplied to the analyzer must meet the specifications. To ensure this, a separate regulator & filter unit must be installed to each water and air supply line.

If several water lines (hot/cold/deionized water) are connected to the analyzer, each of these must have its own regulator unit with a flow-through capacity of 70 L/min (18.5 US gal/min). Also see Technical specifications.

4.2. Installing

Install the regulator units on the wall, close to the analyzer.

Choose the installation point so that the lines can be connected without problems, and the regulators are easily accessible for checking and servicing.

NOTE: Customer supplies and installs shut-off valves to the supply lines connected to the regulators!

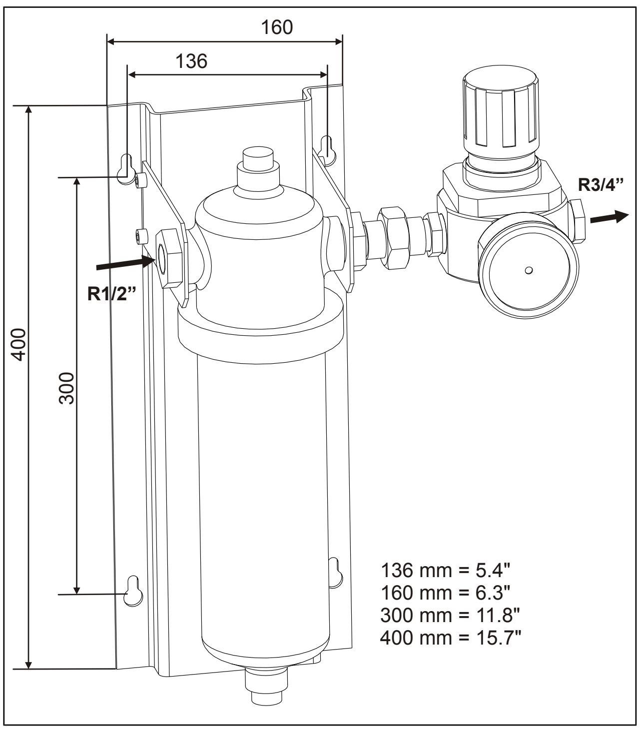


Fig. 1. Water regulator, dimensions and connections.

4.3. Adjustments

Adjust the pressure to the correct range with the regulator; see Technical specifications.

Fig. 2. Water regulator unit, K05136.

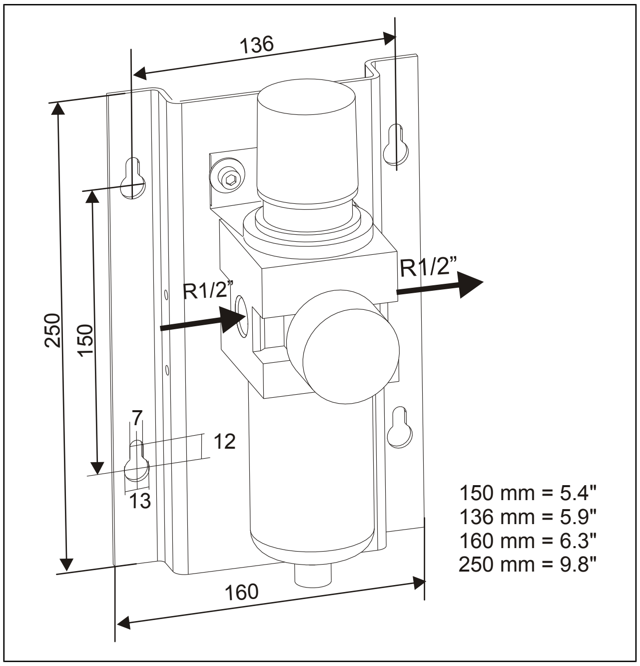


Fig. 3. Air regulator, dimensions and connections.

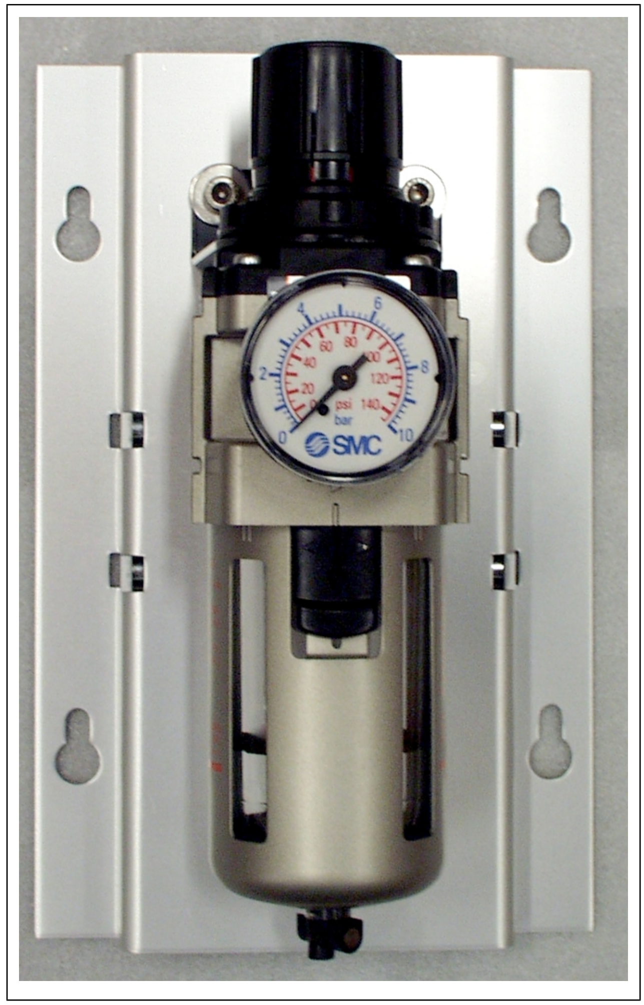


Fig. 4. Air regulator unit, K03089.

5. Neutralization valve, option

5.1. Function

If the sample contains chlorine dioxide residual, this must be neutralized before brightness measurement using e.g. sulphur water or sodium bisulphite . The neutralization valve assembly contains a regulator and valve mounted on an installation plate. The assembly adjusts the neutralization chemical pressure for the analyzer.

5.2. Installing

Install the valve assembly on the wall in a place where it is easily accessible for service, for example next to the water & air regulators.

The customer supplies and installs the chemical inlet line, as well as the line from the valve assembly to the analyzer. Note that the concentration of SO_2 water tends to dilute with time. Use small-diameter tube for the chemical supply line, to make sure that the analyzer gets fresh SO_2 water all the time.

The delivery includes some FEP tube (8/6, about 2 m/6 - 7 ft.) for connection to the washing chamber.

NOTE: Do not use rubber hose for the chemical lines!

NOTE: The customer is also required to install a shut-off valve to the chemical supply line, before the valve unit!

Lead the neutralization tube into the analyzer through one of the discharge outlet holes in the bottom of the cabinet. Fasten the tube to the discharge connector for example with a cable tie, so that it does not hang loose and chafe against the sharp edge of the hole. Use the connector (Fig. 2, part 1, included in delivery) to connect the other end of the tube to the coupling on top of the washing chamber (Fig. 3, part 2). When neutralization is not used, the connection on the washing chamber is closed with a metal plug.

The customer installs and connects the solenoid valve control cable. Connection: see Connections 3, point F.

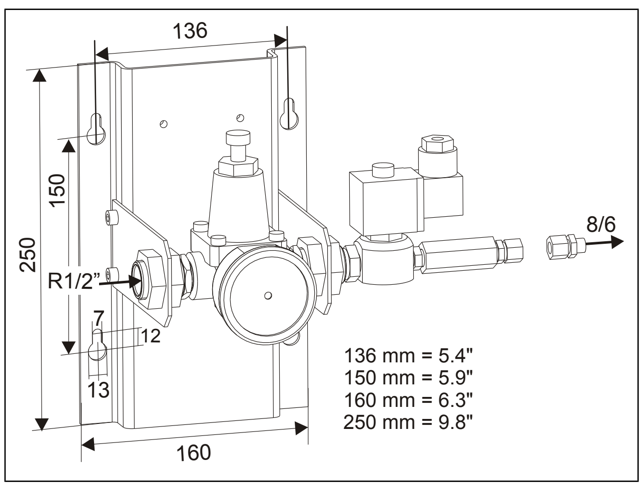


Fig. 1. Dimensions of neutralization valve assembly.

5.3. Adjustments

Adjust the pressure to the correct range with the regulator; see Technical specifications.

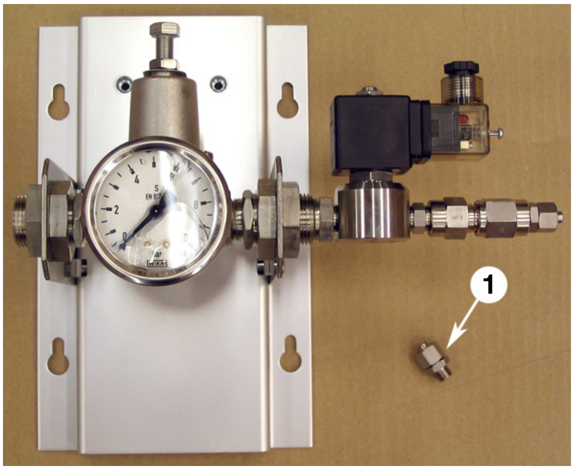


Fig. 2. Connections of neutralization valve. Part 1 = connector for attaching the chemical tube to washing chamber; attached to the valve with a cable tie for delivery.

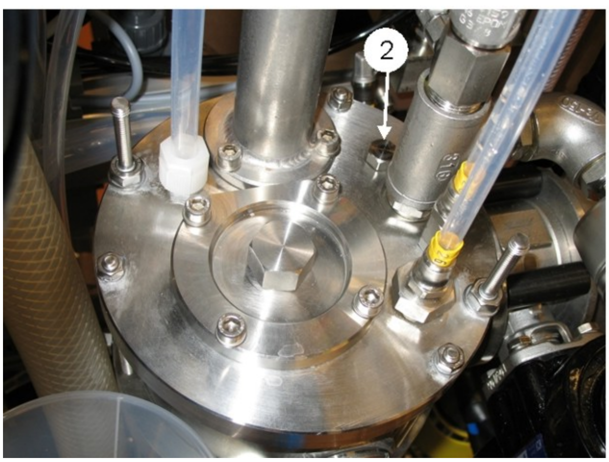


Fig. 3. Connecting the neutralization chemical tube to washing chamber; here the connection is closed with a metal plug.

6. Customer IO Box

6.1. Function

Customer IO Box is a separate unit with which the available number of analog and binary connections of analyzers can be increased when necessary. Using this unit, 8 - 20 binary outputs, 8 - 20 binary inputs and 8 - 40 analog outputs can be connected to the system. The board uses 24 V operating voltage, and it connects to the analyzer with a CAN-bus.

Customer IO Box can be installed on top of a Fiber-Shive module or on the wall. The cable conduits can be moved to the bottom or to the rear wall, depending on the installation, and the empty slot is closed with a metal plate.

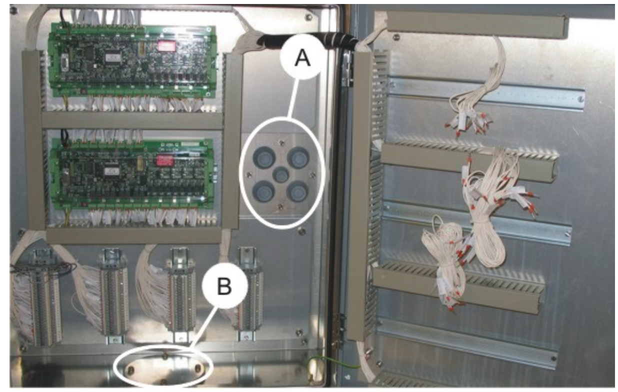


Fig. 1. Customer IO Box, with 2 Customer IO boards installed.

6.2. Installation to analyzer

When the unit is installed to the analyzer, its housing is attached with bolts on top of the Fiber-Shive module (option). The cable conduits are then on the rear wall of the unit (Fig. 1, point A).

6.3. Installation on the wall

When the unit is installed on the wall, the cable conduits are moved to the bottom of its box (Fig. 1, point B). Turn the mounting supports on the rear wall so that the box can be fastened to the wall. The mounting supports have 10mm holes for mounting bolts, recommended bolt size 8mm.

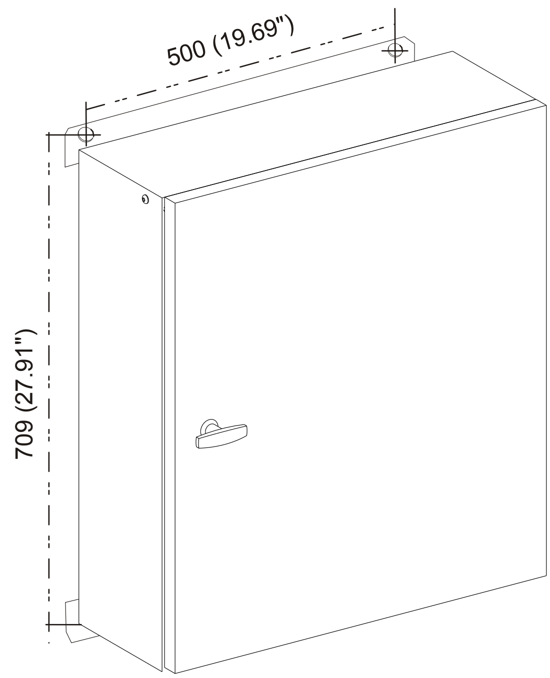


Fig. 2. Customer IO Box, mounting on wall.

6.4. Connections

The unit should preferably be installed close to the analyzer. Cables for 24 V operating power and CAN-bus (2 wires) are connected between the analyzer and Customer IO Box. An external 24 V voltage can also be used. The connections are listed in Fig. 6. For the connections at the analyzer, see the electric and data connections of the analyzer in question.

If the length of the connection cable is over 10 m (33 ft), make sure that the CAN-but speed is set slow enough at the Customer IO boards (inside the box). The communication speed can be checked from the board LEDs when power is on (see below). The factory setting is usually correct, but if more boards are installed later on, this must be taken into account. Either order the boards with the correct specifications, or change the baud rate after installation if necessary.

Fig. 3 shows a Customer IO Box with all board slots in use, Fig. 4 shows a Customer IO board.

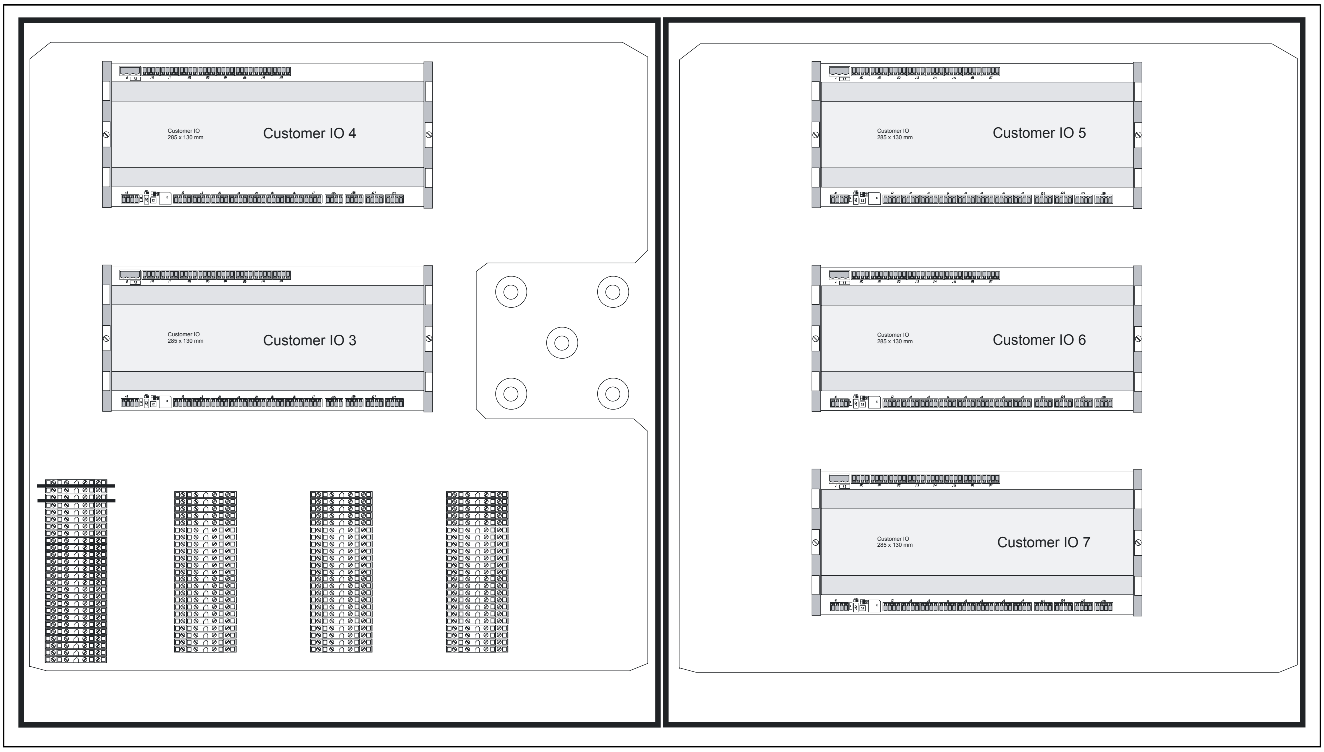


Fig. 3. Customer IO Box.

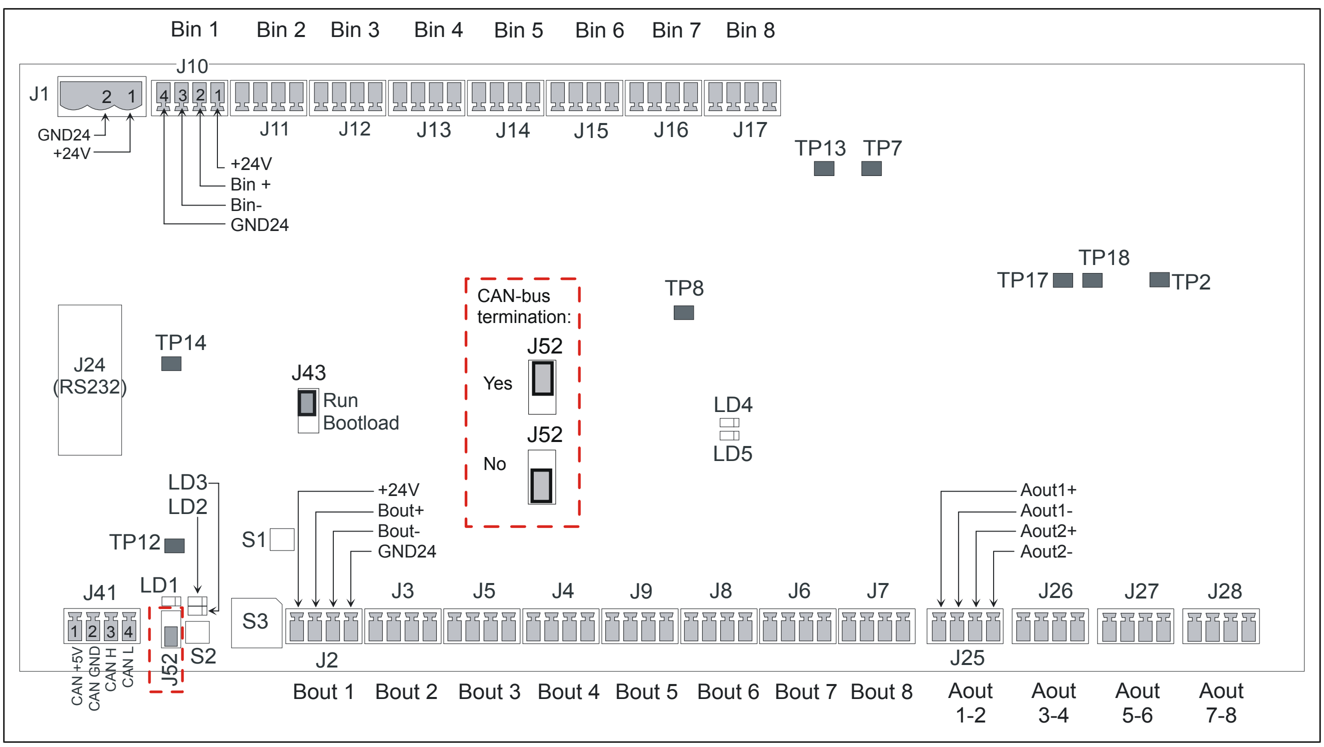


Fig. 4. Customer IO board, A4910040 V1.0.

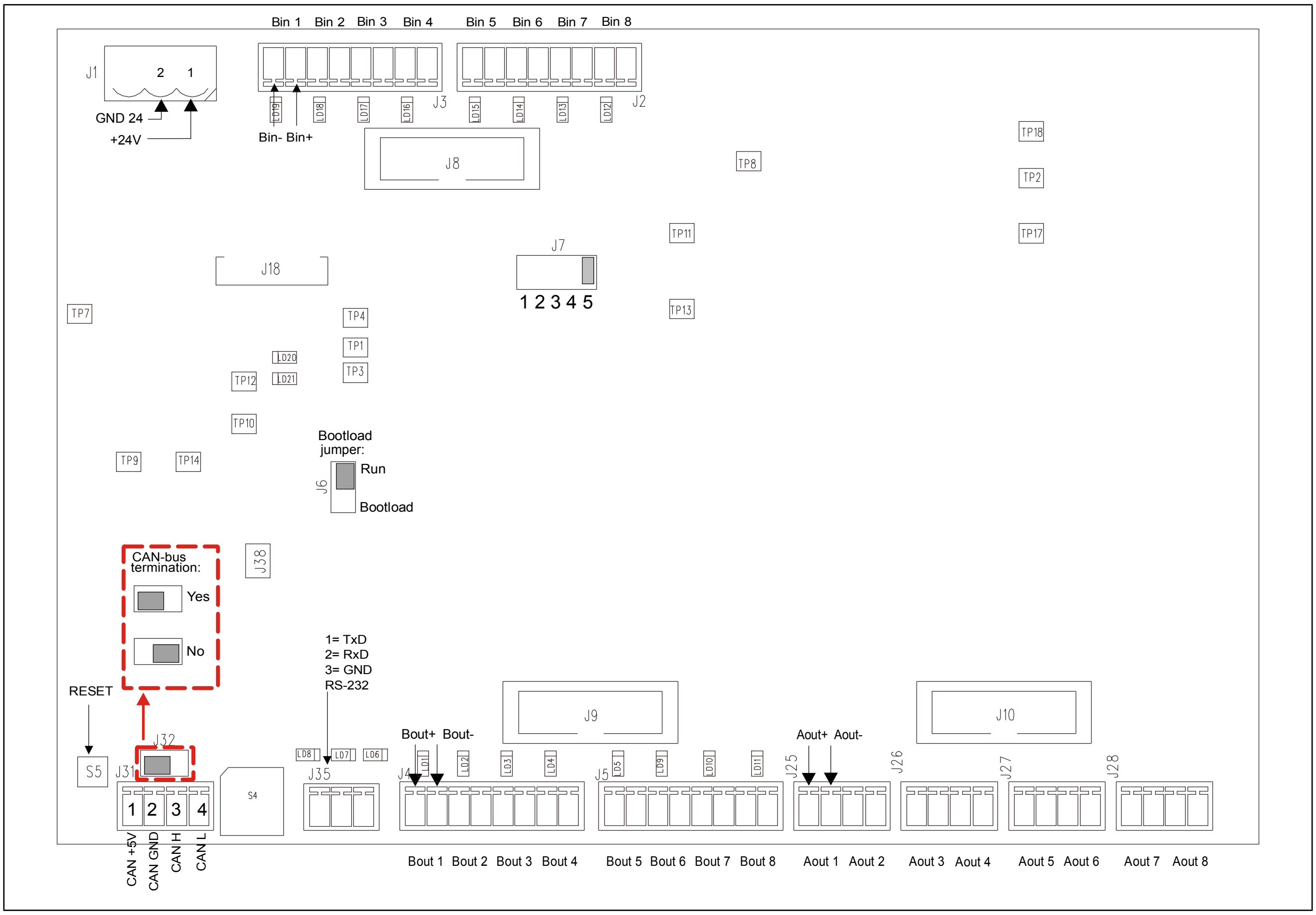


Fig. 5. Customer IO board, A4910040 V2.1.

Signal	Term.	
+24V	1	Oper. power to IO Box, cable from analyzer
GND 24	2	Oper. ower GND, cable from analyzer
CAN +5V	11	CAN-bus operating voltage
CAN GND	12	CAN-bus GND
CAN H	13	CAN-data +, cable from analyzer
CAN L	14	CAN-data -, cable from analyzer

BINARY OUTPUTS 1 - 20				BINARY INPUTS 1 - 20				
Signal	Term.	Signal	Term.	Signal	Term.	Signal	Term.	
Bout +1	20	Bout -1	50	Bin +1	80	Bin -1	110	Customer I/O 3
Bout +2	21	Bout -2	51	Bin +2	81	Bin -2	111	
Bout +3	22	Bout -3	52	Bin +3	82	Bin -3	112	
Bout +4	23	Bout -4	53	Bin +4	83	Bin -4	113	
Bout +5	24	Bout -5	54	Bin +5	84	Bin -5	114	
Bout +6	25	Bout -6	55	Bin +6	85	Bin -6	115	
Bout +7	26	Bout -7	56	Bin +7	86	Bin -7	116	
Bout +8	27	Bout -8	57	Bin +8	87	Bin -8	117	
Bout +9	28	Bout -9	58	Bin +9	88	Bin -9	118	Customer I/O 4
Bout +10	29	Bout -10	59	Bin +10	89	Bin -10	119	
Bout +11	30	Bout -11	60	Bin +11	90	Bin -11	120	
Bout +12	31	Bout -12	61	Bin +12	91	Bin -12	121	
Bout +13	32	Bout -13	62	Bin +13	92	Bin -13	122	
Bout +14	33	Bout -14	63	Bin +14	93	Bin -14	123	
Bout +15	34	Bout -15	64	Bin +15	94	Bin -15	124	
Bout +16	35	Bout -16	65	Bin +16	95	Bin -16	125	
Bout +17	36	Bout -17	66	Bin +17	96	Bin -17	126	Customer I/O 5
Bout +18	37	Bout -18	67	Bin +18	97	Bin -18	127	
Bout +19	38	Bout -19	68	Bin +19	98	Bin -19	128	
Bout +20	39	Bout -20	69	Bin +20	99	Bin -20	129	

ANALOG OUTPUTS 1 - 24				
Signal	Term.	Signal	Term.	
Aout +1	140	Aout -1	190	Customer I/O 3
Aout +2	141	Aout -2	191	
Aout +3	142	Aout -3	192	
Aout +4	143	Aout -4	193	
Aout +5	144	Aout -5	194	
Aout +6	145	Aout -6	195	
Aout +7	146	Aout -7	196	
Aout +8	147	Aout -8	197	
Aout +9	148	Aout -9	198	Customer I/O 4
Aout +10	149	Aout -10	199	
Aout +11	150	Aout -11	200	
Aout +12	151	Aout -12	201	
Aout +13	152	Aout -13	202	
Aout +14	153	Aout -14	203	
Aout +15	154	Aout -15	204	
Aout +16	155	Aout -16	205	
Aout +17	156	Aout -17	206	Customer I/O 5
Aout +18	157	Aout -18	207	
Aout +19	158	Aout -19	208	
Aout +20	159	Aout -20	209	
Aout +21	160	Aout -21	210	
Aout +22	161	Aout -22	211	
Aout +23	162	Aout -23	212	
Aout +24	163	Aout -24	213	

ANALOG OUTPUTS 25 - 40				
Signal	Term.	Signal	Term.	
Aout +25	164	Aout -25	214	Customer I/O 6
Aout +26	165	Aout -26	215	
Aout +27	166	Aout -27	216	
Aout +28	167	Aout -28	217	
Aout +29	168	Aout -29	218	
Aout +30	169	Aout -30	219	
Aout +31	170	Aout -31	220	
Aout +32	171	Aout -32	221	
Aout +33	172	Aout -33	222	Customer I/O 7
Aout +34	173	Aout -34	223	
Aout +35	174	Aout -35	224	
Aout +36	175	Aout -36	225	
Aout +37	176	Aout -37	226	
Aout +38	177	Aout -38	227	
Aout +39	178	Aout -39	228	
Aout +40	179	Aout -40	229	

Fig. 6. Connections of Customer IO Box.

6.5. Checking and changing the settings

The baud rate used by the Customer IO boards (A4910040 V1.0) can be checked from LD4 & LD5, located in the middle of the board. When power is on, these LEDs indicate the baud rate as follows:

- 1000 kbit/s = LD4 and LD5 are on
- 500 kbit/s = LD5 is on
- 250 kbit/s = LD4 is on
- 125 kbit/s = neither LED is on
- 62.5 kbit/s = LD4 and LD5 are on

Accordingly the baud rate used by the Customer IO boards (A4910040 V2.1) can be checked from LD20 and LD21, located on the bottom left side, as follows:

- 1000 kbit/s = LD20 ja LD21 are on
- 500 kbit/s = LD20 is on
- 250 kbit/s = LD21 is on
- 125 kbit/s = neither LED is on
- 62,5 kbit/s = LD20 and LD21 are on

The speed is the slower, the longer the connection cable. When cable length is over 10 m (33 ft) the speed should be lowered. When the maximum cable length (300 m / 984 ft) is in use, set the baud rate to the minimum value. The speed has no practical meaning for the user, as the results are updated quickly enough in any case.

The baud rate of Customer IO boards can be changed when the board is installed to Customer IO Box.

1. Make sure that operating power to the board is connected.
2. Connect an RS232 serial cable between the board and a PC. Use for example the Programming cable (code K03463) supplied by Valmet. The cable type is illustrated in Fig. 7.
3. Start a terminal emulator program on the PC, for example HyperTerminal (hypertrm.exe): Start / Programs / Accessories / Communications / HyperTerminal.
4. Give settings for the connection in the "New Connection" window, and choose an icon for it (Fig. 8, step A).
5. Give settings for the connection port in the "Connect To" window (for example COM1) and click OK to confirm (Fig. 8, step B).
6. Change the COM port settings as shown and click OK to confirm (Fig. 8, step C).
7. Enter the required baud rate in the terminal window and press ENTER:
   command "B,1000" <enter> (= for speed 1000 kbit/s)
   command "B,500" <enter> (= for speed 500 kbit/s)
   command "B,250" <enter> (= for speed 250 kbit/s)
   command "B,125" <enter> (= for speed 125 kbit/s)
   command "B,62,5" <enter> (= for speed 62.5 kbit/s)
8. When the setting is correct, press RESET on the board.

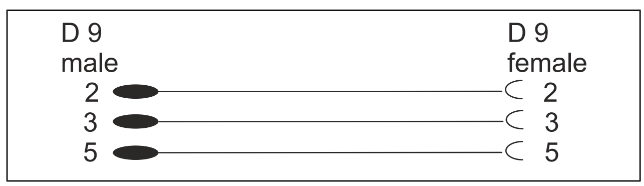


Fig. 7. Serial cable needed to set the baud rate.

The board (A4910040 V1.0) also has LEDs LD1 - 3, located on the bottom left side; these LEDs indicate the following:

– LD1, red, RESET
– LD2, red, CAN error
– LD3, green. Blinks once per second when CAN-communication is operating, goes off when communication stops.
– LD2 & LD3 off = program is not running

The board (A4910040 V2.1) has LEDs LD6 - 8, located on the bottom left side; these LEDs indicate the following:

– LD6, green. Blinks when the program is running.
– LD7, red, CAN error + board RESET
– LD3, green. Blinks once per second when CAN-communication is operating, goes off when communication stops.
– LD7 & LD8 off = program is not running

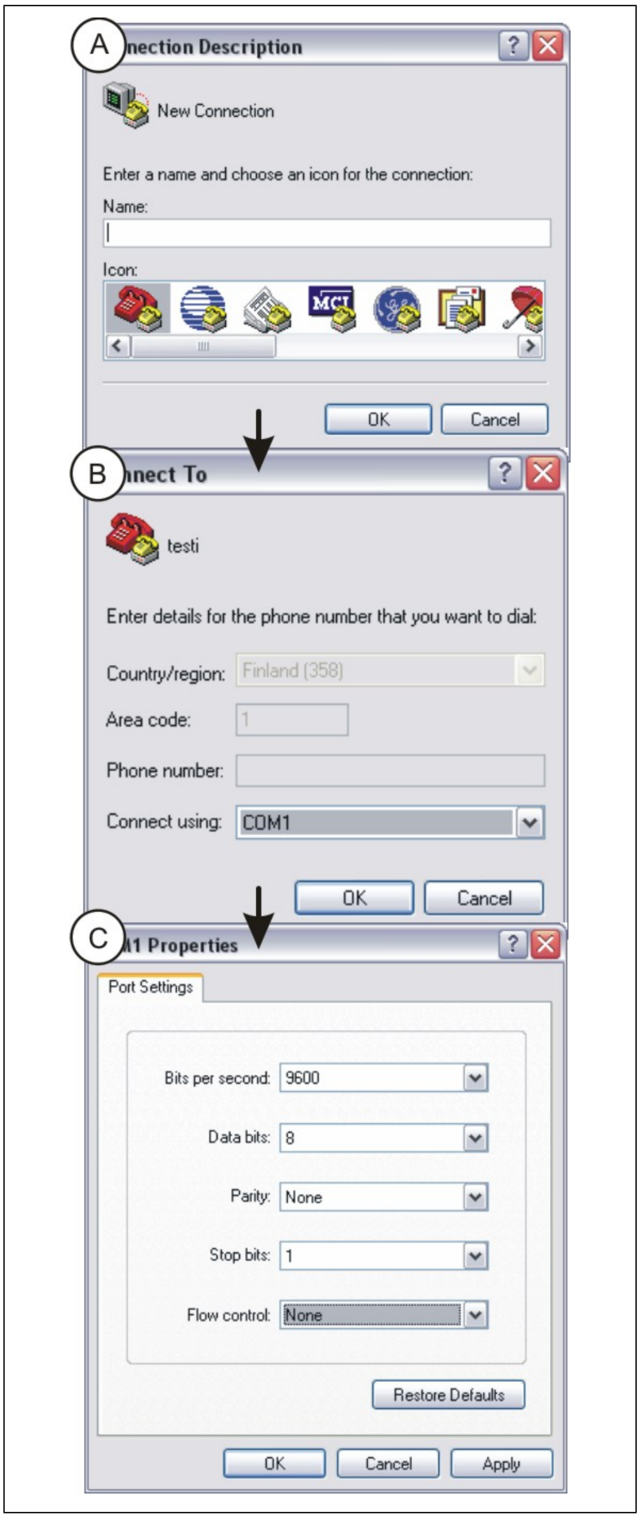


Fig. 8. Using HyperTerminal: creating a connection, and COM port settings.

7. Connections 1 - Overview, water, air, chemicals

IMPORTANT:
- See Technical specifications for the pressure & temperature requirements.
- The supply lines can be made using metal pipe. However, all connections to analyzer must be made with flexible hose (length 0.5 - 1 m / about 2 - 3 ft) that does not conduct electricity.
- After installation, remove the filters and open all valves, and then rinse the lines clean with a strong bypass flow before connecting them to analyzer.

A. Pressurized air

The supply line must be provided with Valmet's regulator units (E, option), or with a corresponding regulator + filter supplied by the customer. The customer is also required to install a shut-off valve and a check valve to the line, close to the analyzer. A cleaning gun (with shut-off valve) is connected to the pressurized air inlet coupling.

B. Cold water

The supply line must be provided with Valmet's regulator units (E, option), or with a corresponding regulator + filter supplied by the customer. The customer is also required to install a shut-off valve and a check valve to the line, close to the analyzer. A cleaning gun (with shut-off valve) is connected to the cold water inlet coupling.
B1. To unit 1 (One Cabinet).
B2. To unit 2 (Two Cabinet model only).

Booster station
To prevent condensation, cold water temperature must be stabilized to +18…20 °C (+64…68 °F) by using a booster station: Pressure is increased with a pump/valve combination, the pressurized water is led first to a temperature regulator and further through a water tank to the analyzer. A check valve prevents return flow.

C. Deionized water

Deionized water is used for brightness measurement. The water must meet "boiler water" specifications. See Technical specifications.
Connect the deionized water supply to the cold water inlet coupling. With Two Cabinet model, make sure to connect the water inlet to the correct coupling!

NOTE: If no hot water is connected to the analyzer (= only brightness measurement in use), also branch the cold water supply to the hot water inlet. The cleaning chemical ejector operates with the water pressure at the hot water inlet.

D. Hot water

The supply line must be provided with Valmet's regulator units (E, option), or with a corresponding regulator + filter supplied by the customer. The customer is also required to install a shut-off valve and a check valve to the line, close to the analyzer.
Hot water is used for Kappa sample washing. If the device only measures, hot water is not needed.

NOTE: If hot water is also used for sample transport, its consumption will be considerably higher! Always determine the required volume separately in each case, and choose the boiler capacity accordingly. Also remember to reconfigure the hot water alarms!

D1. Water boiler
To ensure a stable temperature, a water boiler (minimum volume 100 L / 26 US gal) is recommended The required heating capacity is calculated with the equation $Q = c{*}q_m{*}\Delta t$, where:
Q = required capacity
c = specific heat
c_{H2O}= 4.2 kJ/kg °C
q_m= mass flow [kg/sec] ([L/sec])
Δt = required increase in temperature

Example (One Cabinet model):
q_m= 105 L/h => 0.029 L/sec = 0.029 kg/sec
Δt = 50 °C
c = 4.2 kJ/kg °C
Q = 4.2 kJ/kg °C × 0.029 kg/sec × 50 °C = 6.09 kJ/sec = kW
+ safety margin 15 % =>minimum heating capacity 7.0 kW

E. Water and air regulators (option)

F. Neutralization (option)

If brightness samples contain chlorine dioxide residual, they must be neutralized before measurement with sulphur water (SO_2) or sodium bisulphite. Lead the neutralization tube inside the analyzer through one of the discharge outlet openings in the bottom of the cabinet, and connect it to the washing chanber with a connector (included in delivery). See section "Neutralization valve" for more information. Connection of neutralization control signal: See Connections 3.

G. Cleaning chemical tank

Keep the chemical tank close to the analyzer, preferably under the analyzer. Lead the chemical tube inside the analyzer through the discharge connection opening, and connect it to the ejector. See section "Cleaning chemical tank" for more information.

H. Sample lines

See Connections 2.

J. Discharge from analyzer

See Connections 2.

K. Discharge from sample collector

See Connections 2.

L. Operating voltage

See Connections 3.

M. Connections to mill DCS

See Connections 3.

N. Sampling device control connections

See Connections 3.

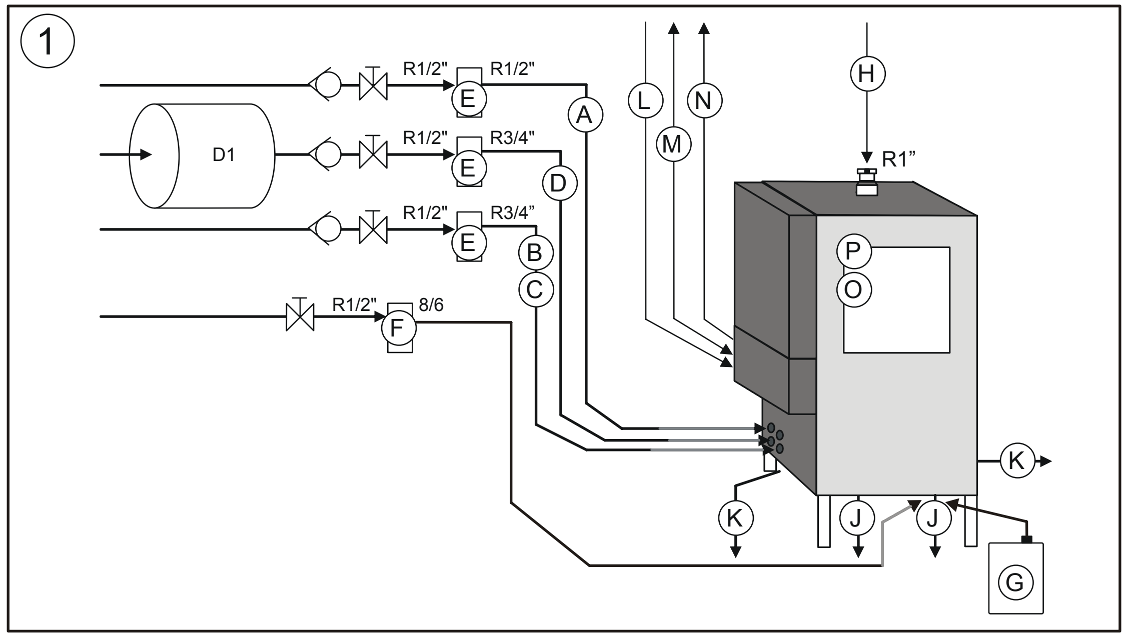
O. PC connection

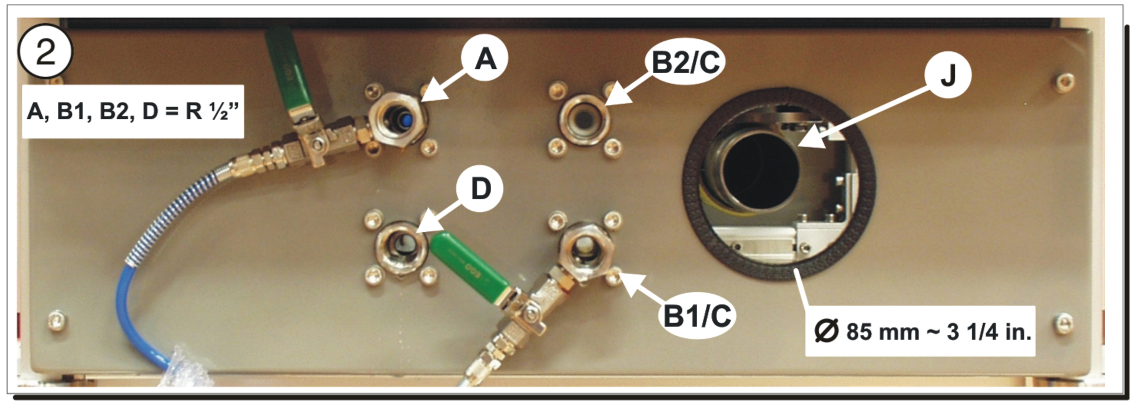
Inside the analyzer, see Connections 4.

P. Operating terminal connection

Connector inside the analyzer, on the left side wall.

Pictures:
Fig. 1: Principle of analyzer's connections.
Fig. 2: Close-up of the inlet couplings on analyzer's left side wall.





H. Sample lines (1 - 16)

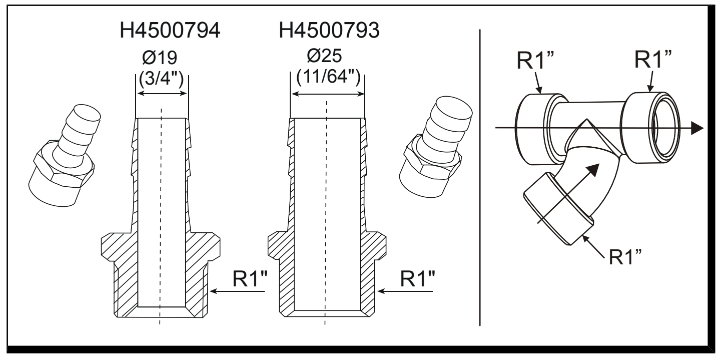
Recommended inside diameter for all sample lines, including blowline sampling, is 19 mm (3/4"). Also max. 25 mm (1") tube can be used, but in this case water consumption will be higher and sample transport time longer.

Use the same diameter tube and the Y-connectors delivered with analyzer (see picture) for the entire trunk line. Make sure there are no narrower or wider sections, tight bends, or other irregularities that disrupt the sample flow and may cause blockages.

If the trunk line is made of metal pipe, use DN15 (or DN20) acidproof steel pipe and weld the Y-connectors to the pipe. All connections to both analyzer and samplers must always be made with flexible, non-conductive tube, length 0.5–1 m (2–3 ft).

NOTE: Always use only plastic or acidproof steel for the sample lines, use no components made of other metals (e.g. brass)! Always make the connections to both analyzer and samplers with flexible tube.

Separate trunk lines should be made for brown stock and bleached stock (brightness > 88, final brightness) and measured in separate units (Two Cabinet model). If the same unit (One Cabinet) measures both brown and bleached stock, keep these in separate trunk lines and only combine them right before the inlet to analyzer. See Fig. H.



J. Discharge from analyzer

Analyzer's discharge hose: inside diam. 50mm (2"), fasten to outlet connector with a hose clamp. Maximum hose length (measured from outlet connector) is 2 m (6.6. ft).

Each chamber has a separate discharge outlet. The outlet pipe fastens in position with 4 bolts, and it can be turned around in 90º steps; see Fig. J/d.

Make the discharge line as short as possible and ensure sufficient fall, at least 2–3 cm/m (~ 1" per every 3 ft). Make sure that all of the discharge hose is below the outlet connector and contains no sagging sections where water collects. Fasten the hose in place, ensure free gravitational fall into a canal or a larger -diameter hose near the analyzer. The hose end must not hang in water. See Fig. J/e.

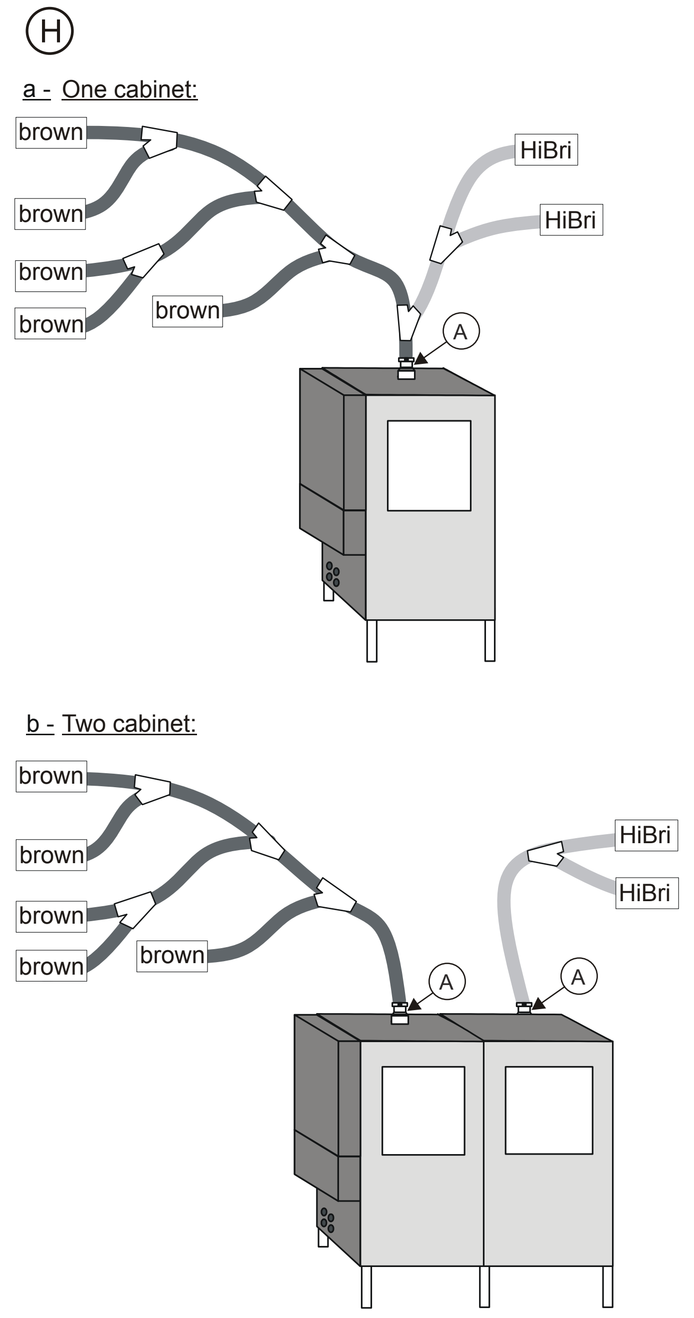
Discharge from Fiber-Shive module (option): inside diam. 34 mm (~1 3/8").

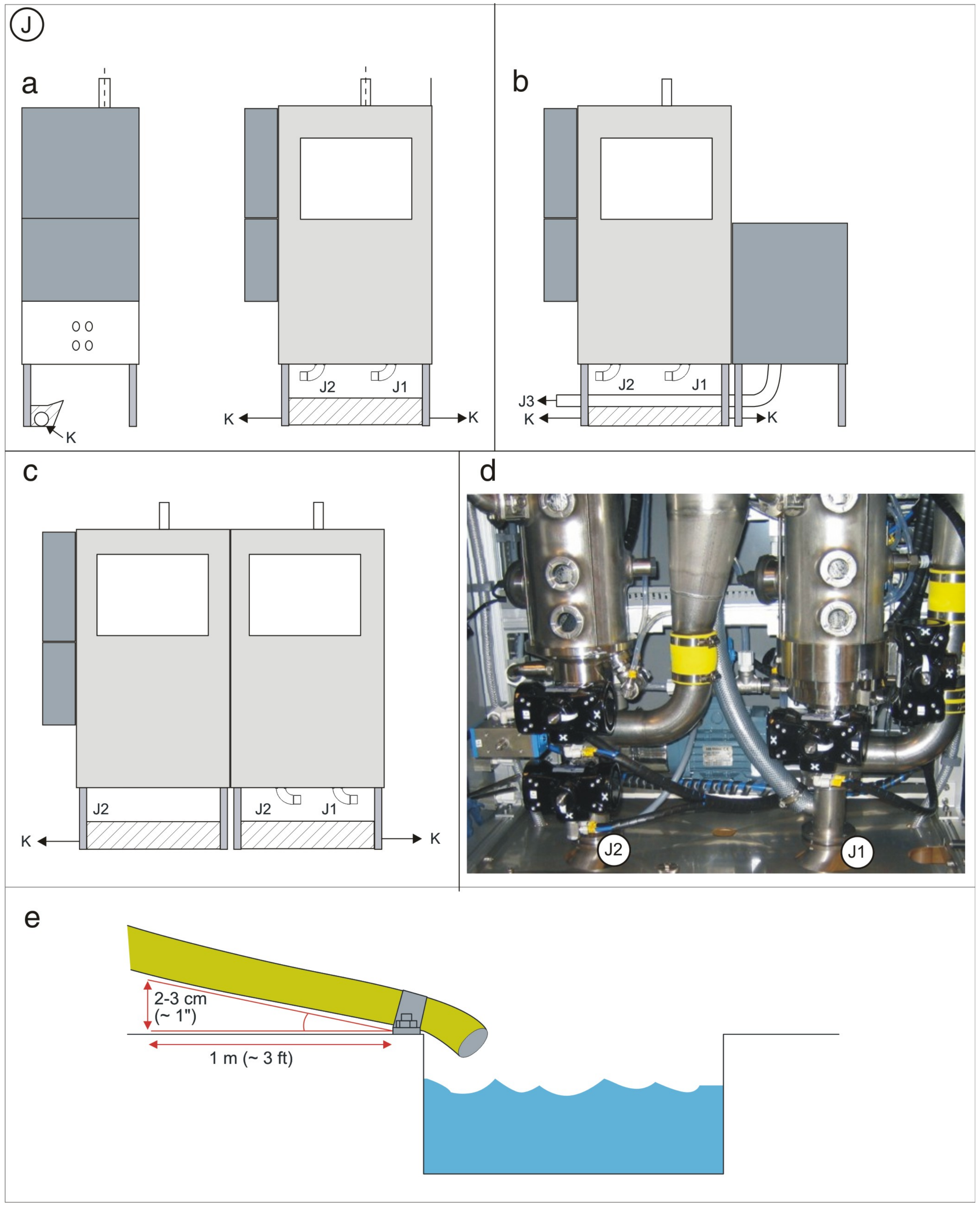
Discharge connections:
J1 = discharge from washing chamber
J2 = discharge from Sweep module
J3 = discharge from Fiber-Shive module
K = discharge from sample collector

K. Discharge from sample collector

Fluid from the sample collector flows into a vat placed under the analyzer. Install the vat so that it falls slightly towards the outlet end, and attach a discharge hose (diameter 50 mm / 2") to the outlet.

The Two Cabinet model has two vats, one under each cabinet. Connect the vats together and lead their combined discharge to the sewer with one hose.





9. Connections 3 - connection box

IMPORTANT:
Always check input voltage and frequency before making any connections. Follow the applicable electric safety regulations. Insert cables into analyzer's electronics unit through the lead-through bushings. When the connections have been made, close the connection box carefully, and seal any unused bushings to protect the unit from water, pulp, and other impurities!

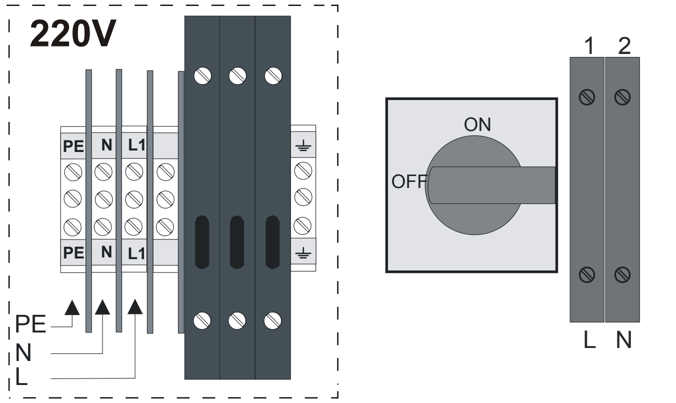
L. Operating voltage

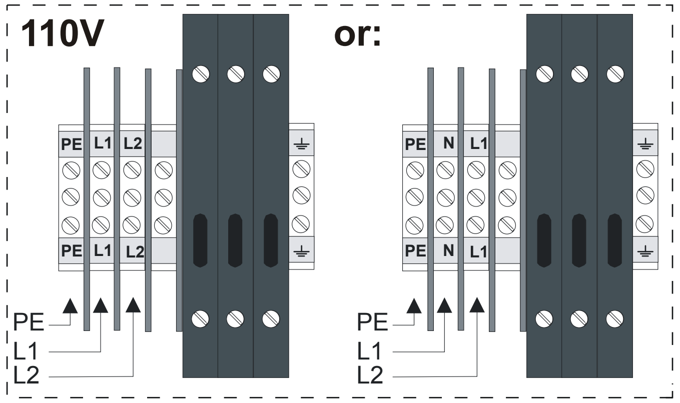
Connection to analyzer's mains power strip.
Input voltage: 180–250 VAC, 50–60 Hz 10 A.

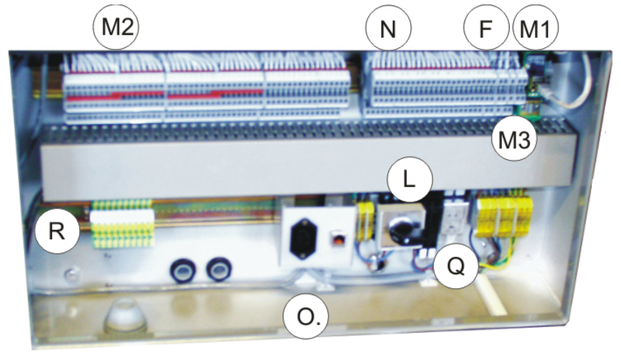
NOTE: Install a separate safety switch to the main power line, outside the analyzer and easily accessible.

Analyzer's main fuses (2 x 10 A glass tube; 1 = L, 2 = N) are located next to the main power switch.
After the fuses the voltage is distributed to
- the main power supply (24 V, 10 A)
- pump inverter(s), one for each cabinet
- Fiber-Shive module's PC.

The power connections of samplers are shown in the corresponding sampler manuals.







F. Neutralization valve connection

Connect the neutralization valve control signal to the connection strip: 181 (+) and 182 (-).

M. Connection to mill DCS – alternatives:

M1. Digital

Ethernet or RS485, protocol: Modbus Float. No Customer I/O board installed.

M2. Analog, max. 16 Aout/Bout/Bin

One or two Customer I/O boards installed to analyzer.

M3. Analog, more than 16 Aout/Bout/Bin in use

Boards installed in a separate Customer I/O Box.
Connections to analyzer: +24 V operating voltage and CAN-bus.

See the next pages for more information on each alternative.

N. Sampler connections

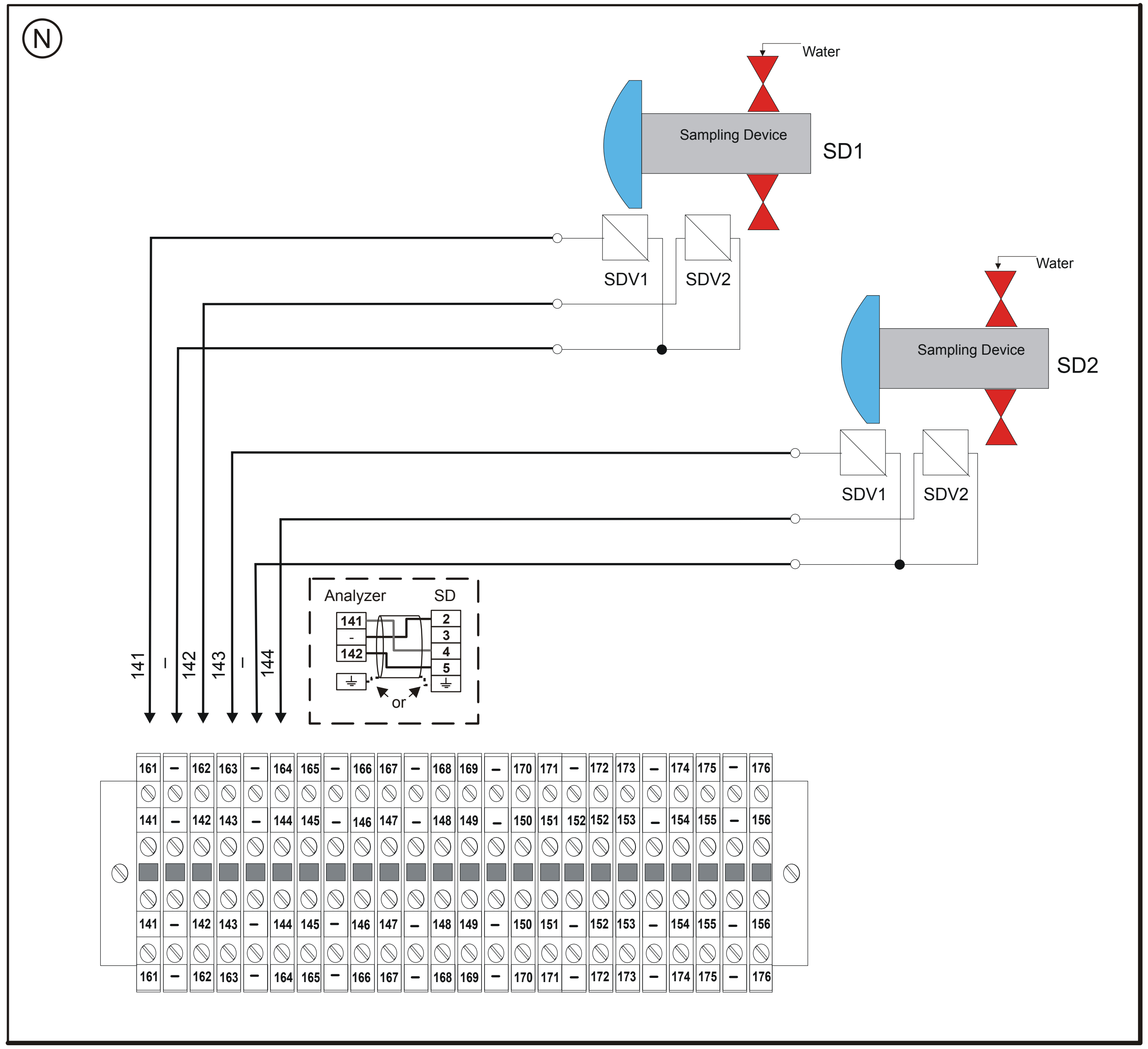
The connection box contains connectors for 16 samplers, on a two-tier connection strip.

O. Connecting a PC

See also Connections 4.

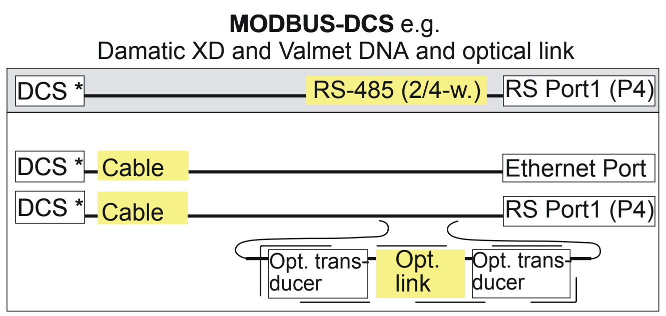
Q. Mains filter

R. Cable mantles (grounding)



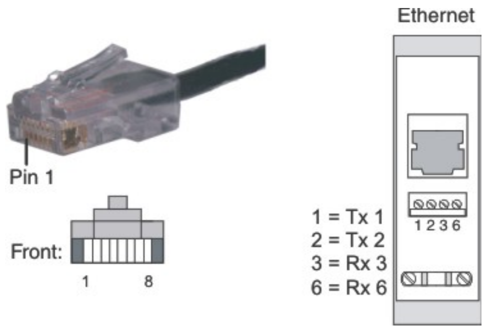
10. Connections 4 - PC, connections to DCS

M1. Digital connection to mill DCS



M1a. Digital, Ethernet copper cable

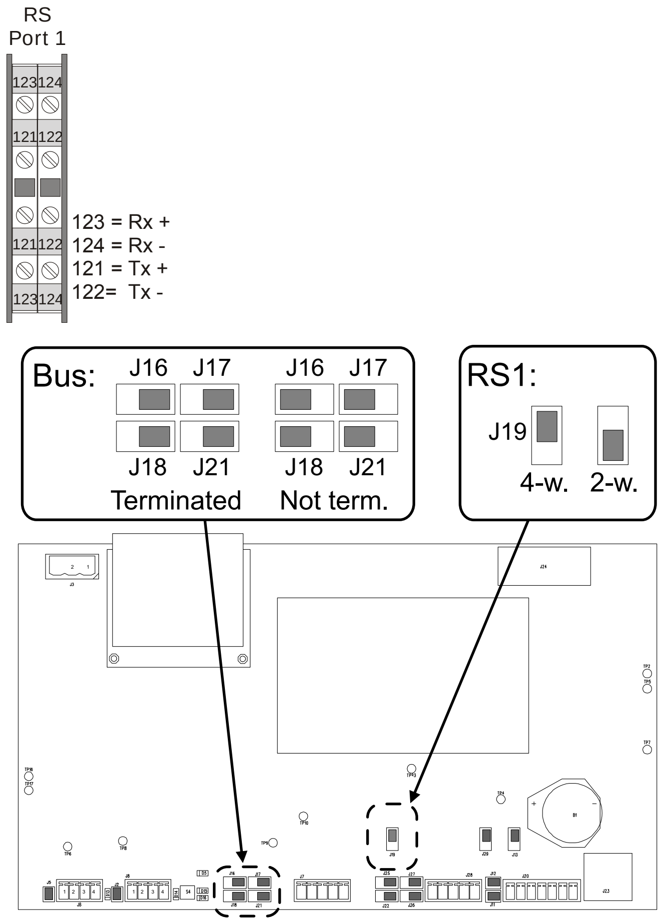
Protocol: Modbus Float. No Customer I/O board installed.
Ethernet cable: 100BASE-TX Cat5 paired cable, 2 pairs in use.
Connections to Ethernet module. Connect the Ethernet cable to analyzer's terminal strip:
RJ-45 connector pins 1–3 = screw connectors 1–3.
RJ connector pin 6 (Rx) = screw connector 6.



NOTE: Ground the cable shield and pair shields only at ONE end (under the grounding connector's cable clamp or at the system end), not at both ends!

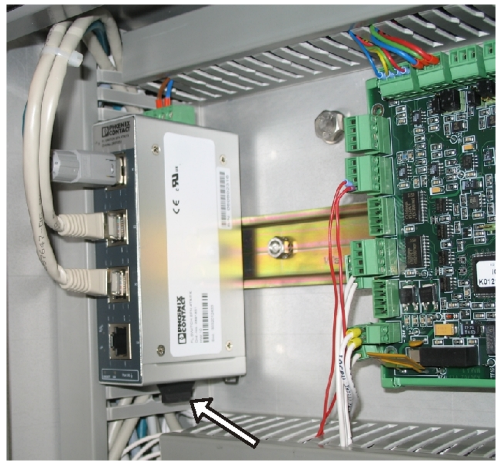
M1b. Digital, RS-485

Protocol: Modbus Float. No Customer I/O board installed. Connections to terminal strip, RS Port 1.
RS1 port connection (2-wire or 4-wire) is selected with a jumper on Master CPU; default = 4-wire (see picture). If the bus is used in 2-wire mode, connect the wires to Tx terminals and leave Rx terminals free.
Serial bus termination is selected with jumpers located on MasterCPU, must always be terminated (= setting "Terminated").



M1c. Digital, Ethernet, optical cable

Connect the optical cable to port X5, located on the bottom of the Ethernet Switch. Connector type: SC-DUPLEX. Ethernet Switch is located in the top left corner of analyzer's electronics box.



M3. Analog, Customer I/O Box

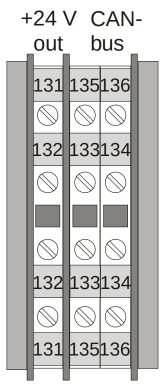
When analog communication is used and more than 16 analog outputs / binary inputs / binary outputs are needed, the Customer I/O boards must be installed in a separate Customer I/O Box.
Depending on the number of boards, the box may contain up to

- 8–20 binary outputs
- 8–20 binary inputs
- 8–40 analog outputs

Recommendation: Minimize the distance between Customer I/O Box and analyzer.

Customer I/O Box connects to the analyzer with a CAN-bus. Maximum distance between Customer I/O Box and analyzer is 300 m (about 1000 ft) at communication speed 125 Kbit/sec.

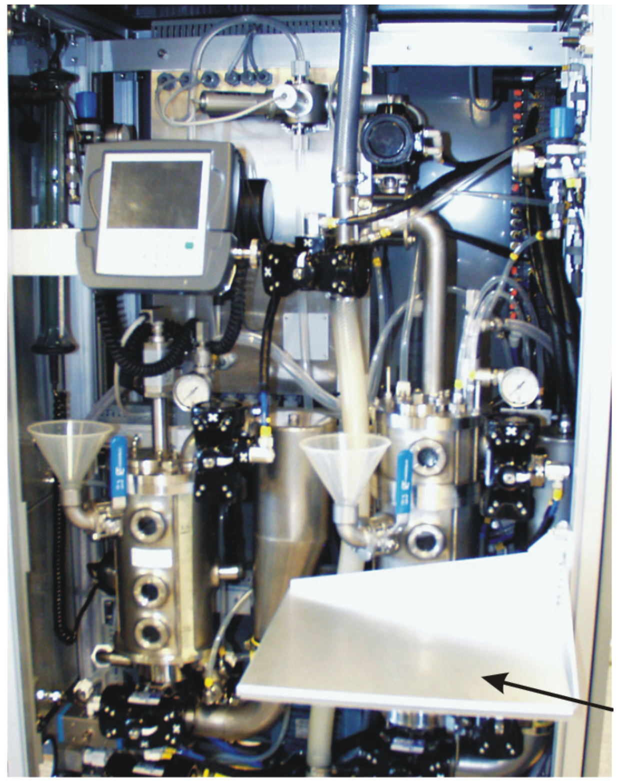
Customer I/O Box is powered by analyzer. If the Customer I/O Box is located at the maximum distance of 300 m (980 ft) from the analyzer, the feed cable must be at least 2 x 2.5 mm^2.



131 = +24V
132 = GND 24
135 = CAN H (+)
136 = CAN L (-)

O. Connecting a PC

A laptop PC with the Valmet Analyzer Interface software can be connected to the analyzer.
For example configurations and calibration calculations can then be done with the PC. The PC connection located in the connection box (see Connections 3) contains a power outlet and an Ethernet connector.
A worktop for a PC can be attached with finger screws to the cabinet frame. When a PC is not used, detach the worktop and close analyzer's doors. You can keep the worktop for example on top of the cabinet.



11. Connections 5 - compact analog connection to DCS

M2. Analog, compact analog connection

1 or 2 Customer I/O boards installed to analyzer, connected to analyzer's terminal strip. Available connections:

- 1–16 analog outputs, isolated from other electronics.
- 1–16 binary outputs, relay contact, opening/closing (default: closing); function selected on Customer I/O board by turning the corresponding relay around (180°).
- 1–16 binary inputs, opto-isolated, 20–50 VDC.
- CAN-bus and 24V output for possible later installation of Customer I/O Box.

Binary output connections

The first group of 18 terminals (1–36) in the strip. In the strip:

- top row = signal +
- bottom row = signal –

Default: analyzer supplies the loop voltage, top row is connected together with a ground strip (see picture). Always connect the ground strip starting from a plus (+) connector.

Load (24V max. 50 mA).

The function of binary outputs can be configured as necessary (e.g. to generate alarms).

Bout 1 = L1 alarm Bout 2 = L1 meas. ready
Bout 3 = L2 alarm Bout 4 = L2 meas. ready
Bout 5 = L3 alarm Bout 6 = L3 meas. ready
Bout 7 = L4 alarm Bout 8 = L4 meas. ready

Binary input connections

The second group of 18 terminals (41–76) in the strip In the strip:

- top row = signal +
- bottom row = signal –

Input impedance 7.5 kΩ.

Operating range 20–50 VDC.

The function of binary inputs can be configured as necessary (e.g. to transmit grade or process stop information to analyzer).

Analog output connections

The next group of 18 terminals (81–116) in the strip. In the strip:

- top row = signal +
- bottom row = signal –

Loop resistance max. 600 Ω.

Analog output function can be configured as necessary (e.g. for use in process controls).

PICTURE: connection examples

Ex. 1: Bout1 & Bout2 connection when analyzer supplies loop voltage (ground strip inserted).

Ex. 2: Bout9 & Bout10 connection when DCS supplies loop voltage (no ground strip).

Ex. 3: Bin1 & Bin2 connection when DCS supplies loop voltage (no ground strip).

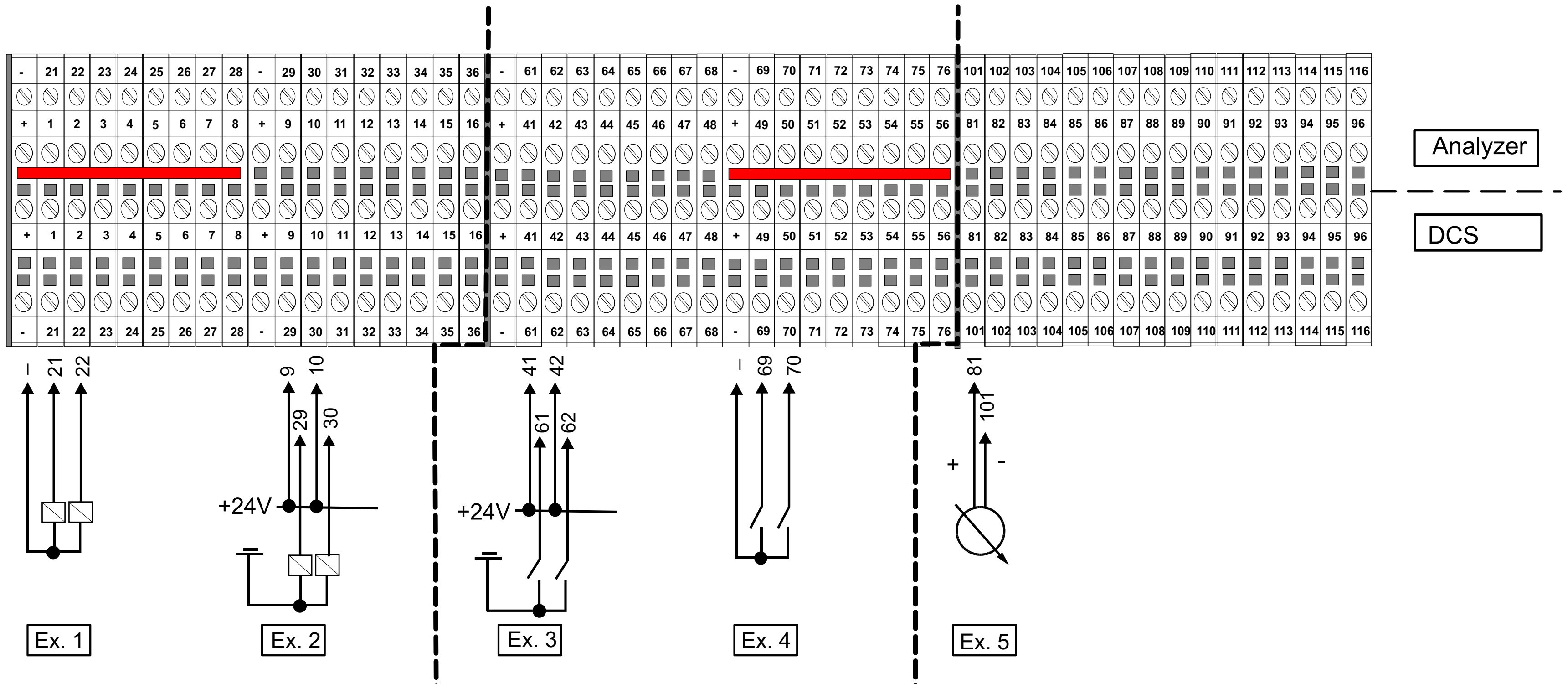
Ex. 4: Bin9 & Bin10 connection when analyzer supplies loop voltage (ground strip inserted).

Ex. 5: Aout 1 connection.

Binary outputs		
	+	-
Bout 1	1	21
Bout 2	2	22
Bout 3	3	23
Bout 4	4	24
Bout 5	5	25
Bout 6	6	26
Bout 7	7	27
Bout 8	8	28
Bout 9	9	29
Bout 10	10	30
Bout 11	11	31
Bout 12	12	32
Bout 13	13	33
Bout 14	14	34
Bout 15	15	35
Bout 16	16	36
Total load max. 1 A, 30 VDC		

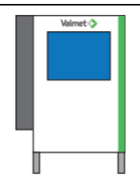
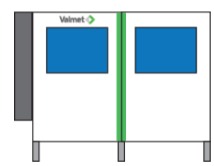
Binary inputs		
	+	-
Bin 1	41	61
Bin 2	42	62
Bin 3	43	63
Bin 4	44	64
Bin 5	45	65
Bin 6	46	66
Bin 7	47	67
Bin 8	48	68
Bin 9	49	69
Bin 10	50	70
Bin 11	51	71
Bin 12	52	72
Bin 13	53	73
Bin 14	54	74
Bin 15	55	75
Bin 16	56	76
Voltage/input 24 VDC, 20 mA		

Analog outputs		
	+	-
Aout 1	81	101
Aout 2	82	102
Aout 3	83	103
Aout 4	84	104
Aout 5	85	105
Aout 6	86	106
Aout 7	87	107
Aout 8	88	108
Aout 9	89	109
Aout 10	90	110
Aout 11	91	111
Aout 12	92	112
Aout 13	93	113
Aout 14	94	114
Aout 15	95	115
Aout 16	96	116



Binary outputs 1-16
Binary inputs 1-16
Analog outputs 1-16

Valmet Kappa Analyzer Technical specification

	 One-Cabinet	 Two-Cabinet	 + Fiber-Shive (option)
Height	1650 mm (64.96")	1650 mm (64.96")	1050 mm (41.34")
Width	1000 mm (39.37")	1870 mm (73.62")	600 mm (23.62")
Depth	720 mm (28.35")	720 mm (28.35")	720 mm (28.35")
Weight	210–240 kg (460–530 lbs)	400–470 kg (880–1040 lbs)	90 kg (198 lbs)
Consumptions – for connections, see next page			
Instrument air	11.000 NL/h	12.500 NL/h	–
Cold water / deionized water:			Intermittent, 45 L/analysis (approx. 6 minutes)
- Average:	240 L/h (63 US gal/h)	360 L/h (95 US gal/h)	
- Momentary peak value:	17 L/min (4.5 US gal/min), corresponds to flow rate 1020 L/h (270 US gal/h)	24 L/min (6.3 US gal/min), corresponds to flow rate 1440 L/h (380 US gal/h)	
- During sample transfer:	40–50 L/min (10.6–13.2 US gal/min), corresponds to flow rate 2400–3000 L/h (634–793 US gal/h)		
Hot water			–
- Average:	50–100 L/h (13–26 US gal/h), depends on the number of hot water washes		
- Momentary peak value:	280 L/h (74 US gal/h)		
- During sample transfer:	Only if used also for sample transfer; 40–50 L/min (10.6–13.2 US gal/min), corresponds to flow rate 2400–3000 L/h (634–793 US gal/h)		
Cleaning chemical	Dependent on device settings. Example: 10 measurements / hour, chemical wash every 100 measurements, chemical added for 5 seconds		–
	0.2 L/day (example)	0.4 L/day (example)	
SO_2-water	~ 0.5 L/day		–
Electric & data connections			
Operating voltage	Connection to analyzer's connection box. 180–250 VAC, 50–60 Hz, 10 A, stabilizer recommended.		
Power intake	610 W	980 W	300 W
Data connections	**Serial connections:** PC.............................. Ethernet Flexi-U .... Ethernet Communicator-i.......... RS-485 (4-wire) Modbus-TCP/IP .... Ethernet (copper or fiber) Modbus-RTU............. RS-485 (2/4-wire)	**Option** (depending on the number of Customer IO boards) 0–56 analog inputs, 4–20 mA, isolated, max. load 600Ω 0–36 binary outputs, max. 48 V / 1 A, relay 0–36 binary inputs, 24–48 VDC, isolated	
Environmental conditions, protection class of enclosure, generated noise			
Temperature	5–50 °C (41–122 °C), protect from direct sunshine		
Relative humidity	10–90%, no condensation, protect from direct rain and dripping/splashing water		
Protection class	Measurement cabinet: IP54 (NEMA 3S). Analyzer electronics box, connection box & module electronics box: IP65 (NEMA 9)		
Noise generated by device	max. 75 dB, measured at a distance of 1 meter from analyzer		

Valmet Kappa Analyzer Technical specification

<table>
<tr><th>Sample / water / air connections</th><th>One-Cabinet / Two-Cabinet</th><th>Fiber-Shive (option)</th></tr>
<tr><td>Sample inlets</td><td>With trunk line, connection at analyzer with R1" inside thread.
Max. 16 sample lines divided between the cabinets + manual sample inlet.
The entire trunk line must be made using the same pipe diameter.
Recommended: tube with inside diameter 19 mm (3/4"). If 25 mm (1") tube is used, water consumption and sample transfer times will increase.
Metal pipe: DN15 (or DN20) acid-proof steel pipe only, all connections to analyzer and samplers with flexible, non-conducting tube.
Max. pipe size: 25 mm (1") / DN20.</td><td>Sample from analyzer</td></tr>
<tr><td>Discharge</td><td>Separate discharge connection from each chamber (1 or 2 per cabinet).
Inside diam. 50 mm (2"), fastening with hose clamp.</td><td>Inside diam.
25 mm, R1"</td></tr>
<tr><td>Instrument air</td><td>Needed for all applications. Filtered instrument air.
Pressure 4–6 bar (400–600 kPa, 58–87 psi).
Connection at analyzer: ISO 7/1–Rp 1/2"
Filter at analyzer: 5 µm
Recommended tube size: DN15</td><td>From analyzer.</td></tr>
<tr><td>Cold water</td><td>For Kappa measurement. Chemically purified, Ca- and Mg-free water.
Pressure: 5–8 bar (500–800 kPa, 73–116 psi)
Temperature: 18–30 °C (64–86 °F), allowed variation during sequence ± 5 °C (9 °F); if temperature is lower, air humidity will begin to condense inside the analyzer.
Connection at analyzer: ISO 7/1–Rp 1/2"
Filter at analyzer: 100 µm
Recommended tube size: DN20</td><td rowspan="2">From analyzer, uses whichever alternative is connected.</td></tr>
<tr><td>Deionized water</td><td>Only for Brightness measurement
– recommended in brightness range > 85.
"Boiler water" specification + conductivity < 0.3 mS/m, pH 6–8, $KMnO_4$ consumption < 4 mg/L, SiO_2 < 0.02 mg/L
Pressure: 5–8 bar (500–800 kPa, 73–116 psi)
Temperature: 18–30 °C (64–86 °F), allowed variation during sequence ± 5 °C (9 °F); if temperature is lower, air humidity will begin to condense inside the analyzer.
Connection at analyzer: ISO 7/1–Rp 1/2"
Filter at analyzer: 100 µm
Recommended tube size: DN20</td></tr>
<tr><td>Hot water</td><td>Only in Kappa measurement – recommended for washing & sample transfer when pulp contain alkali before D0-stage or there is no O_2-stage.
Chemically purified, Ca- and Mg-free water.
Pressure 3–6 bar (300–600 kPa, 44–87 psi)
Temperature 50–60 °C (122–140 °F), allowed variation during sequence max. ± 2,5 °C (4 °F)
Connection at analyzer: ISO 7/1–Rp 1/2"
Filter at analyzer: 100 µm
Recommended tube size: DN20</td><td>Not needed.</td></tr>
<tr><td>SO_2-water</td><td>Only in final brightness measurement.
SO_2 concentration 10–60 g/L
Pressure 1–6 bar (100–600 kPa).
Temperature 10–50 °C (50–122 °F)
Connection at SO_2-valve unit: R1/2" inside thread
Recommended tube size: 6/8</td><td>Not needed</td></tr>
</table>

Valmet Kappa Analyzer Technical specification

Kappa measurement & Brightness measurement (option)

	Kappa measurement	Brightness measurement
Measurement range	0–120 Kappa points	40–90+ (% ISO)
Stability	1 % of meas. range maximum per month	–
Measuring loops	One-Cabinet: 1 loop; Two-Cabinet: 2 loops	
Speed, Single Chamber	new result every 4–6 minutes	new result every 4–6 minutes
Speed, Dual Chamber	new result every 3–4 minutes	new result every 3–4 minutes
NOTE!	The measurement speeds stated above are **averages**. The length of sample lines, and the device settings (e.g. the number of sample washes) may have an effect on actual speed!	
Repeatability (10 consecutive measurements from the same pulp)	Kappa < 2 ± 0.1 (1 σ) 2–8 ± 0.1 (1 σ) 8–20 ± 0.25 (1 σ) 20–40 ± 0.5 (1 σ) 40–60 ± 1.0 (1 σ) > 60 ± 1.2 (1 σ)	40–60 0.40 (1 σ) 60–85 0.35 (1 σ) 85–90+ 0.30 (1 σ)

Fiber-Shive module (option)

	Results	Meas. range	Repeatability
Shive content	% of pulp, n/mg, n/g, n	W: 75–2000 µm L: 0.3 – 20 mm	5 %, when shive content is > 400 n/g
Length-weighted fiber length	Lc(l) ISO, n, l, w	0.20 – 7.0 mm	1.5 %
Fiber width	weighted value	10 – 2000 µm	0.6 %
Fines	Surface area % (A) and length percentage (B)	100 – 2000 µm² 2 – 10 µm	Fines A: 3 % Fines B: 0.2 fines %
HW/SW ratio		0 – 100 %	HW/SW 3%
Curl		0 – 100 %	3 %
Vessels	n, n/1000, n/m		5 %
Kink	n/1000, n/m, angle		5 %
Measuring speed	Shive measurement: 4–6.5 minutes, sample > 1 g/min. Fiber measurement: 40 sec, measuring > 8000 fibers/second		

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