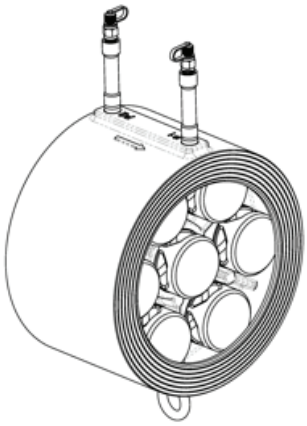
AUTOMATIC FLOW BALANCING VALVE

cim 3790

PN 16



Main features:

Cim 3790 is used for balancing the flow in cooling, heating and domestic water systems.
Cim 3790 is a wafer style automatic balancing valve with following features:

- Constant flow regardless system pressure fluctuations;
- System balancing is assured automatically, even under fluctuating pressure conditions;
- Automatic balancing is achieved by means of cartridges that provide constant flow within a fixed range of differential pressures;
- The self-cleaning cartridge design makes very difficult for any particles to accumulate and compromise the accuracy of the valve.

It is made of cast iron (GGG40) with flanges according to EN/ANSI standards.
This article is made in compliance with the quality management requirements of ISO 9001:2008 standard.
All articles are tested according to the EN 12266-1:2003 standard.
It can be used in a wide variety of sectors: heating, air conditioning, water, sanitary systems and generally with any non corrosive liquid.

Technical data:

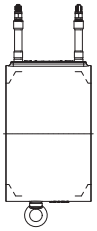
Max. static working pressure	16 bar
Max. flow temperature	120 °C
Min. temperature	-20°C
Fluids:	Water and Glycol
Material of parts in contact with water:	
	Valve body;
	Cartridge, etc.
Materials:	
	Cast Iron (GGG40)

Approved by:

EAC

Rev. 0 del 01/2014

Models:

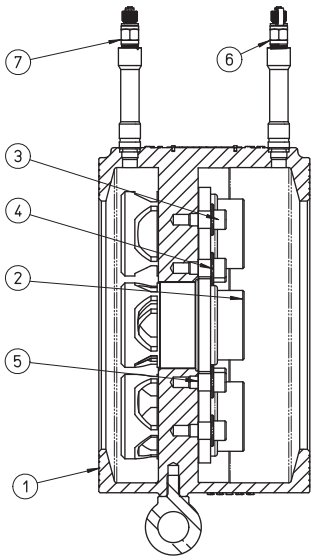


Cim 3790 - Automatic balancing valve - PN 16 - Cast Iron*					
DN	Material	Max. N. of cartridges	Flow rate range		
			(l/s)	(m^3/h)	(GPM)
50	Cast Iron GGG40	1	1.06 ÷ 12.50	3.82 ÷ 45	16.82 ÷ 198.13
65		1	1.06 ÷ 12.50	3.82 ÷ 45	16.82 ÷ 198.13
80		1	1.06 ÷ 12.50	3.82 ÷ 45	16.82 ÷ 198.13
100		2	1.06 ÷ 25.00	3.82 ÷ 90	16.82 ÷ 396.26
125		3	1.06 ÷ 37.50	3.82 ÷ 135	16.82 ÷ 594.39
150		4	1.06 ÷ 50.00	3.82 ÷ 180	16.82 ÷ 792.52
200		7	1.06 ÷ 87.50	3.82 ÷ 315	16.82 ÷ 1386.90
250		12	1.06 ÷ 125.00	3.82 ÷ 540	16.82 ÷ 2377.55
300		15	1.06 ÷ 150.00	3.82 ÷ 675	16.82 ÷ 2971.94
350		19	1.06 ÷ 237.50	3.82 ÷ 855	16.82 ÷ 3764.45
400		26	1.06 ÷ 325.00	3.82 ÷ 1170	16.82 ÷5151.35
450		33	1.06 ÷ 412.50	3.82 ÷ 1485	16.82 ÷ 6538.26
500		40	1.06 ÷ 500.00	3.82 ÷ 1800	16.82 ÷ 7925.16
600		56	1.06 ÷ 700.00	3.82 ÷ 2520	16.82 ÷ 11095.23
800		85	1.06 ÷ 1062.50	3.82 ÷ 3825	16.82 ÷ 16840.97

* The valve is supplied with the cartridge already installed. For orders specify the code of the required cartridge in accordance with the attached tables.

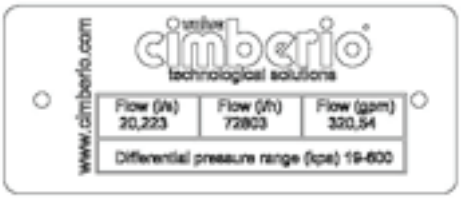
Cross section:

1. Valve body
2. Cartridge
3. Fixing screw
4. Washer
5. Spacer
6. Extensions for binder point
7.Blue binder point
8. Red binder point

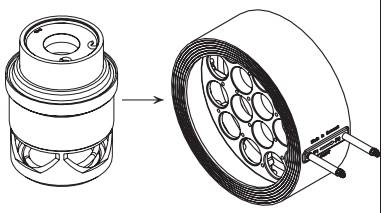


Installation procedure:

Before installation of Cim 3790, check that inside the valve and the pipes there are no foreign matters, which might damage the tightness of the valve, and burr pipe connections.
It is advisable to install a filter and an intercepting valve on the feed line.
Before installation of Cim 3790, make sure that the sum of nominal flow rates of cartridges supplied in the valve are the ones required by the system. This value is shown on the plate placed on valve body between the two binder points (see picture).
This plate shows the total flow rate of the valve and the working differential pressure range.
Make sure that the pump is able to guarantee the minimal differential pressure (Δp min) listed in the tables on following pages.
Valve may be installed either on horizontal or vertical pipelines, following the arrow direction casted on the valve body, which shall be the same as the flow one.



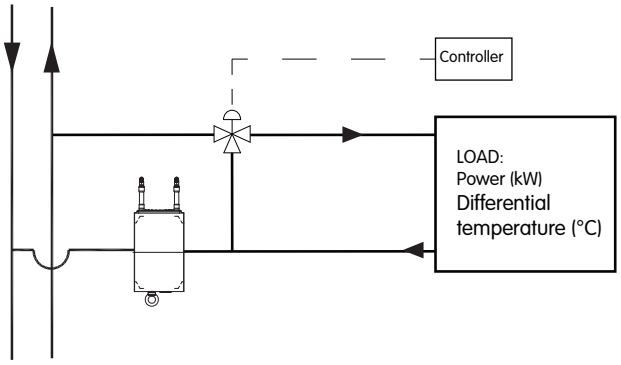
Balancing:



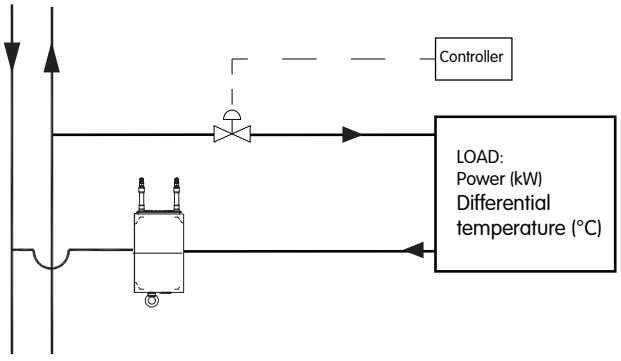
Flow rate balancing is achieved automatically by Cim 3790, regardless pressure fluctuations. The flow rate of each cartridge depends on the fixed orifice installed therein. Each fixed orifice has a four digit code number,corresponding to the last four digits of Cimberio cartridge code.Once the cartridge is identified by Cimberio code, the relevant flow rates and minimum Δp can be read in the tables shown in "Tables" section of this brochure.
Using the electronic differential manometer Cim 726, check that the differential pressure is higher or the same as the minimum value shown in said tables. The differential manometer interfaces with the balancing valve through two sensors inserted in the binder points of the valve.These cartridges are available in two materials: AISI 304 (version CA….H) and AISI 316 for high resistance to corrosion (version CA….HR).

Typical installations:

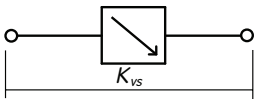
Cim 3790 is suitable for constant volume system, where diverting or mixing valves are installed as fancoil control. Below a typical installation with a diverting valve: in each moment the flow rate will result constant and there will not be extra-flow due to the pressure fluctuations introduced by the hidraulic shortcircuit that would be created when the flow goes across the by-pass.



The automatic flow balancing valves can also be used with variable speed pumps. By using a 2 ports control valve (ON/OFF), the flow in each emitters can be stopped as soon as the desired room temperature in reached. In this way the branches that are still opened will not be affected by the total flow variations. The effect is that there is an energy saving due to the reduction of the total pumped flow.



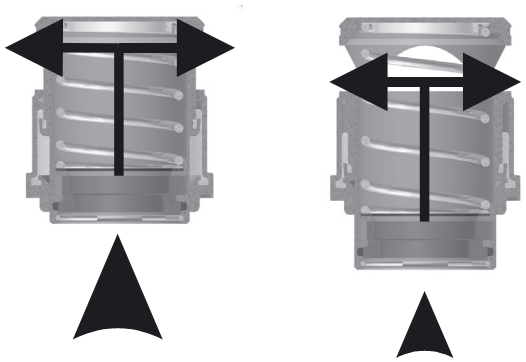
Sizing:



Kvs - Kv across the valve when it is fully open (at start up pressure)

Relative density	
Fluid	r
Water	1.000
Water and glycol 10%	1.012
Water and glycol 20%	1.028
Water and glycol 30%	1.040
Water and glycol 40%	1.054
Water and glycol 50%	1.067

When the pressure increases, the spring is compressed and the piston reduces outlet windows, in order to maintain the same flow rate; when Δp decreases the windows start to open again (see picture on the right).

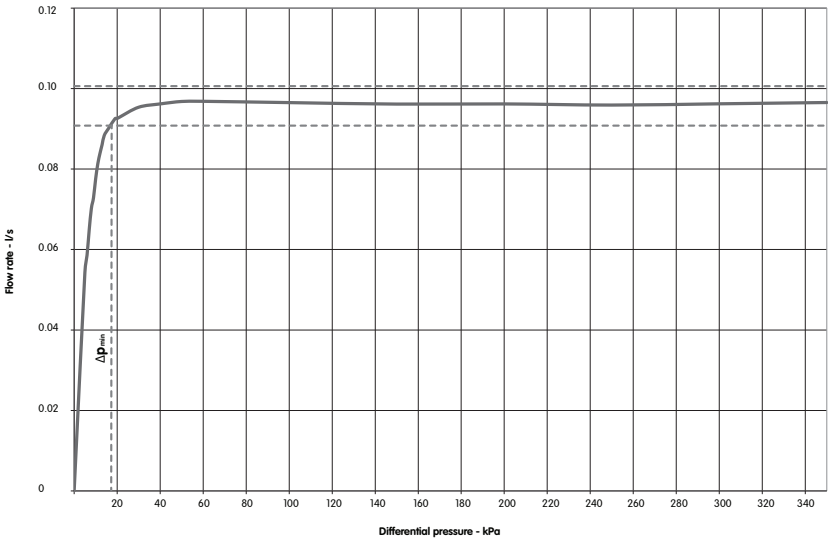


Constant flow is obtained through the valve, despite pressure fluctuations.
By simply measuring differential pressure across the valve, the flow through the cartridge is obtained as follows:

- If measured differential pressure is above Δp_{min} (start-up pressure), the flow rate is the same as the one stated on the cartridge table;
- If measured differential pressure is below minimum Δp_{min} stated on cartridge table, flow rate is calculated with one of the following formula:

$$Q = Kvs \cdot \sqrt{\frac{\Delta p}{r}}$$

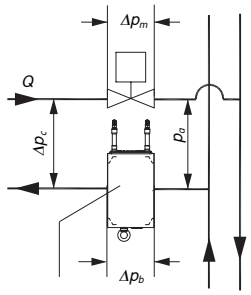
where:
Q is the flow rate in m^3/h, r is the relative density, Δp is the pressure drop across the valve .



FLOW COEFFICIENT

Kv, in metric system represents the flow in m^3/h of water at the temperature of 15.5°C (density =998 kg/m^3) which causes a pressure drop of 1 bar. In the USA flow coefficient is called Cv (Kv = 0.865 Cv).

$$Kv = \frac{Q}{\sqrt{\Delta p}}$$



$\Delta p_a = \Delta p_b + \Delta p_c + \Delta p_m$

Δp_b *Pressure drop across Cim 3790*
Δp_m *Pressure drop across the control valve*
Δp_c *Circuit pressure drop*
Δp_a *Available pressure for the riser*

SUGGESTED VALUES AND TIPS:

- Velocities in the pipeline:
  Max = 3 m/s
  Min = 0.75 m/s

For the preliminary sizings where the value of maximum available pressure is not known, it is possible to use the maximum head of the pump directly.

EXAMPLE

It is required to balance the circuit in the figure, the given data are:

- Circuit pressure drop: Δp_c=10 kPa;
- Pressure drop across the control valve: Δp_m= 8 kPa;
- Flow rate: Q= 22.7 m^3/h=6.31 l/s;
- Maximum head: $\Delta p_{a,max}$ = 120 kPa (Pump head);
- Pipeline size: DN 100.

It is possible to install a valve with the same diameter of the pipe. Using a Cim 3790 DN100, it is possible to select from the list of the suitable cartridges the closest value of nominal flow rate to the required one.
It is possible to install n. 2 cartridges CA5287H with nominal flow rate of 3.154 l/s (2x3,154 = 6.308 l/s).
This cartridge needs at least 21 kPa of differential pressure in order to work properly, the available pressure on the riser should be at least:

$$\Delta p_a = \Delta p_b + \Delta p_c + \Delta p_m = 21 + 10 + 8 = 39\ kPa$$

The maximum allowable differential pressure across the balancing valve is 600 kPa, it means that the maximum head at the riser shall be:

$$\Delta p_a = \Delta p_b + \Delta p_c + \Delta p_m = 600 + 10 + 8 = 618\ kPa$$

Being the maximum head less than the calculated limit, the installation is correct.

Measurement conversion chart:

Pressure

FROM	MULTIPLY BY	TO OBTAIN
Pa, Pascal	0,001	kPa, kiloPascal
Pa, Pascal	0,000001	MPa, Mega Pascal
Pa, Pascal	0,00001	bar
Pa, Pascal	0,00010972	m_{H2O}, metres of water
Pa, Pascal	0,000145038	psi, pound per square inch
bar	1,01325	atm, atmosphere
bar	0,980665	Kg/cm^2, kilograms per square centimetre
bar	10,1972	m_{H2O}, metres of water
bar	14,5038	psi, pound per square inch
atm, atmosphere	1,03323	Kg/cm^2, kilograms per square centimetre
atm, atmosphere	10,3323	m_{H2O}, metres of water
atm, atmosphere	14,6959	psi, pound per square inch
Kg/cm^2	10	m_{H2O}, metres of water
Kg/cm^2	14,2233	psi, pound per square inch
m_{H2O}	1,42233	psi, pound per square inch

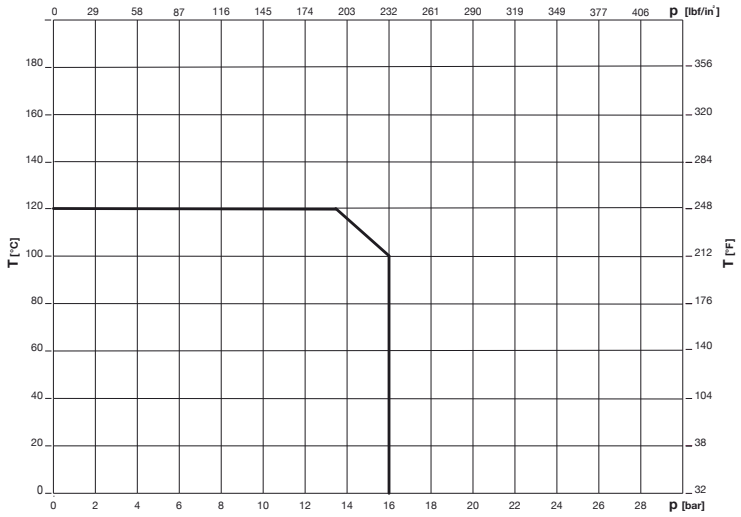
TO OBTAIN ← DIVIDE BY ← FROM

Length, Area, Volume, Density

FROM	MULTIPLY BY	TO OBTAIN
inches	0,0254	m, metres
inches	2,54	cm, centimetres
feet	0,3048	m, metres
feet	30,48	cm, centimetres
yards	0,9144	m, metres
square inches	0,00064516	m^2, metri quadrati
square feet	0,09290304	m^2, square metres
square inches	6,4516	cm^2, square centimetres
square feet	929,0304	cm^2, square centimetres
square yards	0,8361274	m^2, square metres
l, litres	0,001	m^3, cubic metres
gallons	0,003789412	m^3, cubic metres
cubic yards	0,7645549	m^3, cubic metres
cubic feet	0,02831685	m^3, cubic metres
cubic inches	0,0000164	m^3, cubic metres
cubic inches	16,38706	cm^3, cubic centimetres
cubic feet	28,31685	l, litres
gallons	3,875412	l, litres

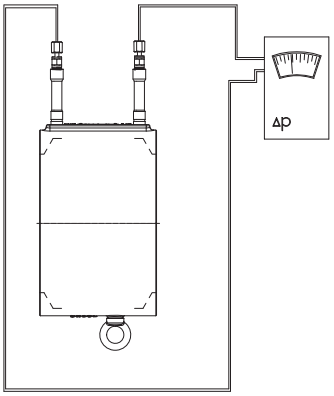
TO OBTAIN ← DIVIDE BY ← FROM

Pressure-temperature ratings:



Cartridges
DN 50 ÷ 800

Cim 3790

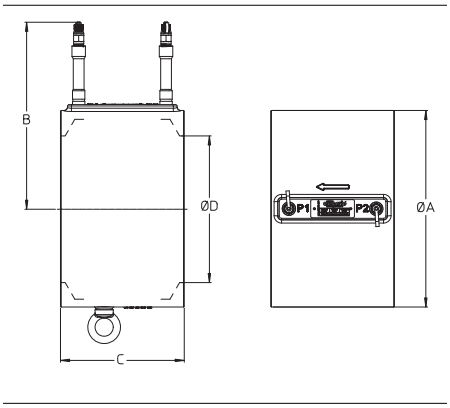


$\Delta p \geq \Delta p_{min}$ --> $Q = Q_{nom}$
$\Delta p < \Delta p_{min}$ --> $Q = Kvs \sqrt{\Delta p}$

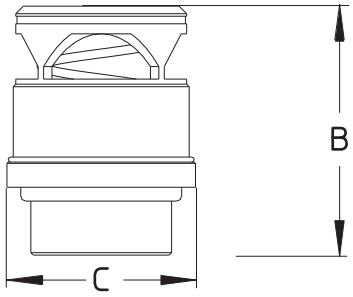
Cartridge code		Flow rate			Δp_{min}	Kvs
Max. 600 kPa	Max. 600 kPa	l/s	l/h	GPM	kPa	$(m^3/h)/bar^{0.5}$
CA5179H	CA5179HR	1.061	3820	16.82	13	10.6
CA5184H	CA5184HR	1.092	3931	17.31	13	10.9
CA5189H	CA5189HR	1.125	4049	17.83	13	11.2
CA5194H	CA5194HR	1.166	4199	18.49	13	11.7
CA5200H	CA5200HR	1.222	4399	19.37	13	12.2
CA5206H	CA5206HR	1.289	4640	20.43	14	12.4
CA5213H	CA5213HR	1.375	4951	21.80	14	13.2
CA5220H	CA5220HR	1.475	5310	23.38	14	14.2
CA5227H	CA5227HR	1.583	5700	25.10	14	15.2
CA5235H	CA5235HR	1.725	6209	27.34	14	16.6
CA5243H	CA5243HR	1.809	6511	28.67	14	17.4
CA5251H	CA5251HR	1.967	7081	31.18	14	18.9
CA5260H	CA5260HR	2.195	7901	34.79	15	20.4
CA5269H	CA5269HR	2.472	8900	39.19	16	22.3
CA5279H	CA5279HR	2.889	10339	45.79	19	23.9
CA5287H	CA5287HR	3.154	11355	50.00	21	24.2
CA5292H	CA5292HR	3.470	12491	55.00	23	26.1
CA5298H	CA5298HR	3.722	13399	59.00	24	27.4
CA5303H	CA5303HR	4.100	14762	65.00	27	28.4
CA5308H	CA5308HR	4.444	15999	70.45	29	29.7
CA6285H	CA6285HR	4.733	17037	75.02	34	29.2
CA6292H	CA6292HR	5.041	18148	79.91	34	31.1
CA6301H	CA6301HR	5.221	18797	82.77	35	31.8
CA6305H	CA6305HR	5.408	19467	85.72	35	32.9
CA6312H	CA6312HR	5.684	20464	90.11	35	34.6
CA6319H	CA6319HR	5.980	21527	94.79	36	35.9
CA6326H	CA6326HR	6.236	22449	98.85	36	37.4
CA6332H	CA6332HR	6.523	23482	103.40	36	39.1
CA6338H	CA6338HR	6.814	24531	108.02	37	40.3
CA6344H	CA6344HR	7.117	25621	112.82	38	41.6
CA6349H	CA6349HR	7.369	26528	116.81	38	43.0
CA6356H	CA6356HR	7.690	27686	121.91	38	44.9
CA6362H	CA6362HR	8.099	29157	128.39	38	47.3
CA6367H	CA6367HR	8.321	29954	131.90	39	48.0
CA6373H	CA6373HR	8.605	30976	136.40	39	49.6
CA6379H	CA6379HR	8.961	32260	142.05	40	51.0
CA6385H	CA6385HR	9.324	33565	147.80	40	53.0
CA6391H	CA6391HR	9.709	34953	153.91	40	55.3
CA6393H	CA6393HR	10.093	36336	160.00	42	56.1
CA6398H	CA6398HR	10.468	37685	165.94	43	57.5
CA6400H	CA6400HR	10.724	38607	170.00	44	58.2
CA6407H	CA6407HR	11.381	40971	180.41	46	60.4
CA6407HH	CA6407HHR	12.500	45000	198.00	49	64.3

Main dimensions:

Cim 3790



DN	50	65	80	100	125	150	200	250	300	350	400	450	500	600	800
kgs	3.9	4.9	4.8	6.9	9.0	11.7	18.8	23.4	33.4	44.2	51.6	54.5	67.8	88.9	127
ØA	100	119	131	163	193	216	271	326	383	443	496	545	601	715	880
B	168	178	184	200	215	226	254	277	310	340	366	391	419	476	558
C	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
ØD	80	80	80	100	125	150	200	260	315	355	405	455	508	610	760
Cart.	1	1	1	2	3	4	7	12	15	19	26	33	40	56	85



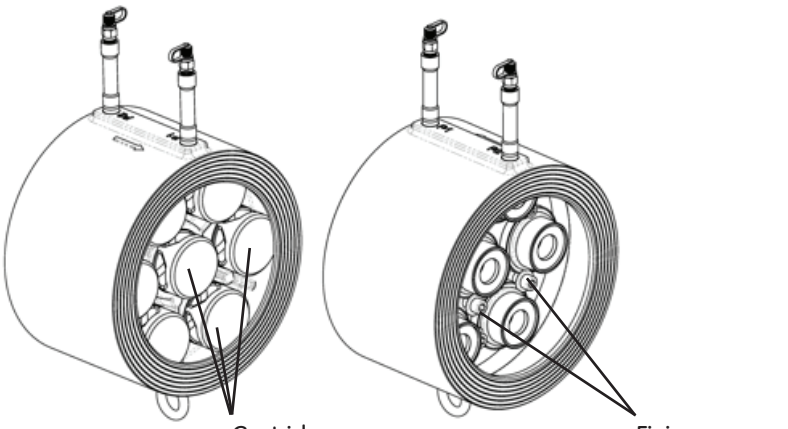
B	99
C	75

Maintenance:

As a rule, the balancing valve does not need any maintenance. In case of replacement or need of disassembling of some components of the valve, make sure that the installation is not under service or pressure.

If a modification of flow rate is needed, you shall proceed as follows:

- Disassemble the valve from the installation;
- Unscrew all fixing screws of cartridges and remove them, together with relevant washers and spacers;
- Take all cartridges inside valve body off;
- Replace all cartridges with the new ones, according to the needed flow rate;
- Fasten the fixing screws of cartridges with relevant washers and spacers;
- If new flow rate requires a lower quantity of cartridges than the available positions, remember to order together with cartridges some blind caps to fill the empty positions;
- Reassemble the valve in the installation.



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bsi. ISO 9001 Quality Management — FM 01820

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